

Movement of the hand in persons of both sexes during 21-30 years of age

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The goniometric features of the hand (dorsal flexion, volar flexion, abduction, adduction, supination and pronation) were studied in 250 men and 250 women in age from 21 to 30 years, divided into 5 groups according to age and sex. Sex and age differences were established. The age 24 years is a "limit" after which limitation in the hand movement begins.

Key words: goniometry, wrist joint, dorsal flexion, volar flexion, abduction, adduction, supination, pronation.

The hand of man is the main organ for the realization of his multiple working and living activities. Studies of the hands' morphofunctional characteristics, including changes in its movement, are of significant importance. Similar studies on the age changes of the movement of the hand, foot and head at 10 years interval have been carried out in our country [3, 4, 5].

The aim of the present study is to search for age and sex differences in the movement of the hand, but at a 2 years interval.

Material and methods

The goniometric characteristics of the hand in 250 men and 250 women 21 to 30 years of age were studied. The persons were divided into five age-groups I (21-22 years), II (23-24 years), III (25-26 years), IV (27-28 years) and V (29-30 years). The movement of the hand was characterized by the following goniometric characters: dorsal and volar flexion, abduction and adduction, pronation and supination, fulfilled from a standardized situation and measured at the level of the wrist joint (Fig. 1). An originally constructed device for three-dimensional goniometry was used [2]. The investigation was carried out according to the methods proposed by Мутафов, Торньова [1]. The main biostatistical characteristics (\bar{x} , S , S_x , V) were determined for each age group and in both sexes. The measured units were

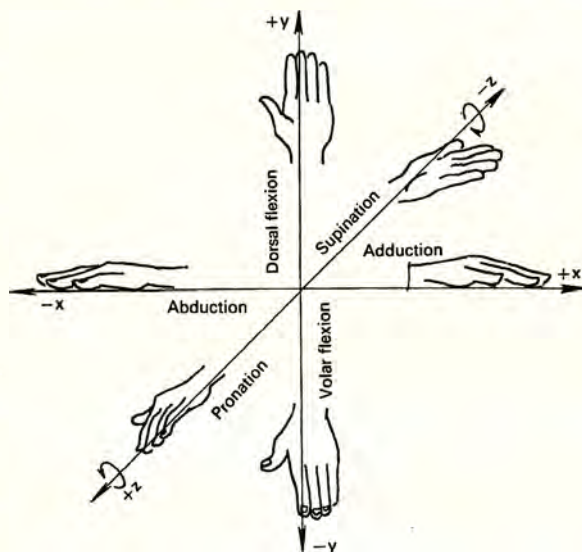


Fig. 1. Scheme of goniometrical indicators of the hand

degrees of angle determined with an allowance of $0,1^\circ$. The direction and volume of the age changes were also traced by the computed interage index (IAI) of change [3].

Results and discussion

The values of the three-dimensional goniometry, represented as volume of movements are highest in the second age group (23-24 years) for both sexes (Fig. 2). This holds true for the whole volume of abduction-adduction movements and of flexional and rotational movements. Second, the age group I (21-22 years) comes and in the last place is the oldest age group (29-30 years) for men and the age group IV (27-28 years) for women. The limitations in the volume of the abduction-adduction movements are most distinctly expressed in the last three age groups (25-26, 27-28, 29-30 years).

The finding is similar also for the six separate goniometric features (Tables 1 and 2). An exception is only observed for the abduction movement in both sexes and for the pronation in men, where the age group I (21-22 years) has the highest values. The higher values for the adduction and supination in the age group II (23-24 years), however, compensate this and the total volume of abduction-adduction and rotation movements remains highest in that same group II (23-24 years), as it already has been pointed out.

Consequently, the changes in the goniometric characters of the hand in both sexes form two general groups: the first one (21 to 24 years) is characterized with higher values; in the second one (25 to 30 years) decreasing of the hands' movement is observed. However, the differences between the separate age groups are negligible (Fig. 2).

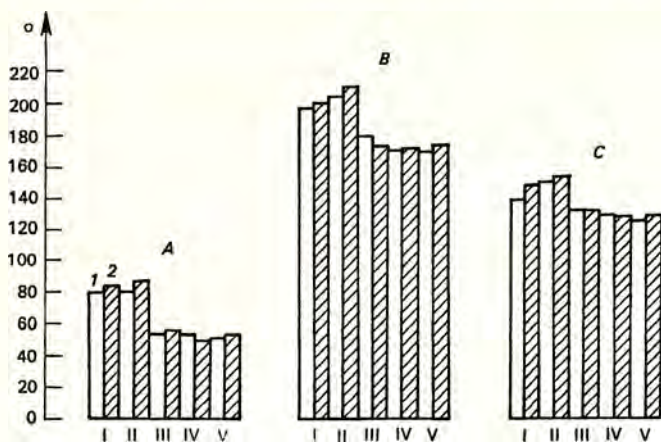


Fig. 2. Volume-movements of the hand

A - abductive-adductive movements; B - rotary movements, C - flexional movements
 1 - men; 2 - women
 I-V - age-sex groups

Table 1. Biostatistical characteristics of the goniometrical indicators of hand - men

