



'Correlation of Hand and Middle Finger Length and Stature in Both Sexes of College Students in Central India for Use in Ergonomics.'

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ABSTRACT

Background: Hand length has good ergonomic value in sports medicine and designing of hand held instruments so as to work efficiently. Stature and hand length plays role in development of various working places. Middle finger length plays important role while holding instruments and is highly correlated with hand length and stature of person.

Moreover, there can be anthropometric variations in different geographical areas. Material and method: 260 students were measured with 130 male and 130 Female candidates. Correlation between parameters were calculated with SPSS. Result: Middle finger length with hand length is highly correlated with pearson Correlation 0.896 for left side and 0.892 for right side. Multivariaent regression equations are calculated in both sexes. Conclusioin: Both hand length and Middle finger length are linearly correlated with height of person. These parameter are useful in ergonomics.

KEYWORDS : Stature, Hand length, Middle finger length, Pearson Correlation.

Introduction:

The study attempts to provide the anthropometric dimensions of the hand, foot and ear for the students in tertiary institutions in Nigeria. The study is necessary because differences in these dimensions as a result of gender and nationalities may consequences on the design and construction of handles, gloves, foot wears, brake pedals, ear-phones and so on. [1].

JasujaO. P. estimating stature from various parameters based on the above mentioned evidences becomes one of the most important and essential exercise for personal identification .In present paper, study on stature estimation from hand and phalanges length has been reported in 60 people. [2]

llayerperumastudied was carried out to investigate the relationship between personal stature and hand length among a group of male and female Sri Lankan adults and to derive a linear regression formula between the handlength and height of an individual. total of 258 individuals with an age range of 20-23 years. [3].

From the present study we found somemultiplication factors which were helpful for Bengaliadult Muslim females for estimation of stature fromrespective hand length. That may be helpful forthose who work in this area especially in the variousmedical disciplines, anthropologists, and securityexperts of Bangladesh. [4]

Human beings are considered to be bilaterally symmetrical. However, there is an asymmetry in the length of the feet irrespective of sex or handedness. One hundred normal subjects (50 males and 50 females) between the ages of 19 and 25 years with no obvious deformities or previous history of trauma to the hands or feet were selected for the study. [5]

Rahulkestudy was planned to evaluate the correlation between middle finger length and stature of a tribal district population of India so that a formula can be derived for estimation of height for this tribal district population. A total of 100 subjects, 23 male and 77 female were included in the study. In the studied population middle finger length and stature among males and females have good correlation. [6]

In this study we found that there is strong correlation between stature and hand length and the linear regression analysis of the obtained data has provided the regression equations for nearly accurate estimation of stature in Gujarati population. Estimation of stature

from hand length in Gujarat region [7]

Sample of 273 living cases (138 male and 135 female students) between the ages of 17 and 23 years with no obvious deformities or previous history of trauma to hands, feet, spine and limbs, were studied. This study shows significant correlation between stature and all five parameters at different degrees. Mathematical formulas were used for estimation of stature Hand length. [8].

100 males and 100 females each containing 50 North Indian and 50 South Indian males and females, aged between 18-21 years. Present study shows higher mean values in each anthropometric dimension were obtained in males than in females. As far as the bilateral asymmetry is concerned, both hand length and width in North and South Indian males and females were statistically significant. In males the highest correlation co-efficient is exhibited by right hand length. Thus, hand length is the best parameter for estimating stature for males. [9]

Material and Method:

Ethical committee permission was taken prior to study. Information sheet was given to allsubjects and written informed consent was obtained.

In this study total of 260 students of age group of 18 to 21 years taken with 130 male and 130 female. Care is taken that no one is has history of accident with fracture of extremity and not suffering from diabetic.

For measurement of **hand length**, both

hands was measured with VernierCalliper length was measured from tip ofmiddle finger or the longest finger to thecentre point of inter styloid line.

Middle finger is measured from tip of finger till proximal crease of phalange in cm.

Standing height was measured with the individual standing bare-foot on the platform of the stadiometer with the upper back buttock and heels pressed against the upright position of the instrument. Head was positioned in the Frankfort horizontal plane, and the head plate was brought into firm contact with the vertex.

Data was tabulated. Discreptive statistical and ratio between hand

length and middle finger length was calculated. Test of significance applied. And Correlation coefficient was calculated with regression equation by SPSS 19.

Observations:

Descriptive analysis of data indicates significant difference in male and female parameters. Both one way ANOVA and t-test signifies values 0.000.

Range of male height in male population is 147 to 193 cm and female population is 124 to 180.34 cm. Normal distribution shows mesocercic distribution of population. F value is 206.528 and highly significant 0.000.

Hand length and middle finger length shows difference in length in both right and left hands with significant difference in both sexes.

