

El Bileği, El ve Parmak Parametre Ölçümlerinin Kadın ve Erkek Arasındaki Karşılaştırılması

The Comparison of Measurements of the Wrist, Hand and Finger Parameters Between Female and Male

Atila YOLDAŞ¹, Mehmet DEMİR², Elisa CALISGAN³, Emre ATAY⁴, Esin GEÇGİL⁵, Mustafa ÇİÇEK¹
Tolga ERTEKİN⁴, Adem DOĞANER⁶

1 Kahramanmaraş Sütcü İmam University School of Medicine, Department of Anatomy, Kahramanmaraş, Turkey

2 Kahramanmaraş Sütcü İmam University School of Medicine Department of Anatomy, Kahramanmaraş, Turkey

3 Kahramanmaraş Sütcü İmam University Department of Physiotherapy and Rehabilitation, Kahramanmaraş, Turkey

4 Afyon Kocatepe University School of Medicine Department of Anatomy, Afyonkarahisar, Turkey

5 Kahramanmaraş Sütcü İmam University Aşin High School of Health Department of midwifery, Kahramanmaraş, Turkey

6 Kahramanmaraş Sütcü İmam University Department of Biostatistics, School of Medicine, Kahramanmaraş, Turkey

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Özet

Amaç: Bu çalışmanın amacı kadın ve erkek arasındaki el, bilek ve parmak parametrelerinin ölçümlerini karşılaştırmaktır.

Gereç ve Yöntemler: Çalışmaya katılan 25-72 yaşları 318 sağlıklı katılımcıyı (n: 210 kadın, n: 108 erkek) içermektedir. Kahramanmaraş Sütcü İmam Üniversitesi Tıp Fakültesi Anatomi Anabilim Dalı'nda mezura, dijital kumpas (0.01 mm duyarlılıkta) kullanılmıştır. Katılımcılardan alınan ölçümler sağ ve sol el çevresi, genişliği uzunluğu ile parmak uzunluğu ile bilek kalınlık ve genişlikleri karşılaştırıldı.

Bulgular: Kadın ve erkek arasındaki skorlara bakıldığında, kadın ve erkek arasında yaş ve vücut kitle indeksi (BKİ) parametreleri açısından istatistiksel olarak anlamlı bir fark bulunmadı ($p>0.05$). Karşılaştırma analizinde, kadın ve erkekte el bileği, el ve parmak parametreleri açısından değerlendirildiğinde ölçüm sonuçları, el bileği çevresi, genişliği, avuç içi genişliği ve uzunluğu, parmak uzunluğu açısından istatistiksel olarak anlamlı fark bulundu. Bütün kadın parametrelerinin puanları erkeklerden anlamlı derecede düşük olduğu tespit edildi ($p<0.05$).

Sonuç: Çalışma sonucunda kadın ve erkek arasında sağ ve sol el bilek, el ve parmak parametreleri açısından istatistiksel olarak anlamlı fark bulundu.

Anahtar Kelimeler: bilek, avuç içi, parmak, antropoloji, ölçüm

Abstract

Purpose: The aim of this study was to compare measurements of the wrist, hand and finger parameters between female and male.

Material and Methods: This randomized trial included 318 healthy participants (n:210 female, n:108 male) aged 25 to 72 years as a result of examination participated in the study. Tape measure, digital caliper with 0.01 sensitivity used in the study were obtained at Kahramanmaraş Sütcü İmam University, Faculty of Medicine, Department of Anatomy. The measurements taken from the participants were right and left wrists circumference, breadth and length, palm breadth, length and fingers length.

Results: Regarding the scores between female and male, no statistically significant difference was found between the female and male in terms of age and body mass index (BMI) parameters ($p>0.05$). In the comparison analysis results of the measurements of wrist, hand and finger parameters in female and male, statistically significant difference was found in wrist circumference, breadth, length, palm breadth and length, fingers length. The points of all parameters of female were significantly lower than male ($p<0.05$).

Conclusion: As a result of the study, statistically significant difference was found between female and male in terms of right and left wrist, hand and finger parameters.

Key Words: wrist, palm, finger, anthropology, measurement

Yazışma Adresi: Atila YOLDAŞ e-Mail: atilayoldas99@hotmail.com Tlf: +905326913413

Kahramanmaraş Sütcü İmam University School of Medicine, Departmen of Anatomy, Kahramanmaraş, Turkey

ORCID No (Sırasıyla): 0000-0002-7807-0661, 0000-0003-2405-9317,0000-0003-4710-9540,0000-0002-2378-1183,0000-000-2489-9527,0000-0001-8925-0230, 0000-0002-0785-483,0000-0003-3884-8042

INTRODUCTION

In respect to age and sex, physical and forensic anthropology investigate with using metric methods to determine difference size of maxilla, meatus aquisticus externus, cervical bones, finger size, the length and width of hand , width of phalanx, fetal skeletal size (1).

