



CORRELATION BETWEEN HAND LENGTH AND FOOT LENGTH IN HEALTH CARE PROFESSIONALS OF FH MEDICAL COLLEGE

Anatomy

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ABSTRACT

Introduction: Human beings are considered to be bilaterally symmetrical. However, there is no symmetry in the length of the feet irrespective of sex or handedness. The hand length could predict bodyweight and body surface area independent of the sex of the individual. But there was no so much data available in the literature showing the relationship between hand length and foot length.

Aim and objective: The present study was conducted to derive the correlation between hand length and foot length and the results demonstrate that there was highly significant correlation between them.

Material and Methods: A cross sectional study was carried out on 200 healthy and normal adult professional students of either sex (100 Male and 100 Female), age between 18-25 years.

Result: the hand length and foot length were compared between the right and left sides, the data showed that the significant difference between males and females on both sides was highly significant for all the parameters measured with p value < 0.01

Conclusion: The results of current study indicate that if the hand length is known, foot length can be predicted and if the foot length is known, hand length can be predicted and vice versa.

KEYWORDS

Anthropometry, Foot Length, Hand Leng

INTRODUCTION:

In forensic science and medicine Alphonse Bertillon, a French police expert invented a system of criminal identification based on anthropometric measurements a 100 years ago.(1,2). Hand has been used as a tool for estimating the area of burn injury. The area of palmar surface of one's hand has been estimated to be 1% of the body surface area by Amirshaybani et al (3). When the growth of the hand is studied between the ages of 2 and 17 years as compare to hand width, the length of the hand increases more. When hand length was compared with the bodyweight for both males and females there was a curvilinear relationship which was not far from being linear by Amirshaybani et al, (4).

Therefore hand length has been considered as an excellent predictor of body surface area and body mass. Change of foot length and width with age has been reported in a few anthropometric studies in literature Cheng et al (5). The foot length and width were found to be increasing significantly on weight bearing between 3 and 18 years of age and in both genders Chang et al (5) and Peker et al (6) in their study found a significant relationship between foot length, toe length, ankle circumference and calf circumference in students aged between 17 and 25 years.

Forensic identification from the foot and its parts is important as there is an increased likelihood of the recovery of feet (often enclosed in shoes), separated from the body, in mass disasters such as high power explosions and bomb blasts, airplane crashes and other high impact transportation accidents. The significance of the human foot and its bones and foot prints in identification has been successfully reported in the past.(7)

MATERIAL AND METHODS:

A cross sectional study was carried out on 200 healthy and normal adult professional students of either sex (100 Male and 100 Female), age between 18-25 years and those having no obvious deformities or previous history of trauma to the hands or feet were selected for the study.

Exclusion criteria included students with any musculoskeletal deformity like kyphosis, scoliosis, poliomyelitis, trauma etc. which will affect the normal measurements of hand and foot length, measurements excluded if any nail extending over the end of toe and other fingers, patients with pedal deformity or injury, abnormal heights like gigantism, dwarfism etc. After obtaining written informed consent the following measurements were taken from subjects.

Hand Length: Each subject was asked to place his/ her hand on a white paper with the palm facing upwards keeping the fingers close together with the thumb lying comfortably but not tightly against the radial aspect of the hand and index finger. A tracing of the hand was made with a lead pencil. The tracing proceeded from the radial styloid process to the ulnar styloid process. A line was drawn joining the two styloid tips. This line is designated as the interstyloid line. The distance between the midpoint of the interstyloid line and the tip of the middle finger in extension was measured as the length of the hand as described by Amirshaybani et al (2).

Foot Length: Each subject was made to stand on a calibrated foot board with his/her back against the wall in such a manner that the posterior most point of the heel will gently touch the wall. A vertical stop was placed against the anterior most point of the foot. The distance between the posterior most point of the heel and the anterior most point of the foot was measured as foot length as described by Peters et al (6). All the measurements were taken on both sides in each subject. The measurements were taken in centimetres (cm). The results were analysed statistically.

RESULT:

A total 200 healthy and normal adult professional students were included in the study among them 100 were males and 100 females. Table 1 shows the descriptive statistics of hand length and foot length in males and females.

Table 1: Statistical Distributions Of The Right And Left Sides Of Both Sex As Well As Difference Between Males And Females.