Features	21-22*	23-24	25-26	27-28	29-30	21-22	23-24	25-26	27-28	29-30
	Adduction					Abduction				
\bar{x}	37,94	40,12	21,32	21,34	19,24	42,72	41,46	32,70	33,82	33,00
S	7,82	8,99	5,72	8,45	6,47	8,35	7,50	9,20	10,20	12,06
$S_{\bar{x}}$	1,11	1,27	0,81	1,20	0,92	1,18	1,06	1,30	1,44	1,70
\bar{V}	20,61	22,41	26,83	39,60	33,63	19,54	18,09	28,13	30,16	36,54
IAI		+5,74	-46,86	+0,09	-9,84		-2,95	-21,13	+3,42	-2,42
	Supination					Pronation				
\bar{x}	149,52	159,66	141,62	137,82	140,26	50,64	45,18	39,62	36,86	33,38
S	16,72	18,99	16,97	16,22	16,99	14,33	14,44	13,06	11,24	14,16
$S_{\bar{x}}$	2,36	2,68	2,40	2,29	2,40	2,02	2,04	1,85	1,59	2,00
\bar{V}	11,18	11,89	11,98	11,77	12,11	28,30	31,96	32,96	30,49	42,42
IAI		+6,78	-11,30	-2,68	+1,77		-10,78	-12,31	-6,97	-9,44
	Dorsal flexion					Volar flexion				
\bar{x}	62,74	63,98	60,84	59,78	58,60	78,04	83,56	72,00	71,52	71,14
S	9,50	11,95	14,11	11,91	10,67	8,68	9,80	9,97	10,10	12,20
$S_{\bar{x}}$	1,34	1,69	2,00	1,68	1,51	1,23	1,39	1,41	1,43	1,72
\bar{V}	15,14	18,68	23,19	19,92	18,21	11,12	11,73	13,85	14,12	17,15
IAI		+1,98	-4,91	-1,74	-1,97		+7,07	-13,83	-0,67	-0,53

* age groups.

The decrease of the hands' movement after age group II is confirmed also by the negative values of the computed IAI. This is particularly well manifested in the abducentional-adducentional movements where the index values are as follows: -46,86 for adduction, -21,13 for abduction, for men, and -43,81 for adduction and -21,71 for abduction for women (Tables 1 and 2).

Table 2. Biostatistical characteristics of the goniometrical indicators of hand — women

Features	21-22*	23-24	25-26	27-28	29-30	21-22	23-24	25-26	27-28	29-30
	Adduction					Abduction				
\bar{x}	40,26	42,36	23,80	21,96	22,10	43,50	43,26	33,84	29,72	31,10
S	8,24	9,24	11,63	7,34	7,38	10,28	9,82	12,49	11,35	9,88
$S_{\bar{x}}$	1,16	1,31	1,64	1,04	1,04	1,45	1,39	1,77	1,60	1,40
\bar{V}	20,47	21,81	48,86	33,42	33,39	23,63	22,70	36,91	38,19	31,77
IAI		+5,22	-43,81	-7,73	+0,64		-0,55	21,78	-12,17	+4,64
	Supination					Pronation				
\bar{x}	159,96	164,58	135,0	133,08	134,36	46,36	48,44	43,38	42,48	42,62
S	16,68	18,95	20,51	21,29	16,89	17,19	21,42	15,80	16,75	14,52
$S_{\bar{x}}$	2,36	2,68	2,90	3,01	2,39	2,43	3,03	2,23	2,37	2,05
\bar{V}	10,63	11,51	15,19	16,00	12,57	37,08	44,22	36,42	39,43	34,07
IAI		+4,85	-17,97	-1,42	+0,96		+4,49	-10,45	-2,07	+0,33
	Dorsal flexion					Volar flexion				
\bar{x}	65,54	71,48	59,32	59,74	60,96	81,62	83,16	73,20	70,68	71,12
S	10,47	8,79	11,98	10,10	11,44	8,95	7,87	11,62	12,82	8,99
$S_{\bar{x}}$	1,48	1,24	1,69	1,43	1,62	1,26	1,11	1,64	1,81	1,27
\bar{V}	15,97	12,30	20,20	16,91	18,77	10,96	9,46	15,87	18,14	12,64
IAI		+9,06	-17,01	+0,71	+2,04		+1,89	-11,98	-3,44	+0,62

* age groups

The intersex comparison of the hand movement shows that it is slightly higher in women, particularly in both younger groups. For the remaining groups no regularity is observed (Fig. 2). The differences thus mentioned are probably due to the well-known fact that the capabilities for movement of joints in women are greater.

Conclusion

Our results suggest that the age of 24 years represents a "limit" after which a more weakly or strongly expressed decrease in the hand movement begins. The appearance of this changes in the goniometric characteristics are probably connected with the period of finishing of the biological development of the individual and particularly of the sindesmological system of the locomotory system as well as a result of the systematic influence of the working and living activities. The detailed elucidation of this problems requires further investigations within broader age limits and in persons of different professional groups.

References

1. Мутафов, С., С. Торньова-Ранделова. Методика по промишлена антропометрия. С., БАН, 1975. 84с.
2. Мутафов, С., И. Горанов, Х. Бижев, С. Торньова-Ранделова, Г. Куцаров. Уред за измерване движенията в гривнената става при изпъната ръка (маноангулометър). — Описание на изобретения, ИНРА, С., 1979, 1-4.
3. Мутафов, С., А. Начева, С. Ранделова, В. Кузмова, Е. Лазарова, В. Лилова. Възрастови промени в подвижността на ръката. — Ергономия, №1, 1982, 24-27.
4. Мутафов, С., А. Начева, С. Ранделова, В. Кузмова. Възрастови промени в подвижността на ходилото. — Ергономия, №3, 1982, 19-22.
5. Мутафов, С., А. Начева, С. Ранделова, В. Кузмова. Възрастови промени в подвижността на главата. — Ергономия, №4, 1983, 15-26.