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Anthropometrical Measurements of the Hand in Rural Population of Lublin Region

Antropometryczne pomiary ręki u ludności wiejskiej Lubelszczyzny

INTRODUCTION

This paper is the next one describing antropometric measurements of the upper limb in the rural population of Lublin region. In the previous reports the authors presented: measurements of arm, forearm and moving part of the whole upper limb (15, 16, 17). Now they are presenting results of measurements of hand only.

Antropometrical measurements of hand have been made and characterized on the basis of statistic studies presented in the previous paper (15). We have established the following measurements:

- 1) the length of hand — from point of *interstylium*, from proximal groove of hand flexion to *dactylium* point of IIIrd finger,
- 2) the length of palm — distance from *interstylium* point to metacarpophalangeal groove of IIIrd finger (proximal groove),
- 3) the breadth of hand — distance from *metacarpale ulnare* point to *metacarpale radiale* point on the height of metacarpalephalangeal articulation.
- 4) the breadth-length hand index

$$\frac{\text{breadth of hand}}{\text{length of hand}} \times 100$$

and the length of fingers I, II, III, IV and V — distance from proximal groove of flexion to *dactylium* point.

OWN STUDY

The length of right hand ranged in male from 16 to 22 cm, and of left hand — from 16.2 to 22 cm, and of right hand from 15.1 to 20.7 and left from 15 to 20 cm in female in the examined material. The most frequently observed was the length of right hand from 18 to 19 cm and left — 18.5—19 cm (18.5—20%/cases) in male, and respectively 17.5 and 18 cm (21—22%) in female. The remaining

length measures, both in male and female, were observed in lower percentage on both sides of the body (both maximal and minimal rates included).

The length of hand on both sides of the body in male was similar in 24.6% and in female in 23.1% of cases. The length of right hand was bigger in 27.5% in male and in 30.2% of cases in female, but left hand was longer in 47.9% in male and in 46.7% of cases in female. The differences between frequency of occurrence of longer right and longer left hands, both in male and female, are significant ($p < 0.001$ and $p < 0.001$).

The length of hand (min.-max.) in both sides of the body in particular age groups in connection with mean values (M), standard deviation (SD), standard error of the mean (SE) and coefficient of variation (V) in male shows Table 1, in female — Table 2. The lowest mean length of hand was observed in male up to 21 years of age, and it increased up to 51 years and over 51 decreased again. Differences in mean lengths of both hands in female are pretty small in particular age groups. A statistical study presented that the length of both hands in male correlates significantly with the age ($p < 0.001$), in female — almost significantly ($p < 0.05$). The mean lengths of left hand both in male and in female in all age groups were higher than of the right one. The lengths of hands in particular age groups were always bigger in men than in women in all examined material.

In conformity with Bergmann (3) classification we observed: short right hands in 10.2%, medium-long in 69.4% and long in 25.2%, left ones in 8.8, 66.0 and 25.2% cases, respectively. Up to 25 years of age short hands were in dominance, next, medium — short. In female we examined 9,9% short right hands, medium-long in 69.8% and long in 20.3% of cases, left ones in 8.3, 70.0 and 21,7% of cases in relation. During all life medium-long hands dominated in female.

The length of right palm in male ranged from 9.2 to 13 cm, of the left one from 9.2 to 12.8 cm and in female of the right one from 8.4 to 12,6 cm, the left one from 8,5 to 12.5 cm. The most frequently observed length of palm was 11 cm both in male and female (ap. 30%. The remaining length measures were observed in lower percentage (both maximal and minimal included). The length of palm was the same in 23.5% (male), in 36.3% (female) on both sides of the body. The palm was longer in the right side of the body in 36.7% (male) and in 36.3% (female). It was longer in the left side of body in 39.8% (male) and 38.6% (female) of cases. The differences between frequency of occurrence of longer right palm in relation to the left one are (statistically) accidental, both in male and in female ($p > 0.30$ and $p > 0.30$).

