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Research Paper

Correlation of Hand and Foot Length and Stature in Both Sexes in Central India.

Medical Science

KEYWORDS : Stature, Hand length, Foot length, Pearson Correlation, ergonomics.

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ABSTRACT

Background:Ergonomics is the science of designing the job to fit the worker, rather than physically forcing the worker's body to fit the job . Stature and hand and foot length plays role in development of various working places. Foot length plays important role while designing foot wear and stability.Moreover, there can be anthropometric variations in different geographical areas. Material and method:336 students were measured with 157 male and 179 Female candidates. Result:Foot length with hand length is highly correlated with pearson Correlation 0.77 for left side and 0.78 for right side. Conclusioin: Both hand length and foot length are linearly correlated with height of person.

Introduction:

Adapting tasks, work stations, tools, and equipment to fit the worker can help reduce physical stress on a worker's body and eliminate many potentially serious, disabling work relatedmusculoskeletal disorders (MSDs).

Ergonomics draws on a number of scientific disciplines, including physiology, biomechanics, psychology, anthropometry, industrial hygiene, and kinesiology [1].

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

Ilayperuma studied 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[].

The present study has been designed to conduct measurements on male and female Kayastha inhabiting in different village or cities of Bundelkhand region in the age range of 20 to 40 years. Foot length and hand length shows highest correlation for estimation of stature [].

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 [].

Shekhar et alRight foot length and stature among males andfemales have good correlation in this tribaldistrict of Andhra Pradesh[].

Stature can be more accurately calculated by foot breadth than long bones. The findings are useful to anatomists, criminologists, human biologist and forensic medicine experts []. 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 [].

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 [].

Material and Method:

Ethical committee permission was taken prior to study. Written informed consent was obtained.

In this study total of 336 students of age group of 18 to 21 years taken with 157 male and 179 female. Care is taken that no one has history of accident with fracture of extremity and not suffering from diabetes.

For measurement of **hand length,** both hands was measured with Vernier Calliper. Length was measured from tip ofmiddle finger or the longest finger to thecentre point of inter styloid line.

Foot lengthis the straight distance from the most posteriorly projecting point on the heel to the tip of the most anteriorly projecting toe when the subject is standing erect in cm

Standing height was measured with the individual standing barefoot 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.

Descriptive statistical, 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 141 to 175.34 cm. Normal distribution

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shows mesocertic distribution of population. F value is 356.83 and highly significant 0.000.

Hand length and Foot 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	172.18	158.31
Std. Dev.	7.30	6.15
Std. Er. Mean	0.58	0.46
Skewness	-0.313	0.009
Kurtosis	0.814	-0.161



Figure 1 Graph of mean Height in cm

Table 2: Hand Length

	Male		Female	
	Right	Left	Right	Left
Mean	18.57	18.58	16.88	16.85
Std. Dev.	0.79	0.83	0.84	0.84
Std. Er. Mean	0.06	0.06	0.06	0.06
Skewness	0.159	0.196	0.43	0.24
Kurtosis	-0.27	0.096	0.391	0.033



Figure 2: Hand Length Mean Values.

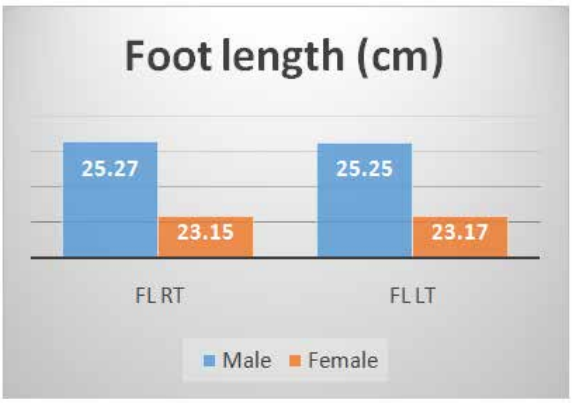

Figure 3:Foot Length (cm)

Pearson Correlation had been calculated with significant linear correlation between hand length and foot length has observed it is 0.77 on right side and 0.76 of left side.

