

Katedra i Zakład Anatomii Prawidłowej Człowieka. Akademia Medyczna w Lublinie
Kierownik: prof. dr hab. n. med. Stanisław Załuska

Natalia ZARZYCKA, Stanisław ZAŁUSKA

Measurements of the Moving Part of Upper Limb in the Inhabitants of the Lublin Region

Pomiary części wolnej kończyny górnej u ludności wiejskiej Lubelszczyzny

Измерения свободной части верхней конечности у населения деревни люблинской области

INTRODUCTION

This paper is the next one describing measurements of the upper limb in rural population of the Lublin region. In previous reports we presented measurements of the arm (12) and the forearm (13), in the present study — the moving part of the whole upper limb. Material and methods were presented in the first report (12). On the basis of obtained results the length of upper limb index was also calculated:

$$\frac{\text{the length of upper limb}}{\text{body height}} \times 100$$

The height of the body was calculated from the basis to the *vertex* point.

OWN STUDY

The length of the mobile part of the upper limb from *acromion* to *dactylion* of the third finger in straight position in the joints connecting each of its parts was measured.

In men the length of right upper limb ranged from 66 to 87 cm, and left — from 65.2 to 84.6 cm. The most frequent right limb length was found to be 76 and 79 cm (in 13 and 12% of cases) and the left one: 79, 78, 77 and 75 cm (11.5, 11.0, 11.2, 10.8%). The remaining lengths of both upper limbs were observed in lower percentage (minimal and maximal lengths included). The length of upper limbs was the same in 8.5% of cases, bigger on the right side — in 49.4%, and bigger of the left side — in 42.1% of cases. The differences between frequency of

Table 1. Comparison between the length of right and left upper limb in men

Age group	Difference between right and left limb				p	Direction of differences						X ²	p	
	from		to			R=L		R>L		R<L				
	mean	t	mean	t		f	%	f	%	f	%			
I	-1.6	1.034	+2.3	1.034	+0.25	1.034	3	14.3	10	47.6	8	38.1	0.22	>0.50
II	-3.3	0.657	+3.2	0.657	+0.10	0.657	5	9.4	26	49.1	22	41.5	0.33	>0.50
III	-3.1	1.957	+3.4	1.957	+0.24	1.957	5	5.5	49	53.8	37	40.7	1.67	>0.15
IV	-2.3	1.613	+3.2	1.613	+0.17	1.613	9	9.8	46	50.0	37	40.2	0.98	>0.30
V	-2.8	2.112	+4.3	2.112	+0.23	2.112	13	9.6	63	46.3	60	44.1	0.07	>0.70
VI	-2.0	1.308	+4.7	1.308	+0.18	1.308	6	6.9	43	49.4	38	43.7	0.31	>0.50

Explanation: R — right side, L — left side.

Table 3. Comparison between the length of right and left upper limb in women

Age group	Difference between right and left limb				p	Direction of differences						X ²	p	
	from		to			R=L		R>L		R<L				
	mean	t	mean	t		f	%	f	%	f	%			
I	-2.4	1.440	+4.0	1.440	+0.16	1.440	11	12.2	41	45.6	38	42.2	0.11	>0.700
II	-3.2	3.100	+3.9	3.100	+0.28	3.100	21	13.5	80	51.3	55	35.3	4.63	<0.040
III	-3.1	3.158	+3.5	3.158	+0.24	3.158	20	9.1	114	51.8	86	39.1	3.92	<0.050
IV	-3.2	5.603	+3.5	5.603	+0.33	5.603	27	8.3	186	57.4	111	34.3	18.94	<0.001
V	-3.0	3.588	+3.3	3.588	+0.29	3.588	13	5.9	117	53.2	90	40.9	3.52	>0.070
VI	-3.1	1.365	+3.1	1.365	+0.14	1.365	11	7.9	70	50.0	59	42.1	0.94	>0.300

For explanation see Table 1.

occurrence of longer right upper limb and frequency of longer left upper limb are almost significant ($p \approx 0.09$), although in all groups of age they are accidental ($p > 0.50, 0.50, 0.15, 0.30, 0.70, 0.50$) — Table 1.