The length of palm in both sides of the body in particular age groups shows Table 3 (male) and Table 4 (female) relation to M , SD , SE and V . The lowest mean lengths of palms (bilateral) were found in male up to 21 years of age. This increased up to 51 year of age, and later significantly decreased. In female the lowest length of palm was at 41 years of age, the highest, at 61. Both in male and in female the differences in mean lengths of both palms in particular age groups

Table 1. Values of hand length in male

Age group	Number of persons	Body side	Values min.-max. cm	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>V</i>
I	21	R	16.0—20.6	18.50	1.40	0.30	7.7
		L	16.2—20.9	18.23	1.46	0.32	8.0
II	53	R	16.9—20.4	18.85	0.81	0.11	4.3
		L	16.6—20.7	18.90	0.86	0.12	4.6
III	91	R	16.5—21.2	18.97	0.96	0.10	5.1
		L	16.3—21.3	19.02	0.97	0.10	5.1
IV	92	R	16.8—22.0	19.17	1.02	0.10	5.3
		L	16.9—22.0	19.31	1.04	0.10	5.4
V	136	R	16.3—21.4	18.77	0.94	0.80	5.0
		L	16.6—21.4	18.92	0.90	0.08	4.8
VI	87	R	16.8—21.0	18.84	0.93	0.10	4.9
		L	16.8—22.0	18.95	0.99	0.10	5.3
Total	480	R	16.0—22.0	18.88	0.98	0.04	5.2
		L	16.2—22.0	18.99	1.00	0.04	5.3
Significance of age influence			R $\sqrt{MSe}=0.9692$; $F^0=4.54$; $F_{0.01}=3.06$; $p<0.01$ L $\sqrt{MSe}=0.9873$; $F^0=4.62$; $F_{0.01}=3.06$; $p<0.01$				

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

Table 2. Values of hand length in female

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	15.5—19.6	17.45	0.81	0.08	4.6
		L	15.2—19.8	17.53	0.82	0.08	4.7
II	156	R	15.3—19.7	17.53	0.92	0.07	5.2
		L	15.2—19.5	17.59	0.88	0.07	5.0
III	220	R	15.1—20.7	17.43	0.90	0.06	5.2
		L	15.0—20.8	17.50	0.92	0.06	5.2
IV	324	R	15.3—20.6	17.52	0.89	0.04	5.1
		L	15.2—20.4	17.58	0.87	0.04	5.0
V	220	R	15.8—20.5	17.66	0.93	0.06	5.3
		L	15.8—20.5	17.73	0.91	0.06	5.1
VI	140	R	15.5—20.0	17.46	0.93	0.08	5.3
		L	15.3—20.3	17.54	0.95	0.08	5.4
Total	1150	R	15.1—20.7	17.52	0.90	0.02	5.2
		L	15.0—20.8	17.59	0.90	0.02	5.1
Significance of age influence			R $\sqrt{MSe}=0.9023$; $F^0=1.85$; $F_{0.05}=2.22$; $p>0.05$ L $\sqrt{MSe}=0.8959$; $F^0=1.71$; $F_{0.05}=2.22$; $p>0.05$				

For explanation see Table 1.

are pretty small, and the length of palms correlates significantly with the age ($p<0,001$). The length of palms in all age groups was bigger in men than in women.

The breadth of right hand ranged from 7.2 to 10.6 cm and of the left — from 6.8 to 10.4 cm in male and in female — from 6.6 to 10.0 and from 6.5 to 9.8 cm,

Table 3. Values of palm length in male

Age group	Number of persons	Body side	Values min.-max. cm	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>V</i>
I	21	R	9.2—12.0	10.68	0.88	0.19	8.3
		L	9.5—12.2	10.61	0.84	0.18	7.9
II	53	R	10.0—12.5	11.07	0.54	0.07	4.9
		L	10.0—12.6	11.10	0.59	0.08	5.3
III	91	R	9.7—13.0	11.15	0.64	0.07	5.8
		L	9.5—12.8	11.12	0.61	0.06	5.5
IV	92	R	9.8—12.6	11.21	0.61	0.06	5.5
		L	9.8—12.5	11.23	0.62	0.06	5.5
V	136	R	9.4—12.8	10.99	0.58	0.05	5.2
		L	9.2—12.6	11.06	0.58	0.05	5.3
VI	87	R	10.0—12.3	11.02	0.59	0.06	5.4
		L	10.0—12.6	11.03	0.59	0.06	5.3
Total	480	R	9.2—13.0	11.06	0.62	0.03	5.6
		L	9.2—12.8	11.08	0.62	0.03	5.6
Significance of age influence		R	$\sqrt{MSe}=0.612; F^0=3.541; F_{0.01}=3.06; p<0.01$				
		L	$\sqrt{MSe}=0.610; F^0=3.837; F_{0.01}=3.06; p<0.01$				

For explanation see Table 1.

