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The Proportions of Upper Extremity in Turkish Men

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The aim of our study is to investigate the proportions of upper extremity in Turkish men. With this opinion, 532 male students who were studying in Medical Faculty of Trakya University between the years of 1986 and 1993 had taken place in this study. The lengths of total upper extremity, arm, forearm and hand were measured on subjects at an average age of 19.92 ± 1.33. The measurements were made with a millimetric segmented, not bending, wooden meter fixed on the wall.

We found the length of total upper extremity 78.68 ± 3.99 cm, the length of arm 34.82 ± 2.55 cm, the length of forearm 24.94 ± 2.16 cm and the length of hand 18.92 ± 1.50 cm. The proportions of the length of arm, forearm and hand to the upper extremity which they form are determined as % 44.25 ± 0.03, % 31.70 ± 0.02, % 24.04 ± 0.01 respectively as well. Also the proportions of the parts to each other are; hand length / arm length % 54.30 ± 0.05, hand length / forearm length % 75.80 ± 0.11 and forearm length / arm length % 71.60 ± 0.09.

In conclusion, it is determined that approximately, the arm length is 1/2, the forearm length is 1/3 and the hand length is 1/4 of the length of upper extremity in Turkish men. These results are compared with the literature.

Keywords: Anthropology, upper extremity, proportion.

Introduction

Since the time of Hippocrates, different studies had been made on human body. These studies which had started anatomically first were for learning the human body better. With the development of science and art, these studies had achieved an artistic and aesthetic way [1]. Especially with the period of Renaissance, many artists had appeared in arts like painting and sculpture and they had made work of arts which had had human as a subject. Artists like Polyclet, Lysipphus, Guyauma, Vitrivius, Michael Angelo and Paul Richer had measured some lengths of the human body and had found various proportions between them [1, 2, 3, 4]. This shows us that human body and art is in close relationship as well. Scientists had taken it in a different point of view and had standardized these findings. Then the anthropologists had taken part in the studies and named the results which they had found as "SCIENTIFIC RULE" [2, 4]. In 1895 Fritsch had developed these rules and found "FRITSCH RULE". Physical anthropologists had tried to understand and describe the origin of human, physical features, the causes of differences in different human groups, differences and similarities between physical features and evolution of these features too [6]. It

had been thought that some lengths of the human body were proportional [5]. Some constant proportions had been found with the assistance of the studies of the artists and scientists. These proportions had been named as "CANON" and the unit measure of each canon as "MODULE" [1, 2, 3, 4]. Hand, foot, head, third finger of the hand and metacarpophalangeal length had been used as module more often. French anatomist Paul Richer had determined some proportions on human body and used head height as a module [1, 2, 3, 4].

Material and Methods

Our study was made in the laboratory of anthropometry at the Department of Anatomy of Trakya University Medical Faculty. 532 male students who had educated in second class of our faculty between the years of 1986 and 1993 took part in this study. Measurements were made by the same researcher at the same time of the day and the measurements were made with a millimetric segmented, not bending, wooden meter fixed on the wall. The results were noted on forms those prepared before. The data collected were evaluated with the NCSS computer statistics program, the averages and standard deviations were calculated.

Upper extremities are the most active and flexible parts of the body and they are attached to each sides of the body with the shoulder joints. Although in anatomic nomenclature it is used "membrum" that means "limb" or "member", it is preferred to use "extremitas" that means "borderland" in medical terminology for upper extremities [7, 10]. The upper extremities are examined in three parts anatomically; arm, forearm and hand. These three parts are bound to each other with joints. And these joints were shoulder, elbow and wrist [9, 10, 11, 12].

While measuring the upper extremity, constant anthropological points and superficial anatomical formations were used. The anthropological points that have been used and the measurements that have been made in our study are respectively [5, 7, 11];

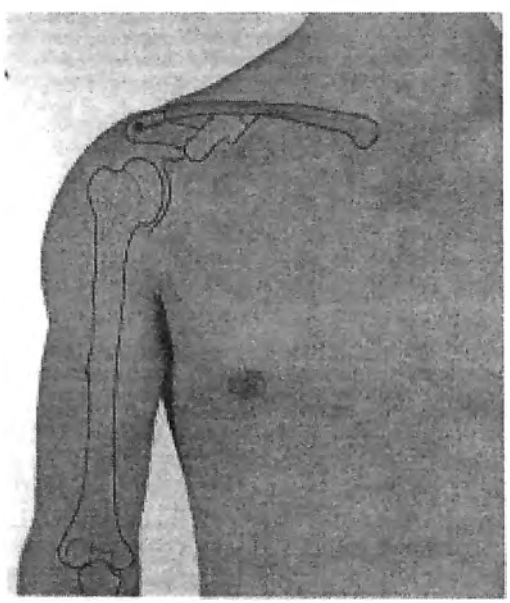

Fig. 1. Acromion (Acromiale)

Fig. 2. Radiale and Stylion

Total length of upper extremity: The distance between acromion and acromelion.
Acromion (Acromiale): The point at the superior and external border of the acromion process when the subject is standing erect with relaxed arms **(Figure 1).**
Acromelion (Onychion): The tip of of the middle finger which is the longest.
Arm length: The distance between acromion and radiale.
Radiale: The point at the upper and lateral border of the head of radius which is felt in fovea lateralis olecrani. **(Figure 2).**
Forearm length: The distance between radiale and stylion.
Stylion: The most distal point of the processus styloideus radii **(Figure 2).**
Hand length: The distance between stylion and acromelion.