Although hand and index finger length were used determination of age and sex and scientists research the stage of ossification, there is very little knowledge available about differences of wrist, palm and finger parameters between female and male. Experts still do not know what differences between sexes, how to diagnose it physically and effectively (2,3).

Wrist circumference is measured with tape measure on styloid process of radii; while wrist breadth is measured with the help of a caliper on the distal line of the palm. Wrist length is measured with distance between styloid process of radii and ulnae (4).

The measurement of different hand dimensions include palm breadth and length. The length of palm is evaluated using distance between artifacts distal line and the skin fold on the metacarpophalangealis III. The breadth of palm is assessed using distance between metacarpophalangealis II and skin fold on the metacarpophalangealis V (5).

Since, with the help of measurements taken from various anthropometric points on the hand, finger and indices calculated from hand parameters, which have started to be used frequently in identification studies and gender determination are frequently conducted from individuals. Also, hand and finger parameters has important to determine age and sex (6).

Studies have observed on the role of hand and finger measurements in establishing the profile of individuals in anthropological investigations. Besides the lengths of the fingers Thumb, Index Finger Length, Middle, ring finger and little length and their ratios have also been used for sex identification of an individual (7). Differation of finger length between male and female is related to prenatal estrogen and testosterone levels controlled by the HOX genes (8).

There is, however, only a limited amount of data related to the compression of wrist, hand and finger. To the best of our knowledge, there is no study assessing the sex determination on using parameters of wrist, hand and finger. The aim of this study was to objectively compare radiological measurements of the wrist, hand and finger parameters between female and male.

MATERIAL AND METHODS

This retrospective study was performed in compliance with the principles of the Declaration of Helsinki. Informed consent was obtained from all the study participant's families. Ethics committee approval was received by, Kahramanmaraş Sütçü Imam University Faculty of Medicine Clinical Research Ethics Committee (number: 2018/13).

The target population of the study consisted of healthy individuals May 2018 and July 2018 at the Department of Anatomy, Faculty of Medicine, Kahramanmaraş Sütçü Imam University. Individuals that met the inclusion criteria were selected from the target population using probable simple random sampling. As part of the simple random sampling method, individuals were listed by number and those to be sampled were selected using a random number table.

The study included 318 healthy individuals, aged between 25 and 72 years, a mean age of

33.89 ± 11.70 years. A voluntary consent form was obtained from the participants before the study. Individuals who agreed to participate in the study and met the inclusion criteria were selected by a randomized sampling method in the relevant phase. The inclusion criteria were healthy children, aged 25-75 years, and be able to adapt to the study. Individuals were excluded from the study if they were outside the age range of 25-75 years, had any existing health problem such as did not adapt to the this study, or were not willing to participate in the study, having any disease that may affect the arm, forearm and phalanx. After the application of these criteria, a total of 4 individuals were excluded because of 2 female with shoulder subluxation, 2 male not willing to participate in the study.

The demographic information and clinical characteristics of the individuals were recorded including age and gender. Height-weight meter, tape measure (mm) and digital caliper (mm) with 0.01 sensitivity were used in the measurements.

The size of wrist circumference, breadth and length was evaluated using a tape measure, digital caliper with 0.01 sensitivity both female and male aged 25-72 years. The tape measure is important and recommended for evaluation because of highly reliability.

Wrist circumference measured with tape measure on styloid process of radii (**Figure 1/A**). Wrist breadth measured with the help of a caliper on the distal line of the palm (**Figure 1/B**). Wrist length measured with distance between styloid process of radii and ulnae (9) (**Figure 2/A**).



Figure 1. Measurement of Wrist Circumference (A) and Wrist Breadth (B)

Palm length and breadth were evaluated with a tape measure, digital caliper with 0.01 sensitivity both female and male aged 25-72 years. Palm length measured with distance between artifacts distal line and the skin fold on the metacarpophalangealis III. Palm breadth evaluated with maximum distance between metacarpophalangealis II and skin fold on the metacarpophalangealis V (10) (**Figure 2/B**).