Table 4. Values of palm length in female

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	9.0—11.2	10.30	0.52	0.05	5.2
		L	8.8—11.2	10.19	0.54	0.06	5.3
II	156	R	9.0—11.5	10.19	0.56	0.05	5.5
		L	9.0—11.8	10.22	0.54	0.04	5.3
III	220	R	8.7—12.6	10.14	0.59	0.04	5.8
		L	8.6—12.5	10.13	0.58	0.04	5.8
IV	324	R	8.4—12.1	10.20	0.56	0.03	5.5
		L	8.7—12.1	10.22	0.57	0.03	5.5
V	220	R	8.4—12.0	10.33	0.57	0.04	5.5
		L	8.5—12.1	10.34	0.57	0.04	5.5
VI	140	R	8.8—11.9	10.21	0.62	0.05	6.0
		L	8.6—12.1	10.20	0.62	0.05	6.1
Total	1150	R	8.4—12.6	10.21	0.58	0.02	5.6
		L	8.5—12.5	10.22	0.57	0.02	5.6
Significance of age influence		R	$\sqrt{MSe}=0.573; F^0=3.12; F_{0.01}=3.04; p<0.01$				
		L	$\sqrt{MSe}=0.572; F^0=3.08; F_{0.01}=3.04; p<0.01$				

For explanation see Table 1.

respectively. We observed most frequent breadth of hand of 8.9 cm (27%) in male and 7.9 cm (37%) in female. The remaining breadth measures were observed bilaterally in lower percentage (both maximal and minimal included). The breadth of hand in both sides of the body was the same in 46.5% (male) and in 26.7%

(female). The differences between the frequency of occurrence of wider right and wider left hand are significant (both in male and female) — $p < 0.001$.

The breadth of hands in particular age groups related to M , SD , SE and V show Table 5 (male) and Table 6 (female). The lowest breadth of hand was

Table 5. Values of hand breadth in male

Age group	Number of persons	Body side	Values min.-max. cm	M	SD	SE	V
I	21	R	7.2— 9.5	8.41	0.64	0.14	7.6
		L	6.8— 9.7	8.30	0.76	0.17	9.2
II	53	R	7.6— 9.6	8.80	0.43	0.06	5.8
		L	7.6— 9.6	8.74	0.46	0.06	5.3
III	91	R	7.7—10.2	8.91	0.50	0.05	5.7
		L	7.6—10.0	8.83	0.49	0.05	5.5
IV	92	R	7.7—10.6	8.92	0.51	0.05	5.7
		L	7.7—10.4	8.89	0.48	0.05	5.4
V	136	R	7.6—10.4	8.85	0.48	0.04	5.4
		L	7.6—10.3	8.82	0.51	0.04	5.7
VI	87	R	8.0—10.0	8.88	0.42	0.05	4.7
		L	8.1—10.0	8.86	0.42	0.05	4.8
Total	480	R	7.2—10.6	8.86	0.49	0.02	5.5
		L	6.8—10.4	8.81	0.50	0.02	5.7
Significance of age influence		R	$\sqrt{MSe}=0.483$; $F^0=4.28$; $F_{0.01}=3.05$; $p<0.01$				
		L	$\sqrt{MSe}=0.492$; $F^0=5.52$; $F_{0.01}=3.05$; $p<0.01$				

For explanation see Table 1.