The mean length of the right upper limb in men was 77.27 ± 0.16 cm, $SD = 3.57$, which is 4.6% of the mean value, and the left upper limb — 77.07 ± 0.17 cm, $SD = 3.64$, which is 4.7% of the mean value. The length of both upper limbs (min.-max.) values in men in particular age groups in connection with mean values (M), standard deviation (SD), standard error of the mean (SE) and coefficient of variation (V) shows Table 2. The smallest mean length of upper limbs was found in men under 21 years of age. Then it increased intensively up to 31 years of age, decreased slightly up to 41, and increased up to the age of 51, and again was lowered in the remaining period of life. Mean lengths of the right upper limb in all age groups were slightly greater than those of the left one (Table 2). Statistical study shows that the length of the right and left upper limbs in men correlates significantly with the age of the examined person ($p < 0.05, 0.01$).

Table 2. Length of upper limb in men with regard to body side

Age group	Number of persons	Body side	Values min.—max. cm	M	SD	SE	V
I	21	R	66.0—85.1	74.96	5.41	1.18	7.2
		L	65.2—85.9	74.71	5.35	1.17	7.2
II	53	R	71.9—84.2	77.66	3.19	0.44	4.1
		L	70.8—84.5	77.56	3.31	0.46	4.3
III	91	R	69.8—86.5	77.36	3.24	0.34	4.2
		L	69.8—85.3	77.12	3.30	0.35	4.3
IV	92	R	68.8—86.0	77.93	3.78	0.39	4.9
		L	68.9—85.6	77.76	3.65	0.38	4.7
V	136	R	68.4—87.0	77.28	3.54	0.30	4.6
		L	68.3—86.3	77.05	3.67	0.38	4.8
VI	87	R	68.0—85.5	76.75	3.17	0.34	4.1
		L	66.8—86.4	76.57	3.38	0.36	4.4
Total	480	R	66.0—87.0	77.27	3.57	0.16	4.6
		L	65.2—86.4	77.07	3.64	0.17	4.7
Significance of age influence		R	$\sqrt{MSe} = 3.532; F^0 = 2.957; F_{0.05} = 2.23; p < 0.05$				
		L	$\sqrt{MSe} = 3.600; F^0 = 3.241; F_{0.05} = 3.06; p < 0.01$				

For explanation see Table 1.

In women the length of the right upper limb ranged from 58.6 to 84.8 cm, and of the left one — from 58.7 to 86.0 cm. The most frequently observed length of the right upper limb ranged from 69 to 75 cm (in 50% cases), and of the left one — from 68.5 to 74.0 cm (in 54%). The remaining length measures were observed in lower percentage (both maximal and minimal included). In women the lengths of both upper limbs were the same in 9% of cases, bigger on the right side in 52.8% and bigger on the left side in 38.2% of cases. The differences between

frequency of occurrence of the longer right and left upper limbs were significant ($p < 0.001$). The upper limbs length differences in women were in groups II, III and IV statistically ($p < 0.04, 0.05, 0.001$), in group V — almost significant ($p \approx 0.07$), and in groups I, VI — accidental ($p > 0.70, 0.30$) — Table 3.

The mean length of the right upper limb in women was 71.77 ± 0.10 cm, $SD = 3.40$, which is 4.7% of the mean value, and the mean length of the left one — 71.51 ± 0.10 cm, $SD = 3.38$, which is 4.7% of the mean value. The biggest mean lengths of both upper limbs we observed in women under 31 years, then they decreased up to 51 years of age and increased slightly up to 61 and lowered significantly in remaining life period. In all age groups the right limbs are slightly longer than the left ones. Statistical study allows the statement, that the connections between the length of the right and left upper limbs and age were accidental ($p > 0.10, 0.10$) — Table 4.

Table 4. Length of upper limb in women with regard to body side

Age group	Number of persons	Body side	Values min.—max. cm	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>V</i>
I	90	R	65.0—78.6	72.03	3.00	0.32	4.2
		L	63.2—79.8	71.87	3.01	0.32	4.2
II	156	R	62.4—79.6	72.11	3.47	0.28	4.8
		L	61.5—78.4	71.83	3.35	0.27	4.7
III	220	R	61.5—82.0	71.80	3.43	0.23	4.8
		L	63.0—81.0	71.56	3.32	0.22	4.6
IV	324	R	63.4—84.8	71.81	3.32	0.18	4.6
		L	62.2—86.0	71.48	3.31	0.18	4.6
V	220	R	58.6—81.5	71.77	3.54	0.24	4.9
		L	58.7—81.7	71.48	3.59	0.24	5.0
VI	140	R	62.1—80.9	71.08	3.44	0.29	4.8
		L	61.4—81.8	70.94	3.54	0.30	5.0
Total	1150	R	58.6—84.8	71.77	3.40	0.10	4.7
		L	58.7—86.0	71.51	3.38	0.10	4.7
Significance of age influence		R	$\sqrt{MSe} = 3.396; F^0 = 1.583; F_{0.05} = 2.22; p < 0.10$				
		L	$\sqrt{MSe} = 3.378; F^0 = 1.288; F_{0.05} = 2.22; p < 0.10$				

For explanation see Table 1.