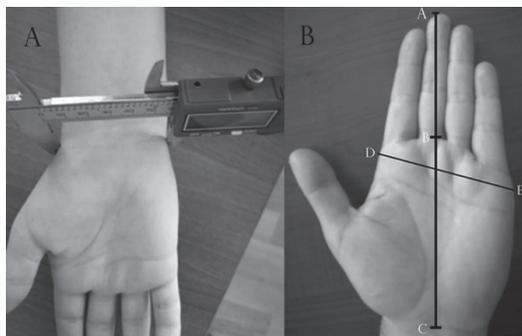


Figure 2. Measurement of Wrist Length (A), Palm and Finger Length (B)

Thumb length measured with the distance between the metacarpophalangealis I skinfold and the tip of the thumb. Index finger length measured with the distance between the metacarpophalangealis II skinfold and the tip of the index finger. Middle finger length measured with the distance between the skin fold of the art. metacarpophalangealis III and the tip of the middle finger. Ring finger length measured with the distance between the metacarpophalangealis IV skinfold and the tip of the ring finger. Little finger length measured with the distance between the skinfold of metacarpophalangealis III and the tip of the little finger (11) (**Figure 2/B**).

RESULTS

Evaluation was made of 318 individuals, comprising 210 female and 108 male with a mean age of 33.89 ± 11.70 years (range, 25-72 years). It has been determined that the age variable has no effect on the right and left wrist parameters, right and left palmar parameters, right and left finger length between sex determination ($p:0.451$). A mean of BMI was $26.12 \pm 4.73 \text{ kg/m}_2$ (range, $15.34-45.66 \text{ kg/m}_2$). No statistically significant difference was in terms of BMI between female and male ($p=0.425$).

In the intra-group analysis of statistically significant results were observed at all time intervals in respect of right and left wrist parameters (wrist circumference, breadth, length) of female and male ($p<0.001$, $p<0.001$, $p:0.016$, $p:0.019$, $p<0.001$, $p<0.001$, respectively) (**Table 1**). Statistically significant differences were determined in respect of right and left palmar parameters between female and male ($p<0.001$) (**Table 2**). Statistically significant difference was in terms of right and left finger length between female and male ($p<0.001$) (**Table 3**).

Table 1. The Comparison of Wrist Parameters Between Female and Male

Parameter (mm)	Female (n:210)	Male (n:108)	p
Wrist Circumference (Right)	16.00 (12.50-20.50)	17.50 (13.00-19.50)	<0.001 ^a
Wrist Circumference (Left)	19.50 (10.90-24.90)	15.30 (5.30-23.90)	<0.001 ^a
Wrist Breadth (Right)	34.65 (14.28-74.33)	37.39 (19.95-89.89)	0.016 ^a
Wrist Breadth (Left)	34.92 (15.50-60.20)	37.29 (20.53-79.91)	0.019 ^a
Wrist Length (Right)	53.42 (33.06-72.00)	56.97 (25.06-97.35)	<0.001 ^a
Wrist Length (Left)	53.37 (20.87-71.16)	57.47 (25.77-91.99)	<0.001 ^a

$p<0.05$, Min: Minimum, Max: Maximum, a:Mann-Whitney U Test; the data are presented in median (min, max)

Table 2. The Comparison of Palm Parameters Between Female and Male

Parameter (mm)	Female (n:210)	Male (n:108)	p
Palm Length (Right)	99.85(65.59-126.93)	106.61(83.67-140.30)	<0.001 ^a

Palm Length (Left)	99.24 (70.91-124.56)	107.97 (86.62-138.41)	<0.001 ^a
Palm Breadth (Right)	77.52(32.20-99.74)	84.09(68.31-124.40)	<0.001 ^a
Palm Breadth (Left)	76.56(30.50-98.48)	84.02(67.48-122.10)	<0.001 ^a

$p<0.05$, Min: Minimum, Max: Maximum, a:Mann-Whitney U Test; the data are presented in median (min, max)

Table 3. The Comparison of Finger Length Between Female and Male

Parameter (mm)	Female (n:210)	Male (n:108)	p
ThumbFinger Length (Right)	62.31 (45.12-77.14)	67.98 (42.78-93.32)	<0.001a
Thumb Finger Length (Left)	61.60 (45.19-88.36)	67.74 (41.18-97.62)	<0.001aw
IndexFinger Length(Right)	68.53 (54.89-90.99)	73.04 (54.44-106.52)	<0.001a
IndexFinger Length(Left)	68.84 (20.80-92.36)	73.67 (51.24-104.41)	<0.001a
MiddleFinger Length(Right)	75.78 (41.00-95.00)	80.44 (58.74-113.52)	<0.001a
Middle Finger Length(Left)	75.28 (59.27-96.62)	81.17 (58.33-111.77)	<0.001a
Ring Finger Length(Right)	70.19 (52.86-89.19)	75.91 (50.44-113.12)	<0.001a
Ring Finger Length(Left)	69.51 (51.70-87.53)	74.47 (45.50-103.81)	<0.001a
Little Finger Length(Right)	57.69 (41.11-79.82)	62.77 (41.09-94.71)	<0.001a
Little Finger Length (Left)	56.60 (36.50-78.61)	60.95 (42.04-100.38)	<0.001a

