

Original Article

A STUDY OF CORRELATION BETWEEN STATURE AND THUMB LENGTH

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ABSTRACT

Stature is one of the most important and useful anthropometric parameter that determine physical identity of an individual. Estimation of stature from amputated limbs has obvious significance in the personal identification in the events of murders, accidents and natural disasters. Not much literature is available on previous study for calculation of height from thumb length even not in this region.

Present study look into possibility of estimation of stature from thumb length. The article presents a correlative study between stature and thumb length and also try to estimate the height from right and left thumb length.

Height and thumb length of 150 medical students aged between 18-28 years of S.N. Medical College, Agra, UP, are measured by stadiometer and digital vernier caliper respectively.

A significant correlation is observed between thumb length and stature. The findings of present study indicate that thumb length can be used successfully to predict stature of an individual.

Key words : stature, thumb length, stadiometer, digital vernier caliper.

INTRODUCTION

Stature can be defined as natural height of a person in erect position. It is determined by many factors such as genetic and environmental factors. The stature prediction occupies relatively a central position in the identification necessitated by the medicolegal experts or medical jurisprudence and also in the anthropological research (Athawale NC, 1963)(2).

When a complete dead body is found, stature determination is rather an easy task but in cases where only some parts of the body are available, the determination of stature of the individual is difficult (Athawale NC, 1963)(2). Estimation of stature from amputated limbs has obvious significance in the personal identification in the events of murders, accidents and natural disaster.

Many previous studies have been done to estimate the stature using the length of different long bones (Allbrook D (1861)(1), Athawale NC (1963)(2), Nat BS (1931)(7), Singh B & Sohal HS (1951)(10), Trotter M & Gleser Gc (1958)(11) and Trotter M & Gleser Gc (1952)(12). Other have tried to estimate the stature using different body parts such as length of hand and foot, head length and arm span Hossain S (2011)(4), Pawar PK, Dadhich A(2013)(8) and Saxena HK (1979)(9). Little data is available on previous work done for calculation of height from thumb length. Here, we have made an effort to find out correlation between thumb length and stature in U.P. population. The data and analysis derived from our study can be used by forensic experts, anthropologists and archeologists as well.

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A Study of Correlation between Stature and Thumb Length

So the aim of the study is to determine the stature from right and left thumb in both sexes in UP population and to find correlation between stature and thumb length.

MATERIAL AND METHODS

The study comprised of 150 medical students of S.N. Medical College Agra, in which 84 are males and 66 are females.

We have included asymptomatic subjects between the ages of 18-28 years and excluded subjects having bone deformity e.g. : scoliosis, kyphosis, arthritis, missing thumb etc.

Informed written consent was taken from the subject.

Measurement of height using stadiometer



(Photo-1)

Measurement of thumb length using thread method



(Photo-2)

Measurement of length of thread using digital vernier caliper



(Photo-3)

In each case, measurement of stature using stadiometer was taken. It was measured as vertical distance from vertex to the foot. Subject was made to stand erect with back facing wall on a horizontal resting plane, barefooted. Palms of hand facing anteriorly, finger pointing downwards and head oriented in eye-ear-eye plane (Frankfurt plane) (Photo-1).

Measurement of thumb length of each subject with digital vernier caliper was taken. It was measured straight distance from mid-point of the proximal digital crease to tip of thumb with the help of thread when hand was placed on the flat plane with palmer surface facing upwards and thumb was abducted. Then length of thread was measured with digital vernier caliper (Photo-2 & 3).

OBSERVATIONS

We assume here variable X as the thumb length and Y as the height of the student. X is independent variable and Y is dependent variable, 'a' is intercept and 'b' is slope in regression equation. A regression equation between thumb length & height is denoted by $(Y = a + bx)$.

TABLE-1: AGE WISE DISTRIBUTION OF THUMB LENGTH OF MALE STUDENTS

Age (yrs)	No. of male students	Average height (cm)	Average right thumb length (cm)	Average left thumb length (cm)
18	21	171.38	6.65	6.65
19	20	168.93	6.68	6.66
20	16	170.81	6.47	6.50
21	9	173.71	7.21	7.05
22	6	170.60	6.60	6.33
23	5	173.10	6.31	6.29
24	3	156.93	6.69	6.59
25	1	164.00	6.13	5.83
27	2	163.50	6.51	6.41
28	1	155.00	6.16	5.73

For 84 male students (N=84), average height is 170cm and average right thumb length in 6.64cm.

