

Original Research Article

## Study of Somatotypes in students of western Maharashtra Population by Anthropometric Method

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**Abstract:** Somatotype though a method of describing various human forms in three numbers. It gives rough idea about the physique of the individual and variation in muscle and skeletal mass. The study was done to evaluate the student of western maharashtra region by this method. This study was comparable with the more such Indian studies. The numbers established by such studies was beyond comparable range. The range of numerical also had to be adjusted with Indian studies. The regression formulae were also derived from this study so that endomorphy, mesomorphy and ectomorphy components can be established from minimum measurements. The above study was first of its kind in establishing numbers of somatotype in western Maharashtra students. This study can be further useful in improving various sports skills and athleticism.

**Keywords:** Somatotype, Endomorphy, Mesomorphy, Ectomorphy.

### INTRODUCTION:

Somatotyping is the method of describing precisely the human form and its variations. Sheldon put forth the concept of somatotyping, stating that somatotype consist of three morphological components i.e. endomorphy, mesomorphy and ectomorphy in varying quantities which he expressed by giving three numerals [1]. Each numerical standing for each component. Example, 3, 2, 5, is the somatotype where numeral 3 stands for endomorphy which signifies relative massive digestive organ and soft roundedness of the body. Numeral 2 stands for Mesomorphy which means relative predominance of muscles, bones and connective tissues. Numeral 5 stands for ectomorphy which signifies the relative predominance of linearity of Somatotype. For each component Sheldon used the rating numerals between 1 to 7. His method required three viewed photograph of each individual. Many workers extended his work to different population but found difficulties.

Robert and Brainbridge found difficulty in rating Nelotics [2]. Tanner found difficulties in rating Mesomorphy in athletics of British. Tanner found difficulties in rating Mesomorphy in athletics of British [3]. In India, Berry and Deshmukh worked on

Sheldon's method. They checked their ralities by Tanner and found the difference in Mesomorphy of 1 to 1<sup>1</sup>/<sub>2</sub> points [4]. Parnell worked on Sheldon's method and constructed M-4 chart to objectify ratings of each components [5]. Haronian and Sugarman objected M-4 chart for Mesomorphy [6].

Heath and Carter introduced the new method with modifications and adaptations of H-C chart in such a way that the ratings for each components were similar to that of Sheldon's method but extended to both ends i.e. less than 1 and more than 7 and not limited between 1 to 7 [7].

### MATERIAL AND METHODS

65 male medical students between age group of 17 to 24 years were selected for present study from medical college. They were clinically normal. The following measurements were taken in each individual with the help of UNA caliper, sliding caliper, weighing machine (Lever type) and the measuring tape.

The following skinfold measurement in mm was taken with the help of UNA caliper by adjusting it for constant pressure of 10 gm/sq mm.

1. Triceps Skin fold: Taken between olecranon and acromion process, on the dorsum of left arm, on a skinfold running parallel to its long axis, in hanging position of the arm.
2. Subscapular skin fold: Taken on a skin fold running upward and medially from the inferior angle of the scapula, on left side.
3. Supra iliac skin fold: Taken on a skinfold running vertically, just above the tubercle of the iliac crest on left side.
4. Calf skin fold: Take on skinfold, in a line with medial malleolus on the maximum circumference of calf girth, on the left side.
5. Biepicondylar diameter of Humerus: It was recorded in centimetres by applying the sliding caliper to the epicondyles of left humerus.
6. Biepicondylar diameter of Femur: It was recorded in centimetres by applying the sliding caliper to the epicondyles of left femur.
7. Biceps girth: It was recorded in centimetres by applying the measuring tape to the maximum girth of left arm in flexed position.
8. Calf girth: It was recorded in centimetres by applying the measuring tape to the maximum girth of left calf in sitting position.
9. Height: It was recorded in inches and tenths, against the wall scale in standing position bare foot.
10. Weight: It was recorded in pounds and tenths on the weighing machine bare foot.

Procedure for obtaining anthropometric somatotype:

All the measurements of each individual were recorded in H-C rating form.

1. To obtain the first component ratings, the sum of the triceps, subscapular and supra iliac skin folds were done. The closest value of the sum was circled in F scale of the above chart. The rating value of the first component was found out below this column.
2. To obtain the second component ratings, first the height was marked in the height scale (first row); the nearest value of biepicondylar diameter of humerus was circled in the second row. Similarly the closest value of biepicondylar diameter of femur was circled in third row. Triceps skin fold was subtracted from biceps girth and calf skin fold was subtracted from calf girth. Corrected obtained values were circled in the fourth and fifth rows respectively. The average of the circled figure was marked by star shaped sign. Then the number columns were counted from the height whether the average deviates to the right or left from the four in the second component ratings and the rating value was circled for second component.
3. To obtain the third component ratings, Height divide by cube root of weight ratio was found out from normographs. It was recorded in H-C chart and the value for this was circled. This was the rating value for the third component.