The lengths min.—max. and mean values of the right and left upper limbs were bigger in men than in women in all the examined material. The length index of the moving part of the upper limb in our material on the right side was 46.21 and on the left side — 46.10 in men, and in women 46.05 on the right side and 45.88 on the left side.

Table 5 shows index value in particular age groups with the respect to the side of body in men, and Table 6 — in women. Results of our study show that the differences between the index value related to sex and side of the body are slight. Both in men and women upper limbs represent mean length category.

Table 5. Length index of upper limb in male in particular age groups with regard to body height

Age group	Body height cm	Right upper limb		Left upper limb	
		Length cm	Index	Length cm	Index
I	165.84	74.96	45.20	74.71	45.04
II	170.02	77.66	45.67	77.56	45.61
III	168.54	77.36	45.90	77.12	45.75
IV	168.35	77.93	46.29	77.76	46.18
V	166.19	77.28	46.50	77.05	46.36
VI	165.65	76.75	46.33	76.57	46.22

Table 6. Length index of upper limb in women in particular age groups with regard to body height

Age group	Body height cm	Right upper limb		Left upper limb	
		Length cm	Index	Length cm	Index
I	159.16	72.03	45.25	71.87	45.15
II	158.09	72.11	45.61	71.83	45.43
III	157.24	71.80	45.66	71.56	45.51
IV	155.45	71.81	46.19	71.48	45.98
V	154.48	71.77	46.45	71.48	46.27
VI	152.14	71.08	46.72	70.94	46.62

DISCUSSION

The upper limb is a subject to constant evolution. It is connected with the change of its function, from supporting to grasping (10, 14). It seems that in men the upper limb shape and length are influenced not only by sex, height, weight, age and environment, but mainly the kind and conditions of work (1, 4—9). This also concerns the length of the upper limbs.

The length of the right upper limb in our study ranged in men from 66 to 87 cm (mean — 77.22 cm) and of the left — from 65.2 to 84.6 cm (mean — 77.07 cm). In women the length of the right upper limb ranged from 58.6 to 84.8 cm (mean — 71.77 cm) and of the left — from 58.7 to 86 cm (mean — 71.51 cm).

Both in men and women the right upper limb was more frequently found to be longer than the left one. Differences between the length of both upper limbs related to the side of the body were almost significant, but in relation to age they were almost significant in men, insignificant — in women.

The length index of the upper limb allows the statement that the inhabitants of the Lublin region are characterized by upper limbs of medium length.

Similar mean lengths of the upper limbs were observed by other authors (1, 3, 9, 11). Examining different sportsmen groups Pi p u s z (9) found the longest right upper limbs in discus fling sportswomen. Other authors have also noticed the influence of sports on the length of upper limbs (2). G ó r n y (1) found that rural population have longer upper limbs than urban population.