Findings

In our study, the lengths of upper extremities were measured first (Table 1). Then the proportions between these results were discussed. The proportions of the parts of upper extremity were shown in table 2 and the proportions of the parts to each other in table 3.

Discussion and Results

We have searched the literature for the aim of comparison of the results that we had found. With this search we could not find any study that includes all the findings we got. However, we could find the possibility to compare some of our findings with some of the studies (Table 4).

Table 1. The lengths of upper extremity

Metric values	Average *n*-532
Upper Extremity Length	78.68 ± 3.99
Arm Length	34.82 ± 2.55
Forearm Length	24.94 ± 2.16
Hand Length	18.92 ± 1.50

Table 2. The proportions of the parts of upper extremity to upper extremity

Proportions	*n*	%
Arm / Upper Extremity Length	532	44.25 ± 0.03
Forearm/ Upper Extremity Length Length Length	532	31.70 ± 0.02
Hand / Upper Extremity Length	532	24.04 ± 0.01

Table 3. The proportions of the parts of upper extremity to each other

Proportions	*n*	%
Hand / Arm Length	532	54.30 ± 0.05
Hand/Forearm Length	532	75.80 ± 0.11
Forearm/Arm Length	532	71.60 ± 0.09

Table 4. The comparison of our findings with the literature

Features	Taskinalp	Kahraman	Muftuoglu	U.S.	Italian	French
Upper Extremity Length	78.68 ± 3.99	76.92	77.45		76	75.58
Arm Length	34.82 ± 2.55	32.21	32.48	28.20		
Forearm Length	24.94 ± 2.16	25.10	24.22	25.10		
Hand Length	18.92 ± 1.50	19.51	20.97	19		
Arm / Upper Extremity Length	%44.25 ± 0.03	%41.82	%41.9	%39		
Forearm / Upper Extremity Length	%31.70 ± 0.02	%32.78	%31.3	%34.7		
Hand /Upper Extremity Length	%24.04 ± 0.01	%25.38	%27	%26.3		
Hand / Arm Length	%54.30 ± 0.05					
Hand / Forearm Length	%75.80 ± 0.11					
Forearm Length / Arm Length	%71.60 ± 0.09					

We have measured total length of upper extremity as 76.68 cm in our study, also Kahraman had measured this length as 76.92 cm and Muftuoglu as 77.45 cm. This length is 76 cm in Italians and 75.58 cm in French people [3, 4, 8]. According to this, while our findings are nearly close to Muftuoglu's findings, they are different from the other researchers'.

In our study we have found the arm length 34.82 cm, forearm length 24.94 cm, and hand length 18.92 cm. While Kahraman has measured this length as 32.21 cm, 25.10 cm, 19.51 cm, Muftuoglu had measured 32.48 cm, 24.22 cm and 20.97 cm respectively. These findings were 28.20 cm, 25.10 cm and 19 cm respectively in a study which was made in the United States. According to this, our arm length finding is longer than Kahraman and Muftuoglu's findings, while the forearm lengths were near to eachother relatively. However, the hand length was found to be shorter than the other researchers' findings. While the arm length was longer than the American race's evidently, a nearness had been seen in forearm and hand lengths [3, 4, 8].

When we take a look at the proportions between the parts that form the upper extremity, we found arm (upper extremity proportion % 44.25, forearm / upper extremity proportion % 31.70 and hand) upper extremity proportion % 24.04 in our study. Kahraman had found the results as % 41.82, %32.78 and %25.38 and Muftuoglu had found as %41.90, % 31.30 and % 27 respectively as well. The nearnesses and differences are the same in proportions like it is in lengths. In our study, while the first proportion is higher, the second is near and the third is lower. These proportions were found as % 39, % 34.7 and %26.3 in a study made in the United States. When we make a racial comparison, it is seen that the first proportion was higher and the other proportions were lower in our study [3, 4, 8].

In the last part of our study we examined the proportions of the parts that form the upper extremity to each other. According to these we determined hand / arm length proportion as % 54.30, hand / forearm length proportion as % 75.80 and forearm / arm length proportion as % 71.60. We could not find any study that had been made before, to compare these results with.

As a result, according to the data of the studies, it can be seen that the upper extremity length of Turkish men had increased. This increase has resulted from the arm length. In spite of the little decrease in forearm and hand length, the increase in arm length compensates this decrease.

We hope that the results we found in this study may be useful in different parts of industry like clothing, furniture, body prosthesis, hand devices and making gloves.

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