Table 6. Values of hand breadth in female

Age group	Number of persons	Body side	Values min.-max. cm	M	SD	SE	V
I	90	R	6.8— 8.9	7.71	0.40	0.04	5.2
		L	6.7— 8.7	7.70	0.40	0.04	5.2
II	156	R	6.9— 9.0	7.86	0.43	0.03	5.4
		L	7.0— 9.0	7.82	0.43	0.03	5.5
III	220	R	6.6— 9.5	7.93	0.44	0.03	5.5
		L	6.5— 9.4	7.88	0.44	0.03	5.6
IV	324	R	6.7— 9.5	7.98	0.42	0.02	5.2
		L	7.0— 9.2	7.93	0.42	0.02	5.3
V	220	R	7.2—10.0	8.06	0.43	0.03	5.3
		L	7.0— 9.8	8.01	0.42	0.03	5.3
VI	140	R	7.0— 9.4	7.98	0.44	0.04	5.5
		L	6.7— 9.4	7.97	0.43	0.04	5.4
Total	1150	R	6.6—10.0	7.95	0.43	0.01	5.5
		L	6.5— 9.8	7.91	0.43	0.01	5.5
Significance of age influence		R	$\sqrt{MSe}=0.425$; $F^0=10.6$; $F_{0.01}=3.04$; $p<0.01$				
		L	$\sqrt{MSe}=0.426$; $F^0=9.08$; $F_{0.01}=3.04$; $p<0.01$				

For explanation see Table 1.

observed up to 21 years of age both in male and female (bilaterally). Afterwards this measure remarkably increased up to 31 years of age in male, insignificantly up to 51, and in female up to 61 years of age. In the remaining periods of life this value decreased insignificantly (both in male and female). The mean breadths of right hands were somewhat bigger than of the left one in male and female. A statistical study presented that the breadth of hand (bilaterally) in male and female correlates significantly with the age ($p < 0.001$). The measures (minimal, maximal and mean) of breadth were bigger in male than in female in particular age groups.

In conformity with Bergmann (3) classification we observed: the narrow hands in 5.2%, left ones in 5.8% (male) and in 3.4 and 4.0% of cases (female). The medium-wide in 44.8 and 47.5% (male) and in 42.1 and 43.5% of cases (female) and wide — in 50.0 and 46.7% (male) and in 54.5 and 52.5% of cases (female). Both in male and female the wide and medium-wide hands were in dominance.

The obtained measurements of breadth and length of hands were correlated with Martin's indications, and calculated breadth-length index of hand which characterized very well the shape of hand.

Very narrow and long hand was observed in 0.2% both right and left (male) and in 3.3 and 3.9% of cases (female); narrow and long hand — in 9.4 and 15.4% (male) and in 25.7 and 29.7% of cases (female); medium-long hand in 43.9 and 46.0% (male) and in 45.1 and 46.4% (female); wide and short hand in 34.4 and 29.4% (male) and in 21.1 and 17.4% of cases (female); very wide and short hand in male almost in 12.1% (right) and 9.0% (left) and in female right in 4.7% and left in 2.6% of cases.

The functional length of finger was measured on the palm side of hand. The obtained results were the basis to establish the finger formula, which was used to determine the types of hands: radial, ulnar and intermediate.

The length of finger show Table 7 (male) and Table 8 (female) in particular age groups. Our results, that means the lengths of fingers (in both sexes) related to the side of the body. This measure increased up to 50 years of age (male) and was not related to age in female. On average the longest finger was the IIIrd one, next IVth, IIInd, Ist and Vth in both sexes (1—5). We selected three types of hand on the basis of their finger measures: ulnar (IIInd IVth), intermediate (IIInd IVth) and radial (IIInd IVth).

Ulnar type of hands was noted in 85.0% (male — right hand) and in 84.4% (male — left hand), in female respectively in 71.5 and 68.0% of cases; intermediate type — in 10.6 and 10.6% (male) and respectively in female — in 19.6 and 21.0% of cases; radial type was noted in 4.2 and 5.0% (male) and in 8.9 and 11.0% of cases (female). In both sexes the ulnar type of hand was in dominance.