REFERENCES

1. Górny S.: Zdjęcie antropometryczne Polski. Część I. Pomiary ludności dorosłej z lat 1955—1956. *Materiały i Prace Antropol.* **84**, 223, 1972.
2. Grus J.: Budowa ciała zawodników uprawiających kajakarstwo w świetle pomiarów uczestników Kajakarskich Mistrzostw Europy. *Roczn. Nauk. WSWF* **21**, 29, 1972.
3. Grus J.: Z badań asymetrii somatycznej kończyn górnych młodzieży studiującej w PWSM. *Monogr. AWF* **68**, 95, 1975.
4. Jarosińska A.: Asymetria kończyn górnych u czołowych siatkarki polskich. *Wych. Fiz. Sport* **5** (3), 361, 1961.
5. Jarosińska A.: Wpływ treningu siatkarskiego na kształtowanie się asymetrii w obrębie kończyn górnych u dziewcząt w wieku 15—17 lat. *Wych. Fiz. Sport* **23** (3), 19, 1976.
6. Kowalska R., Charzewska J.: Podobieństwo proporcji długości kończyny górnej i dolnej u rodziców i ich dzieci w różnych fazach rozwoju ontogenetycznego. *Prace i Materiały Nauk. IMD* **10**, 7, 1968.
7. Malinowski A., Gołąb A.: Proporcje ręki na tle pomiarów kończyny górnej u osiemnastoletniej młodzieży Wielkopolskiej. *Przeł. Antrop.* **34** (1), 117, 1968.
8. Malinowski A., Tuszyński K.: Asymetria morfologiczna i dynamiczna kończyn górnych w związku z wykonywaną pracą zawodową. *KKE, Antropotechnia. Część II*, 31, 1975.
9. Pipusz R.: Charakterystyka morfologiczna lekkoatletów polskich z uwzględnieniem dymorfizmu płciowego. *Roczn. Nauk. WSWF* **11**, 227, 1972.
10. Sokołowski T.: *Elementy dynamiczne kończyn człowieka.* Warszawa 1962.
11. Wolański N.: Wpływ funkcji kończyn (bocność) na kształtowanie asymetrycznej budowy ciała w aspekcie onto- i filogenezy. *Przeł. Antrop.* **28** (1), 27, 1962.
12. Zarzycka N., Załuska S.: Pomiary ramienia u ludności wiejskiej Lubelszczyzny. *Ann. Univ. M. Curie-Skłodowska, Lublin, Sectio D* **44**, 77, 1989.
13. Zarzycka N., Załuska S.: Pomiary przedramienia u ludności wiejskiej Lubelszczyzny. *Ann. Univ. M. Curie-Skłodowska, Lublin, Sectio D* **44**, 85, 1989.
14. Zbrodowski A.: Rozwój motoryczności ręki w onto- i filogenezie człowieka. *Kult. Fiz. Sport* **29** (1), 12, 1975.

Otrzymano 1989.05.29.

STRESZCZENIE

Pomiary antropometryczne kończyny górnej wykonaliśmy u mieszkańców obojga płci na wsi lubelskiej. Długość części wolnej kończyny górnej prawej u mężczyzn w badanym materiale wahała się w granicach 66—87 cm i średnio wynosiła 77,27 cm, a lewej — 65,2—86,4 cm, średnio — 77,07 cm. U kobiet długość kończyny górnej prawej wahała się w granicach 58,6—84,8 cm, średnio — 71,77 cm, lewej natomiast — 58,7—86,0 cm, średnio — 71,51 cm. Zarówno u mężczyzn, jak i u kobiet częściej spotykano dłuższą kończynę górną prawą niż lewą, a różnice w długości kończyn związane ze stroną ciała u obu płci były niemal istotne. Omawiana długość u mężczyzn związana była z wiekiem w sposób istotny po obu stronach ciała, u kobiet natomiast związek ten był losowy.

Długość kończyn górnych u mężczyzn zazwyczaj była większa niż u kobiet. Wskaźnik długości kończyny górnej u mężczyzn po stronie prawej wynosił 46,21, a po lewej 46,10, u kobiet zaś po stronie prawej — 46,05, a po lewej — 45,88. Zarówno więc u mężczyzn, jak i u kobiet kończyny górne reprezentowały kategorię średnio długich.

РЕЗЮМЕ

Антропометрические измерения верхней конечности мы провели у жителей обоого пола люблинской деревни. Длина свободной части правой верхней конечности у мужчи в исследованном материале выносила от 66 до 87 см, средняя — 77,27 см, когда левой — от 65,2 до 86,4, средняя — 77,07 см. У женщин длина правой верхней конечности выносила от 58,6 до 84,8 см, средняя — 71,77 см, а левой — от 58,7 до 86,0 см, средняя — 71,51 см. Как у мужчин так и у женщин более часто встречали мы длинее правую верхнюю конечность чем левую, а различия в длине конечностей связаны со стороной тела были весьма существенные. Обсуждаемая длина у мужчин связана была существенным образом с возрастом по обеим сторонам, а у женщин связь эта была тиражной.

Длина верхних конечностей у мужчин обычно была больше чем у женщин. Индекс длины верхней конечности у мужчин выносил по правой стороне 46,21, а по левой — 46,10; а у женщин по правой стороне — 46,05 и по левой — 45,88. Как у мужчин так и у женщин верхние конечности представляли собой категорию средне длинных.