Statistical Distributions of the right and left sides of both sex as well as difference between males and females								
	MALE				FEMALE			
	Right Hand Length	Left hand Length	Right Foot Length	Left Foot Length	Right Hand Length	Left hand Length	Right Foot Length	Left Foot Length
N	100	100	100	100	100	100	100	100
Minimum	16.9	16.6	25.8	26	16.5	16.3	20.3	20.9
Maximum	21.7	21.2	25.9	25.8	19	19.3	25.7	26.2
Mean	19.43	19.45	26.09	26.14	17.81	17.77	23.55	23.74
SD	0.84	0.82	1.12	1.09	0.63	0.68	0.98	0.99

When the values of the hand length and foot length were compared between the right and left sides, the data showed that the significant difference between males and females on both sides was highly significant for all the parameters measured with p value < 0.01 (Table 2,3,4).

Table: 2 : Statistical Difference Between Right And Left Sides Of Males

Statistical difference between right and left sides of males				
	Paired Sample	T	Df	p Value
Pair -1	Right Hand Length-Right Foot Length	47.23	199	< 0.01
Pair -2	Left Hand Length- Left Foot Length	48.93	199	< 0.01

Table:3: Statistical Difference Between Right And Left Sides Of Males

Statistical difference between right and left sides of females				
	Paired Sample	T	Df	p Value
Pair -1	Right Hand Length-Right Foot Length	48.94	199	< 0.01
Pair -2	Left Hand Length- Left Foot Length	49.22	199	< 0.01

Table:4: Statistical Difference Between Males And Females

Statistical difference between males and females				
	Paired Sample	t	df	p Value
Pair -1	Male Right Hand Length-Female Right Hand Length	15.26	199	< 0.01
Pair -2	Male Left Hand Length- Female Left Hand Length	15.69	199	< 0.01
Pair -3	Male Right Foot Length-Female Right Foot Length	16.98	199	< 0.01
Pair -4	Male Left Foot Length- Female Left Foot Length	16.19	199	< 0.01

DISCUSSION:

In present study we found that there is a significant correlation between hand length and foot length ($p < 0.0001$). The results indicate that if the hand length is known, foot length can be predicted and if the foot length is known, hand length can be predicted and vice versa. In another study conducted by Anil et al (1997), they found a significant correlation between foot length and height of the person. This can be of tremendous use in medico-legal cases especially in the identification of severed body parts. The data can also be of help in plastic and reconstructive surgery. Hand length and foot length has been studied extensively in relation to various body measurements but very few studies were available to predict the correlation between these two variables. It is well established that bilateral symmetry exist in human population i.e. the difference between the measurements of the left and right side of the human body thus both the measurements was considered for the present study and results showed bilateral symmetry for all the parameters studied in males and females. The mean right hand length (RHL) and mean left hand length (LHL) for males were 19.43 and 19.45 which was higher than mean RHL and mean LHL for females i.e. 17.81 and 17.77. Also mean right foot length (RFL) and left foot length (LFL) were 26.09 and 26.14 of males which was higher than mean RFL 23.55 and mean LFL 23.74 of females. This finding correlates with different studies [8-11]. Thus the mean values of all male parameters studied were higher when compared with mean values of female parameters. These statistical significances between males and females were due to the fact that fusion of epiphysis of bones occurs earlier in males than females. Males have about two more years of bone growth than females [12]. In the present study, all variables show statistically significant male-female differences at $p < 0.001$ by student's t-test. Pearson's correlation analysis showed positive and statistically significant correlation between hand length and foot length. These depicts that the relationship between hand length and foot length was significant. The data obtained was computed for providing a predicted range for hand dimensions so that if one variable is known the other can be predicted within the possible range. The range can predict hand dimension within the standard error of estimate thus can be used as a reference for future perspective in forensic domain.

CONCLUSION:

The results of current study indicate that if the hand length is known, foot length can be predicted and if the foot length is known, hand length can be predicted and vice versa. From the data obtained, we have tried to establish a normal range for the hand length as well as foot length when one parameter is known. This can be of tremendous use in medico-legal cases especially in the identification of severed body parts. The data can also be of help in plastic and re-constructive surgery.

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