Table 1: Height in (cm)

	Male	Female
Mean	171.49	157.98
Std. Dev.	7.56	7.59
Std. Er. Mean	0.66	0.67
Min	147	124.46
Max	193.04	180.34
Skewness	-0.158	-0.905
Kurtosis	0.576	0.212



Figure 1 Graph of mean Height in cm

	Male		Female	
	Right	Left	Right	Left
Mean	18.67	18.72	17.34	17.27
Std. Dev.	0.94	0.95	1.23	1.15
Std. Er. Mean	0.08	0.08	0.1	0.04
Min	16	16.3	15.3	15.2
Max	21.7	21.8	24	21.6
Skewness	0.24	0.25	1.66	1
Kurtosis	0.94	0.58	6.01	1.63

Table 2: Hand Length in cm

	Male		Female	
	Right	Left	Right	Left
Mean	8.16	8.18	7.45	7.43
Std. Dev.	0.46	0.46	0.55	0.54
Std. Er. Mean	0.04	0.04	0.04	0.04
Min	7	7	6.2	6.2
Max	9.8	9.8	9.3	9.2
Skewness	0.19	0.28	0.74	0.62
Kurtosis	0.63	0.72	0.79	0.61



Figure 2: Hand Length Mean Values.

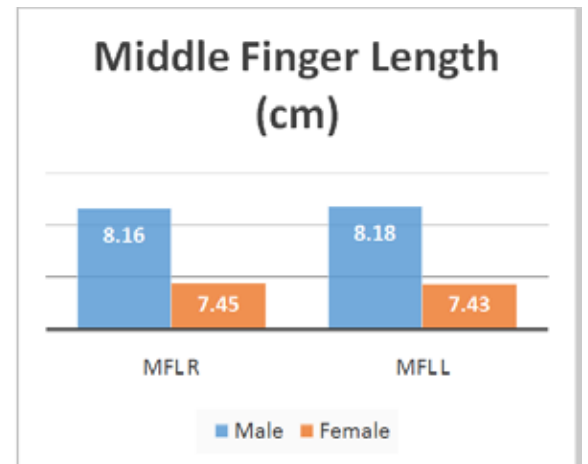


Figure 3: Middle Finger Length (cm)

Pearson Correlation had been calculated with significant linear correlation between hand length and middle finger length has observed it is 0.892 on right side and 0.893 of left side. Very few studies has been carried out by Rahule on tribal Indian population [7] and Jasuja O.P. 0.631 and 0.615 which shows linear correlation [2].

Hand length with stature shows 0.527 right side and 0.567 on left side as compare to 0.51 on right and 0.50 on left side by Patel J [8]; Ilayperuma shows higher of 0.58 on right and 0.59 on left side [3].

Middle finger length with stature obtain 0.56 on right and 0.55 on left as compare to 0.52 right and 0.50 on left by Jasuja O.P.[2].

Regression equations were calculated using both hand and middle finger lengths with height.

Using Hand length both side

In Female:

Eq1: Height = 122.109 – 0.745 * right hand length + 2.062 * Left hand length – 4.984 * Left Middle finger length + 6.738 * Right Middle finger length (R= 0.34).

In Male:

Eq2: Height = 130.251 + 0.067 * right hand length + 1.277 * Left hand length – 1.841 * Left Middle finger length + 3.816 * Right Middle finger length (R= 0.28).

Eq3: Height = 85.945 – 2.947 * Right hand length + 4.991 * Left hand length + 5.302 * Right middle finger length + 0.080 * Left middle finger length (R= 0.59).

Discussion

Hand length has good ergonomic value in sports medicine and designing of hand held instruments so as to work efficiently. Morphometry of the hand provides important guide for development of instruments so as to increase work efficiency. Also helps in the estimation of stature of a criminal. The available data usually apply to Caucasians in Europe or North America. Only few studies of other racial groups exist which emphasize the need to establish standards in different ethnic populations[3].

In this study students from central India has been calculated. Mean value for height is higher in male than in female population.

With statistically significant. As also observed by Jasuja O.P., Patel J, but comparative values are higher than present study [2,7].

Hand length shows higher values in male than in female as in other studies. Correlation coefficient are on higher side in present study than in Jasuja O.P.; Ilayerumal surani; Laila SZ; Patel J.Oommen A.; Prasana L. L. [2-7].

Very few studies had been carried out on middle finger length as in Rahule [6]. It shows good correlation with both height and Middle finger length. Middle finger length on right side is more in male than female.

Regression equations had been calculated with multiple regression. With improved correlation coefficient.

It has been seen that R value is better while applying to study with whole sample. Better predictive value can be deduced when applied together.

Rest other studies shows only univariate analysis.

Conclusion:

In this following inferences can be deduced Hand length is highly correlated with middle finger length.

Middle finger length is positively correlated with both hand length and height of person.

Multiple correlation regression equation gives better predictive value for height when applied together. Following data and equations can be useful for forensic purpose and in designing of instruments or in ergonomics.

Acknowledgement:

We are thankful for facility and opportunity given by Management and Administration of MGM Medical College, Aurangabad.

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