p<0.05, Min: Minimum, Max: Maximum, a:Mann-Whitney U Test; the data are presented in median (min, max)

DISCUSSION

This study investigated to compare measurements of the wrist, hand and fingers parameters between female and male participants aged 25 to 72 years. The results demonstrated that the points of right and left wrist circumference, breadth and length, palm breadth and length, fingers length in male were higher than in female. To the best of our knowledge, this is the first study to compare right and left wrist circumference, breadth and length, palm breadth and length, fingers length between female and male.

When the literature was researched; it is found that small number of study include hand and wrist measurements for gender determination.

The study conducted on India populations found that hand length could be used to determine gender by 83% in male, 88.5% in female and 87% in male and 91.1% in female. Jowaheer and Agnihotri observed a statistical regression based statistical approach and that the gender could be determined by an accuracy of 88% (12). This study conducted on Turkish population found that wrist circumference, breadth, length, palm breadth and length, all finger length could be used for sex determination because of having significant accuracy.

Barrett et al. found that index finger and ring finger length ratio (2D:4D) of human can be used for sex determinati-

on (13). According to Barrett, 2D:4D in male was more less than female. This situation resulted from level of sex hormone during 13th gestational week. Higher level of testosterone hormone in fetal stage and over activation of androgen receptors bring about longer 4th digit with regard to the 2nd digit because of greater chondrocyte proliferation. Also, male experience higher testosterone during 13th gestational week, their 2D/4D is lower than female (13). This study found that 2D and 4D length in male was more significantly than female. Testosterone could be cause for this conclusion.

According to Casse and Ross, the ability of phalangeal length to determine sex is better than metacarpal and metatarsal length (14). This conclusion was similar with this study in terms of accuracy of phalangeal length for sex determination.

Scientist found that digit ratio is based on individual variance, so, they not found overall variance of different population (15). Due to not overall variance or gold standard of different population, we not evaluate digit ratio in male and female.

According to previous studies, the size of wrist and phalangeal length was seen bigger in male, aged 20-60 years, because of higher level of testosterone hormone (16). In the current study, right and left wrist, palm and finger parameters was seen a high score on the frequently in male, the range of 20-60 years. The conclusion of this study was similar to those of previous studies.

Kanchan and Kumar' study showed that the accuracy of ring length and 2D/4D ration for determination is %80 for males; while it is about %74-%78 for female in South India. They utilized from finger length, 2D/4D ratio and phalanx length to predict sex. According to their study, finger length and 2D/4D ratio used for sex determination using with discriminant analysis (17). This study evaluated the points of right and left wrist circumference, breadth and length, palm breadth and fingers length in male and female. All parameters was found higher than in female. In addition, 2D/4D ration was evaluated in previous studies the outside of wrist and palm breadth or length. Therefore, this parameters were investigated firstly with this study.

Bailey et al. (18) assessed the relationship between finger length and ratio (2D/4D) in male and female. They found that man with lower 2D/4D had high aggression scores because of testosterone organizational effect but not observed this relationship in women. This conclusion was similar to the conclusion of the current study in terms of the sex determination from fingers length. Also, this study concluded that finger length is connected with testosterone hormone in 13th gestational week.

This study evaluated size of wrist circumference, length, breadth, palm length and breadth, fingers length in male and female aged 25-72 years. Wrist, palm and finger parameters should be helpful for sex determination. In the other words statistically significant difference was observed in terms of wrist, palm and finger parameters between female and male.

In conclusion, this study showed that the evaluation of right and left wrist circumference, breadth and length, palm breadth and length, finger length have higher accuracy rates for determination of sex. In addition, the results of this study provide further evidence of the finding out how anthropometric measurements taken from male and female aged 25 to 72 years differ in terms of right and left wrist, palm and fingers parameters. Statistically significant differences were determined in respect of right and left wrist circumference, wrist and palm breadth and length, fingers length between male and female.

Compliance with ethical standards

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Conflict of interests

The authors have no conflict of interests to declare.

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