Table 7. Length of fingers (in mm) in male

Age group	Fingers of right hand					Fingers of left hand				
	I	II	III	IV	V	I	II	III	IV	V
	Values from — to Mean					Values from — to Mean				
I	50-71	57-78	68-86	61-82	45-67	51-71	58-80	67-88	62-82	45-63
	61.04	65.47	74.67	70.14	55.90	58.67	66.86	76.24	69.90	54.95
II	53-74	60-80	69-87	60-84	49-68	51-72	58-80	66-93	61-84	45-68
	63.75	69.53	77.87	73.25	59.21	62.58	69.98	78.00	73.00	58.62
III	53-76	61-81	65-90	63-86	48-71	51-78	60-83	68-91	60-86	45-69
	64.38	70.40	78.23	73.84	59.63	62.74	70.70	78.82	73.86	58.78
IV	55-75	57-83	65-109	58-85	49-72	52-73	59-86	67-98	57-87	48-73
	65.55	71.89	79.65	74.98	61.28	64.58	72.17	80.67	75.32	60.64
V	50-76	61-80	65-92	64-87	48-70	51-80	60-84	68-95	64-86	49-70
	64.49	69.94	77.88	73.50	59.37	62.90	70.64	78.68	73.71	58.71
VI	50-77	57-82	65-91	61-88	50-74	51-77	61-83	68-91	60-88	44-74
	65.54	69.89	77.94	73.36	60.28	63.38	70.54	78.69	73.94	59.60
Total	50-77	57-82	65-109	58-88	45-74	51-80	58-86	66-98	57-88	44-74
	64.63	70.15	78.15	73.65	59.78	63.25	70.69	78.91	75.23	59.08

Table 8. Length of fingers (in mm) in female

Age group	Fingers of right hand					Fingers of left hand				
	I	II	III	IV	V	I	II	III	IV	V
	Values from — to Mean					Values from — to Mean				
I	47—70 58.92	55—79 66.41	62—86 73.28	56—81 68.68	42—66 54.83	46—68 56.43	55—77 66.42	64—86 73.49	55—80 68.63	40—66 54.21
II	50—70 59.42	51—76 66.32	61—85 73.49	54—78 68.51	43—65 55.38	44—71 57.33	54—77 66.62	62—84 73.72	54—80 68.56	43—65 54.76
III	46—71 58.93	55—77 66.08	61—83 73.02	58—80 68.37	43—65 54.56	44—68 57.11	55—78 66.26	63—85 73.60	55—80 68.28	42—66 54.09
IV	47—74 59.39	53—79 66.22	61—86 73.11	58—81 68.53	43—68 54.78	45—73 57.69	55—80 66.69	62—86 73.71	51—81 68.57	42—68 54.63
V	46—71 58.99	55—80 66.18	62—88 73.37	57—82 68.48	40—68 54.93	42—70 57.63	53—80 66.86	61—87 73.94	57—84 68.99	40—67 54.61
VI	47—70 58.66	55—77 65.47	63—83 72.38	57—80 67.68	40—68 54.31	45—70 57.61	55—80 66.32	62—86 73.27	56—83 68.25	40—67 54.10
Total	46—74 59.10	51—80 66.12	61—88 73.12	54—82 68.40	40—68 54.80	42—73 57.41	53—80 66.56	61—87 73.67	51—84 68.56	40—68 54.44

DISCUSSION

Anthropometric measurements of hand are one of the most characteristic qualities of man. They are related to many factors e.g. age, sex, profession, conditions and time of work, practice in sport, geographical position and social and economic conditions.

In the inhabitants of Lublin region the length of right hand ranged from 16 to 22 cm (mean — 18.88), of the left one from 16.2 to 22 cm (mean — 18.99) in male, and in female from 15.1 to 20.7 cm (mean — 17.52), and from 15 to 20 cm (mean — 17.59), respectively. The bigger rates were in male than in female. Similar results were found by other authors (12,13). The length of hand was bilaterally related to age (significant in male and almost significant in female). The medium-long hands in inhabitants of Lublin region both in male and female were in dominance.

Longer left hands were found in pianists, metal treatment workers, wiremen, weavers, basket-makers, and agriculture workers (male); in female — precision industry workers, fiddlers, typists, weavers, basket-makers and agriculture workers. On the contrary, longer right hands were observed in manual workers, fiddlers and founders in male; and in pianists, metal and physical workers in female. Similar results were reported in literature. Differences of mean length of hands were minimal (6, 9, 10).

The length of right palm in our study ranges from 9.2 to 13 cm (mean 11.06), of the left one from 9.2 to 12.8 cm (mean 11.8) in male. Respectively, in female from 8.4 to 12.6 cm (mean 10.28) and from 8.5 to 12.5 cm (mean 10.22). The length of the palm was bilaterally bigger in male than in female. More frequently found was the longer left palm in both sexes but the differences were accidental. The length of the palm correlates significantly with the age.

