

Functional Asymmetry of the Upper Limbs in Bulgarians from North Bulgaria

Zl. Filcheva

Institute of Experimental Morphology and Anthropology, Bulgarian Academy of Sciences, Sofia

The hand clasping and arm folding types of 770 men and 741 women, aged 30-39, from North-West, North Central and North-East Bulgaria have been studied. In the males the L-hand clasping and arm folding types are prevalent while in the women it is the R-hand clasping and the L-arm folding types that are more common. The territorial variations in both sexes with regard to both types of asymmetry are statistically insignificant. The intersexual differences are more clearly pronounced in hand clasping. A statistically insignificant correlation between hand clasping and arm folding has been established.

Key words: functional asymmetry, hand clasping, arm folding, intersexual differences.

Introduction

Hand clasping (interlocking the fingers of the hands) and arm folding (crossing of arms on the chest) represent some of the main tests for studying functional asymmetry in the human as an expression of the functional asymmetry of the brain. The study of the functional asymmetry of the upper limbs is of major importance since it is related to active perception which is to a large extent attributed to hands. It is one of the main sources of sensory cognition and hence of abstract thinking and psychological development of the human as a whole.

L u t z [14] was the first to describe two types of interlocking of the fingers. In one case the right thumb is situated over the other fingers and is defined as the R-type and in the other it is the left thumb that is in the same position and this is the L-type. Analogous are the cases in crossing the arms noted by W i e n e r [19]. Quite a number of authors show an interest towards this problem starting from the early 20th century up to our day. Their interests have been directed towards the determination of the factors accounting for these asymmetries, their interrelation, the sex, age and racial influences on them. A unified explanation as to their nature is not found even now, however. L u t z himself [14] as well as a variety of other authors [5, 6, 15, 20] support the hypothesis of their genetic predetermination. Others state that there are no proofs of such a control [4, 19]. According to L o u r i e [13] arm folding as opposed to hand clasping is of a lesser value as an anthropological marker and that the genetic control is more evident in hand clasping. L a i a n d

Walsh [11] suggest that these are more of a habit rather than genetic predetermination. Legebe [12] mentions about a combined influence of the factors in determining the hand clasping type. According to some authors sex and age do not exert an influence on the asymmetries under study [1, 7] while according to others they do [15]. A number of authors do not find correlation between the hand clasping and arm folding types [1, 16, 17, 19]. Others insist on a significant correlation between them [9, 10]. Sarna et al. [18] based on literature data prove statistically that asymmetry in hand clasping and arm folding is not an arbitrary phenomenon.

In our country there is a scanty amount of studies on this problem. Boev and Todrov [2] have investigated a total of 2638 persons of three ethnic groups and have found a very high percentage of the R-hand clasping type especially in the Bulgarians. Mutafov [21] has studied a control group of 1500 healthy children with a predominant L-hand clasping type. Krev [8] has surveyed 2100 students later and has also found a higher per cent of the L-type in both asymmetries.

The aim of the present study is to establish the frequency of the hand clasping and arm folding types in Bulgarians from the three parts of North Bulgaria — North-West, North Central and North-East Bulgaria, to take into account the territorial variability, the intersexual differences and looking for a correlation between these two types of asymmetry.

Material and Methods

A total of 1511 Bulgarians of both sexes (770 men and 741 women) aged 30-39, from the three regions of North Bulgaria — North-West, North Central and North-East Bulgaria have been studied. In the boundaries of the regions under study four administrative districts — Montana, Lovech, Rousse and Varna are situated (according to the administrative-territorial division of Bulgaria since 1987). The studied persons originate from these districts and live there. This study was conducted in unison with the National Programme "Anthropological Characterization of the Bulgarian People" (1989 — 1993) carried by the Department of Anthropology in IEMA at the Bulgarian Academy of Sciences. It was performed using the conventional methods [3, 4, 12], with χ^2 -test applied for comparing the populations under study.

Results and Discussion

Hand clasping

The L-type is prevalent in the males as a whole for North Bulgaria, while in women it is the R-type that is more common. The intersexual differences are statistically significant (Table 1). In the males from all three parts of North Bulgaria the L-type is predominant whose percentage grows from the West to the East. The territorial differences are statistically insignificant. In the women from North-West and North-East Bulgaria the L-type is prevailing while in those from the North Central Part the percentage of the R-type is higher. The territorial differences are statistically significant (Table 2).