By applying regression statistics, height of male student (Y)=156.31+2.06×6.64=169.99 cm. and correlation coefficient (r) between height and length of right thumb is 0.635 while coefficient of determination (R²) is 0.0403.

For 84 male students average left thumb length is 6.59cm. Now according to regression statistics, height of male student (Y) = 152.92 + 2.59 X 6.59 = 169.98 cm and correlation coefficient between height and length of left thumb is 0.245, while coefficient of determination (R²) is 0.0603.

TABLE 2 AGE WISE DISTRIBUTION OF THUMB LENGTH OF FEMALE STUDENTS

Age (yrs)	No. of male students	Average height (cm)	Average right thumb length (cm)	Average left thumb length (cm)
18	10	156.00	6.26	6.25
19	22	158.95	6.07	6.03
20	17	157.30	6.26	6.20
21	4	156.00	6.56	6.45

22	5	155.92	6.16	6.12
23	5	158.96	6.04	5.97
24	2	158.00	5.92	6.05
25	1	154.00	7.04	7.04

For 66 female students (N), average height is 157.56cm and average right thumb length is 6.18cm female student by applying regression statistics, height of female student (Y) = 143.72 + 2.24 X 6.18 = 157.56cm and correlation coefficient (r) between height and length of right thumb is 0.212 while coefficient of determination (R²) is 0.0454.

For 66 female students, average left thumb length is 6.15cm. Now according to regression statistics height of female students (Y) = 145.62 + 1.94 X 6.15 = 157.55cm and correlation coefficient (r) between height and length of thumb is 0.197 while coefficient of determination (R²) is 0.038.

TABLE 3- AGE WISE DISTRIBUTION OF THUMB LENGTH AMONG TOTAL STUDENTS

Age (yrs)	No. of total students	Average height (cm)	Average right thumb length (cm)	Average left thumb length (cm)
18	31	121.13	6.53	6.52
19	42	163.70	6.36	6.33
20	33	163.85	6.36	6.35
21	14	168.26	7.01	6.92
22	11	163.93	6.40	6.26
23	10	166.03	6.18	6.13
24	5	157.36	6.38	6.41
25	2	159.00	6.59	6.44
27	2	163.50	6.51	6.41
28	1	155.00	6.16	5.73

For 150 students (N) average height is 164.53cm and average right thumb length is 6.44 cm. By applying regression statistics height of student $(Y)=135.04+4.58 \times 6.44=164.54\text{cm}$ and correlation coefficient (r) is 0.353 while coefficient of determination (R²) is 0.124.

For 150 students, average left thumb length is 6.40cm. By applying regression statistics height of student $(Y)=135.11+4.60 \times 6.40=164.55\text{cm}$ and correlation coefficient (r) is 0.353 while coefficient of determination (R²) is 0.127.

Table-4

Male average height 170 cm	Male height from right thumb length 169.99 cm	Male height from left thumb length 169.98 cm	Correlation coefficient of male from right thumb length 0.635	Correlation coefficient of male from left thumb length 0.245
Female average height 157.56 cm	Female height from right thumb length 157.56 cm	Female height from left thumb length 157.55 cm	Correlation coefficient of female from right thumb length 0.212 cm	Correlation coefficient of female from left thumb length 0.197

DISCUSSION

Tyagi et.al (1999)¹³ studied the subjects from Delhi and found positive correlation between stature and finger length and have suggested that index finger was best for the prediction of stature in both males and females. Jasuja et.al (2004)⁵ had studied the hand and four phalange lengths in 60 subjects belonging to Jat, Sikhs community. The researchers had observed correlation coefficient that ranged from 0.215 to 0.681 and concluded that stature could be estimated from hand and phalange length.

Varghese et.al (2010)¹⁴ studied in Mysore, India and found that best finger to predict the height in case of male was left thumb and in female it was right thumb.

Kumar et.al (2013)⁶ had studied 200 subjects from Uttarakhand, India aged between 21 years to 30 years for correlation between lengths of thumb and stature and noted positive correlation. The correlation coefficient ranged from 0.240 to 0.256.

CONCLUSION

In present study, a significant correlation is observed between thumb length and stature in both the sexes. Though male height is most strongly correlated with right thumb length. Estimated stature in male from right thumb and left thumb is almost equal to average height in male i.e. 170 cm.

Estimated stature in female from right thumb and left thumb is almost equal to average height in female i.e. 157.56 cm. The finding of present study indicate that thumb length can be used to predict stature of an individual in both male and female.

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