Other authors' results suggest that in male longer left palms had the following professions: fiddlers, metal treatment workers, weavers, and agriculture workers, but longer right palms — physical workers, wiremen and pianists. In female longer right palms had fiddlers and typists, while longer left one — precision industry workers and agriculture workers (7, 10).

The breadth of right hand in male in examined material ranged from 7.2 to 10.6 (mean — 8.86), left one from 6.8 to 10.4 cm (mean — 8.81), in relation in female from 6.6 to 10 cm (mean — 7.95) and from 6.5 to 9.8 cm (mean — 7.91). The breadth of both hands was bigger in male than in female. In both sexes more frequently wider right palms than left ones were found, and these differences connected with body side were statistically significant. Also the breadth of hand correlated significantly with the age. Other authors suggest similar results in their studies (6, 8—10, 13). In our material we had in the most cases medium-wide and wide hands in both sexes, only in male between 18 and 25 of age — narrow hands.

Results from literature reported that in male wider right hands had: physical workers, locksmiths, spinners, white-collar workers, weavers, founders, volleyball-players and agriculture workers; in female typists, spoders, stretchers, physical and mental workers, hand-ball-players and agriculture workers. The wider left hands were in male found in turners, wirepeople, electrical repairmen, plumbers, fiddlers, pianists and basketmakers, and in female — sorters, precision industry workers and basketmakers (6, 7, 10).

It should be stressed that the hand in rural population grows wider during hard physical work, which was confirmed by other authors (7).

In the present study it was noted, that medium-long hands occur most frequently in both sexes and next in occurrence are wide and short hands in male and narrow and long or wide and short hands in female.

The most narrow and slender right hand in male have iron workers and turners, and in other professions most frequently medium-long, short wide left hands were observed. In female the most slender hand have fiddlers and students, in other professions medium-long hands were observed (3, 10, 13).

The IIIrd finger is the longest one, both in male and female on both body sides in the inhabitants of Lublin region, followed by IVth, IInd, Ist and Vth, which was confirmed by other authors (10). Results of other authors suggest that the longest Ist finger have bilaterally fiddlers (male), on the right side agriculture workers and fiddlers (female), on the left side pianists (female); the shortest Ist finger have bilaterally pianists (male), on the right side — precision industry workers, on the left side — agriculture workers (female). The longest IInd finger appeared on the right side in students (male) and pianists (female) and on the left side in wirepeople and fiddlers (female), also the shortest IInd finger occurred in precision industry workers (female), on the right side in wirepeople, on the left side in pianists (male). The longest IIIrd finger was bilaterally observed in students (male) and fiddlers (female), the shortest — bilaterally in fiddlers (male), on the right side in precision industry workers, on the left side in pianists (female). The longest IVth finger have bilaterally fiddlers (female), one the right side students, so on the left side agriculture workers (male); the shortest — bilaterally precision industry workers (female), on the right side wirepeople, on the left side students (male). The longest Vth finger was observed bilaterally in fiddlers (female), on the right side in students, on the left side in fiddlers (male), the shortest — bilaterally in precision industry workers (female), on the right side in physical workers, on the left side in pianists — male (10).

In explored inhabitants of Lublin region ulnar type of hand was in dominance both in male and female. In minimal percentage of cases radial type of hand was observed in both sexes, and intermediate type — in male. Intermediate type of hands was in 20% of cases in female.

Results of many authors suggest, that in various professions the ulnar type of hand is in dominance. In remarkable percentage of cases radial and intermediate types of hand in female, rather than in male can be found (1—5, 11, 12, 14, 18).

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STRESZCZENIE

Antropometryczne badania ręki przeprowadzono u 1630 mieszkańców wsi Lubelszczyzny, w tym u 1150 kobiet i 480 mężczyzn w wieku 18—75 lat. Wykonano następujące pomiary: długości ręki, długości dłoni, szerokości ręki, wskaźnika szerokościowo-długościowego ręki oraz długości palców. Na podstawie powyższych pomiarów ustalono typy ręki. Uzyskane wyniki poddano analizie statystycznej.