T a b l e 1. Percent distribution of hand clasping types among a population of North Bulgaria

Sex	R - type		L - type		Total
	<i>n</i>	%	<i>n</i>	%	
Males	344	44.68	426	55.32	770
Females	376	50.74	365	49.26	741
Both sexes	720	47.65	791	52.35	1511

$\chi^2 = 5.82 > 3.84, k=1, P < 0.05$

T a b l e 2. Comparison of the frequencies of hand clasping types among the three regions of North Bulgaria

Region	Sex	R -type		L - type		Total	Comparison groups	χ^2 0.05 <i>k=1</i>
		<i>n</i>	%	<i>n</i>	%			
1. North - West Bulgaria	Males	139	46.18	162	53.82	301	<u>Males</u>	
	Females	137	48.58	145	51.42	282	1 - 2	0.02
2. North Central Bulgaria	Males	97	46.41	112	53.59	209	1 - 3	1.04
	Females	109	55.33	88	44.67	197	2 - 3	0.93
3. North - East Bulgaria	Males	108	41.54	152	58.46	260	<u>Females</u>	
	Females	130	49.62	132	50.38	262	1 - 2	2.39
Total North Bulgaria	Males	344	44.68	426	55.32	770	1 - 3	0.11
	Females	376	50.74	365	49.26	741	2 - 3	1.52

T a b l e 3. Percent distribution of arm folding types among a population of North Bulgaria

Sex	R - type		L - type		Total
	<i>n</i>	%	<i>n</i>	%	
Males	342	44.42	428	55.58	770
Females	328	44.26	413	55.74	741
Both sexes	670	44.34	841	55.66	1511

$\chi^2 = 0.00 < 3.84, k=1, P > 0.05$

T a b l e 4. Comparison of the frequencies of arm folging types among the three regions of North Bulgaria

Region	Sex	R - type		L - type		Total	Comparison groups	χ^2 0.05 k=1
		n	%	n	%			
1. North - West Bulgaria	Males	142	47.18	159	52.82	301	<u>Males</u>	
	Females	120	42.55	162	57.45	282	1 - 2	3.62
2. North Central Bulgaria	Males	80	38.28	129	61.72	209	1 - 3	0.02
	Females	80	40.61	117	59.39	197	2 - 3	3.27
3. North - East Bulgaria	Males	120	46.15	140	53.85	260	<u>Females</u>	
	Females	128	48.86	134	51.14	262	1 - 2	0.11
Total North Bulgaria	Males	342	44.42	428	55.58	770	1 - 3	2.44
	Females	328	44.26	413	55.74	741	2 - 3	3.43

T a b l e 5. Percent distribution of hand clasping / arm folding combinations among the three regions of North Bulgaria

Sex	RR		RL		LR		LL		Total
	n	%	n	%	n	%	n	%	
Males	165	21.42	179	23.25	176	22.86	250	32.47	770
Females	153	20.65	222	29.96	175	23.62	191	25.77	741
Both	318	21.05	401	26.54	351	23.23	441	29.18	1511

$\chi^2 = 12.41 > 7.82, k=3, P < 0.05$

T a b l e 6. Comparison of the frequencies of hand clasping / arm folging combinations among the three regions of North Bulgaria

Region	Sex	RR		RL		LR		LL		Total	Comparison groups	χ^2 0.05 k=3
		n	%	n	%	n	%	n	%			
1. North - West Bulgaria	Males	67	22.26	72	23.92	74	24.58	88	29.24	301	<u>Males</u>	
	Females	50	17.73	87	30.85	70	24.82	75	26.60	282	1 - 2	4.68
2. North Central Bulgaria	Males	43	20.57	54	25.84	37	17.70	75	35.89	209	1 - 3	1.30
	Females	46	23.35	62	31.47	34	17.26	55	27.92	197	2 - 3	4.56
3. North - East Bulgaria	Males	55	21.15	53	20.39	65	25.00	87	33.46	260	<u>Females</u>	
	Females	57	21.76	73	27.86	71	27.10	61	23.28	262	1 - 2	4.98
Total North Bulgaria	Males	165	21.42	179	23.25	176	22.86	250	32.47	770	1 - 3	4.77
	Females	153	20.65	222	29.96	175	23.62	191	25.77	741	2 - 3	6.31