Hand length with stature shows 0.79 right side and 0.80 on left side as compare to 0.51 on right and 0.50 on left side by Patel [8]; Ilayperuma shows of 0.58 on right and 0.59 on left side [3] Shrivastava

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Std. Dev.	0.79	0.83	0.84	0.84
Std. Er. Mean	0.06	0.06	0.06	0.06
Skewness	0.159	0.196	0.43	0.24
Kurtosis	-0.27	0.096	0.391	0.033

	Male		Female	
	Right	Left	Right	Left
Mean	25.27	25.25	23.15	23.17
Std. Dev.	1.43	1.45	1.3	1.3
Std. Er. Mean	0.11	0.11	0.1	0.1
Skewness	-0.23	-0.3	0.97	0.71
Kurtosis	1.29	1.24	3.86	2.59

Table 3: Foot Length

0.61 in male very low in female of 0.31 [4].

Foot length with stature obtain 0.71 on right and 0.72 on left as compareto shrivastava similar to present study of 0.71 [4] and Shekhar Rao had also 0.77 [7].

Best value was obtained with hand and foot length on same side and when calculated all parameters together.

Using Hand length and Foot length In Female:
Eq1: Height = 70.112+ 2.494 * right hand length + 1.653 * Left hand length +0.558 * Right Foot length + 0.228 * Left Foot length (R= 0.68).

In Male:
Eq2: Height = 76.866 + 0.482 * right hand length + 3.574 * Left hand length + 0.139 * Right Foot length + 1.598 * Left Foot length (R= 0.59).

Whole Data:
Eq3: Height = 43.678+ 1.652 * Right hand length + 3.431 * Left hand length + 0.455 * Right Foot length + 0.841 * Left Foot

length (R= 0.81).

Eq4: Height = 44.36 + 4.977 Right hand length + 1.344 Right Foot length

Discussion

Hand length has good ergonomic value in sports medicine and designing of hand held instruments so as to work efficiently.

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[1].

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

With statistically significant. Better predictive value with hand and foot length calculated together in both sexes. As also observed by Shrivastava, and Patel J, Shekhar et al. [3-6].

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; Ilayeruma Isurani;Shrivastava, and Patel , Shekhar et al.; [3-6].

Regression equations had been calculated with multiple regression.

Conclusion:

In this following inferences can be deducedHand length is highly correlated with Foot length.

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

Correlation is highly significant when data is analyzed combining both sexes together.

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.

REFERENCE

. U.S. Department of Labor Occupational Safety and Health Administration, OSHA 3125; 2000, p .1 | | .Olasunkanmi Salami ISMAILA,Anthropometric Data of Hand, Foot and Ear of University Students in Nigeria,Leonardo Journal of Sciences ISSN 1583-0233 Issue 15, July-December 2009 p. 15-20. | | Isurani Ilayperuma , Gananda Nanayakkara , Nadeeka Palahepitiya, Prediction of personal stature based on the hand length. Galle Medical Journal, Vol 14: No. 1, September 2009 P:15-18. | | | Ankit Srivastava and Vijay Kumar Yadav; Reconstruction of stature using hand and foot dimensions among Indian population; International journal of Engineering sciences and Emerging technologies, Volume 6, Issue 4, pp: 400-404 | | Jitendra P Patel, Bharat G Patel, Ritesh K Shah, Naimish R Bhojak, Jalpa N Desai, | I/C. NHL Journal of Medical Sciences/Jan 2014/Vol 3/Issue 1 p: 41 - 44 . | | | Shekhar Rao B*, Rahule AS, Mohd Saleem, Mohammed Shakeel Mohammed Bashir; Estimation of Stature from Foot Length in a Tribal DistrictPopulation of India; J Cont Med A Dent Sept-Dec 2013 Volume 1 Issue 1: P: 30-35. | | | Dr. Shailesh M. Patel, Dr. Vikash Doshi, Dr. Srushti Ruparelia, Dr. Ankur Zalawadia, Dr. Dhara Parekh; Anthropological Study of the Foot and It's Relationship between Different Parameters and Stature in an Adult Population of Different Areas of Gujarat, NJIRM ; Vol. 2(3). July- September 2011: p:67-70. | | Patel PN , Tanna JA, Kalele SD, Correlation between Hand Length and Various Anthropometric Parameters International Journal of Medical Toxicology and Forensic Medicine. 2012;2(2):61-63. | | | Prasanna LC, and Vinay Kumar; Prediction of Stature and Sex by Hand Dimension-A Statistical Analysis in North and South Indians of Same Age Group; RRJMHS | Volume 3 | Issue 2 | April - June, 2014 p: 96-99