Table 7. Relationship between hand clasping and arm folding among a population of North Bulgaria

Hand clasping	Arm folding		
	right	left	total
Right	318	401	719
Left	351	441	792
Total	669	842	1511

$\chi^2 = 0.01 < 3.84, k=1, P > 0.05$

Arm folding

In both sexes for North Bulgaria as a whole the L-type is prevalent with percentages of distribution almost equal. Intersexual differences are not observed (Table 3). In both sexes from all three parts of North Bulgaria the L-type is prevalent with a highest percentage in North Central Bulgaria. The women from North-East Bulgaria are with close R- and L-types percentages in value. The territorial differences are statistically insignificant (Table 4).

The percent distribution of the combinations between the R- and L-types of hand clasping and arm folding has been traced. Very often a combination of one of two tests with right domination, and for others — with a left one is found. In the males as a whole for North Bulgaria the per cent of the combination between the L-type of hand clasping and the L-arm folding type is highest (LL). In the women it is the combination between the R-hand clasping type and the L-arm folding one that is more common (RL). The intersexual differences are statistically significant (Table 5). This tendency is preserved also in the territorial distribution of the combinations in both sexes where the differences are statistically insignificant (Table 6). The

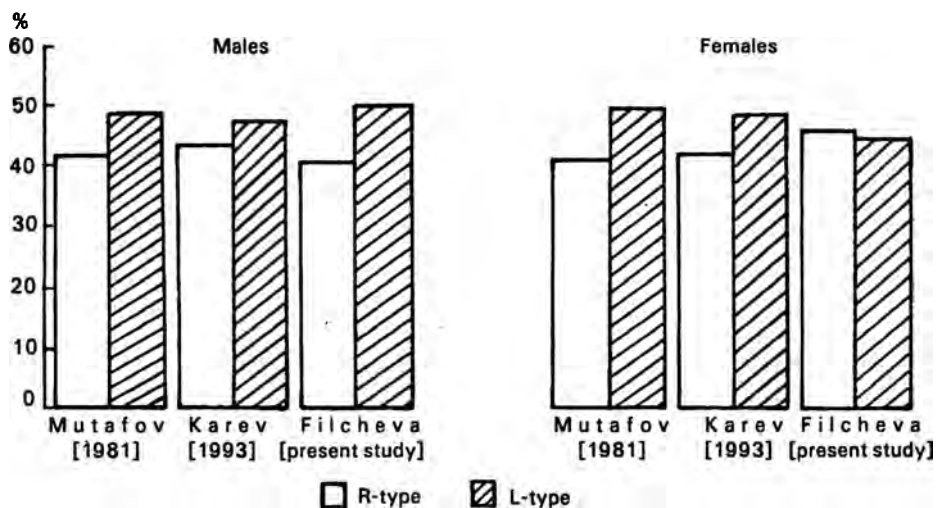


Fig. 1. Comparative data about the frequency of the hand clasping in Bulgarians

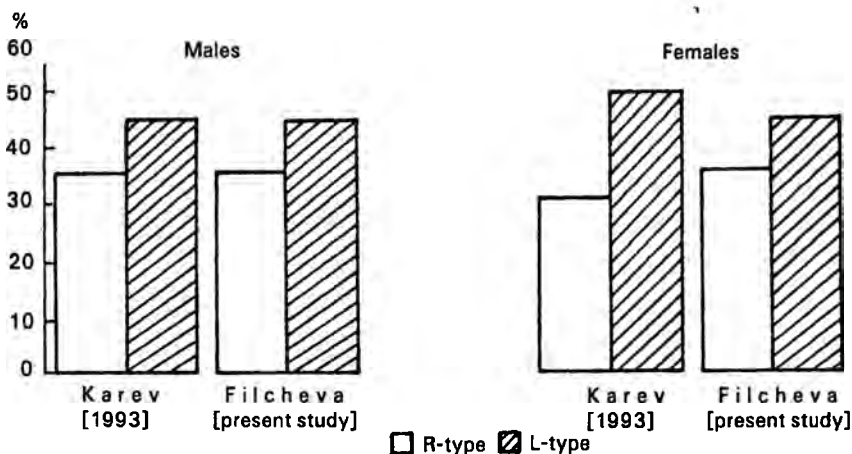


Fig. 2. Comparative data about the frequency of the arm folding in Bulgarians

sought correlation between hand clasping and arm folding is statistically insignificant (Table 7). The data yielded by the present study are closest to of the ones obtained by Mutafov and Karev (Fig.1, 2).

Conclusion

In the males from North Bulgaria the L-hand clasping and arm folding types are predominating, while in the women from North Bulgaria it is the R-hand clasping and the L-arm folding types that are more common. Intersexual differences are found in hand clasping and especially in the combinations between the hand clasping and arm folding types. The territorial variations of the frequency of the hand clasping and arm folding types are statistically insignificant in both sexes. A statistically insignificant correlation between these two types of asymmetry has been recorded.

References

1. Beckman, L. R., Elston. Data on bilateral variation in man: handedness, hand clasping and arm folding in Swedes. — *Human Biol.*, **34**, 1962, 99-103.
2. Boev, P., V. Todorov. Hand clasping bei den Bulgaren. — *Anthropologie*, **11**, 1973, No 1,2, 91-93.
3. Collins, E. The concept of relative limb dimance — *Human Biol.*, **33**, 1961, 293-319.
4. Dahlberg, G. Twin births and twins from a hereditary point of view. Stockholm, Bukforlags A. B. Tidens Tryckeri, 1926.
5. Freire - Maia, N., A. Quelce - Salgado, A. Freire - Maia. Hand clasping in diffrent ethnic groups. — *Human Biol.*, **30**, 1958, 281-291.
6. Freire - Maia, A., N. Freire - Maia, A. Quelce - Salgado. Genetic analysis in Russian immigrants. — *Am. J. Phys. Anthrop.*, **18**, 1960, 235-240.
7. Freire - Maia, A., J. de Almeida. Hand clasping and arm folding among African Negroes. — *Human Biol.*, **38**, 1966, 175-179.
8. Karev, G. B. Arm folding, hand clasping and dermatoglyphic asymmetry in Bulgarians. — *Anthrop. Anz.*, **51**, 1993, No 1, 69-76.
9. Kawabe, M. A study on the mode of clasping the hands. — *Trans. Sapporo Nat. Hist. Soc.*, **18**, 1949, 49-52.

10. Kobyliansky, E., S. Micle and B. Arensburg. Handedness, hand clasping and arm folding in Israeli males. — *Annals of Human Biol.*, 5, 1978, 247-251.
11. Lai, L. Y., R. J. Walsh. The patterns of hand clasping in different ethnic groups. — *Human Biol.*, 37, 1965, 312-319
12. Leguebe, A. Hand clasping: Étude anthropologique et génétique. — *Bull. Soc. Roy. Belge Anthropol. Préhist.*, 78, 1967, 81-107.
13. Lourie, J. A. Hand clasping and arm folding among Middle Eastern Jews in Israel. — *Human Biol.*, 44, 1972, 329-334.
14. Lutz, F. E. The inheritance of the manner of clasping the hands. — *Am. Nat.*, 42, 1908, 195-196.
15. Pons, J. Hand clasping (Spanish data). — *Ann. Hum. Genet.*, 25, 1961, 141-144.
16. Reiss, M. Händefalten — eine Übersicht — *Anthrop. Anz.*, 57, 1999, No 2, 165-184.
17. Rhoads, J., A. Damon. Some genetic traits in Solomon Island population. II. Hand clasping, arm folding and handedness. — *Am. J. Phys. Anthrop.*, 39, 1973, 179-184.
18. Sarna, J., A. Siniańska and A. Wokroj. Hand clasping, arm and leg folding in populations of Poland and other countries. — *Coll. Antropol.*, 4, 1980, No 1, 37-44.
19. Wiener, A. S. Observations on the manner of clasping the hands and folding the arms. — *Am. Nat.*, 66, 1932, 365-370.
20. Yamaura, A. On some hereditary characters in the Japanese race including the Tyosenses (Coreans). — *Jap. J. Genetics*, 16, 1940, 1-9.
21. Мутафов, Ст. Психо-физически особености на децата с аномалии С., Медицина и физкултура, 1981.