A MODIFIED SOMATOTYPE METHOD		HEATH CARTER SOMATOTYPE RATING FORM																								
NAME _____		AGE _____		SEX: M F		No. _____		OCCUPATION _____		ETHNIC GROUP _____		DATE _____		PROJECT _____		MEASURED BY _____										
TOTAL SKINFOLDS (mm)		TOTAL SKINFOLDS (mm)																								
Triceps	=	Upper	10.9	14.9	18.9	22.9	26.2	31.2	35.8	40.7	46.2	52.2	58.7	65.7	73.2	81.2	89.7	98.9	108.9	119.7	131.2	143.7	157.2	171.9	187.0	204.0
Subscapular	=	Lower																								
Supra iliac	=	Mid-point	8.0	13.0	17.0	21.0	25.0	29.0	33.5	38.0	43.5	49.0	55.5	62.0	69.5	77.0	85.5	94.0	104.0	114.0	125.5	137.0	150.0	164.0	180.0	198.0
TOTAL SKINFOLDS	=	Lower	7.0	11.0	15.0	19.0	23.0	27.0	31.5	35.9	40.8	46.3	52.3	58.8	65.8	73.3	81.3	89.8	99.0	109.0	119.8	131.3	143.8	157.3	172.0	188.0
Calf	=	Limit																								
FIRST COMPONENT		FIRST COMPONENT																								
Height (in.)	=	55.0	56.0	58.0	59.5	61.0	62.5	64.0	65.5	67.0	68.5	70.0	71.5	73.0	74.5	76.0	77.5	79.0	80.5	82.0	83.5	85.0	86.5	88.0	89.5	
Bone: Humerus (cm)	=	5.12	5.34	5.49	5.64	5.78	5.93	6.07	6.22	6.37	6.51	6.65	6.80	6.95	7.09	7.24	7.38	7.53	7.67	7.82	7.97	8.11	8.25	8.40	8.55	
Femur (cm)	=	7.47	7.62	7.87	8.04	8.24	8.45	8.66	8.87	9.08	9.28	9.49	9.70	9.91	10.12	10.33	10.53	10.74	10.95	11.16	11.37	11.58	11.79	12.00	12.21	
Manch: Biceps (cm.)	=	23.7	24.4	25.0	25.7	26.3	27.0	27.7	28.3	29.0	29.7	30.3	31.0	31.6	32.2	33.0	33.6	34.3	35.0	35.6	36.3	37.1	37.8	38.5	39.3	
-triceps skinfold	=	27.7	28.5	29.3	30.1	30.8	31.6	32.4	33.2	33.9	34.7	35.5	36.3	37.1	37.8	38.6	39.4	40.2	41.0	41.8	42.6	43.4	44.2	45.0	45.8	
-calf skinfold	=																									
SECOND COMPONENT		SECOND COMPONENT																								
Weight (lb)	=	Upper limit	11.99	12.32	12.55	12.74	12.93	13.13	13.36	13.56	13.77	13.98	14.19	14.39	14.59	14.80	15.01	15.22	15.42	15.63						
HL	=	Mid-point	and 12.16	12.43	12.64	12.83	13.05	13.26	13.46	13.67	13.88	14.01	14.29	14.50	14.70	14.91	15.12	15.33	15.53							
WL	=	Lower limit	below 12.00	12.33	12.54	12.73	12.95	13.16	13.37	13.56	13.76	13.99	14.20	14.40	14.60	14.81	15.02	15.23	15.43							
THIRD COMPONENT		THIRD COMPONENT																								
Anthropometric Somatotype		FIRST COMPONENT   SECOND COMPONENT   THIRD COMPONENT																								
Anthropometric plus Photostatic Somatotype		BY _____																								
		RATER _____																								

Fig 1: Heath Carter Somatotype chart.

Thus three components for each somatotype were found out with H-C chart. In 12 students, where biceps girth was below the lowest value recorded in H-C chart, the importance was given to calf girth for derivation of second component and the regression equation was found out by using biceps girth.

**OBSERVATIONS:**

Somatotypes obtained in the present study by anthropometric method are given in table no 1.

**Table 1: Somatotype of 65 subjects**

1 <sup>1/2</sup> , 1 <sup>1/2</sup> , 6.	2, 2 <sup>1/2</sup> , 5 <sup>1/2</sup> .	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5 <sup>1/2</sup> .	2, 2, 5.	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 4 <sup>1/2</sup> .
2 <sup>1/2</sup> , 4, 2 <sup>1/2</sup> .	3 <sup>1/2</sup> , 3 <sup>1/2</sup> , 2.	2 <sup>1/2</sup> , 4 <sup>1/2</sup> , 1.	1 <sup>1/2</sup> , 1 <sup>1/2</sup> , 6 <sup>1/2</sup> .	2, 1 <sup>1/2</sup> , 6.
2, 2 <sup>1/2</sup> , 5.	3 <sup>1/2</sup> , 2 <sup>1/2</sup> , 4 <sup>1/2</sup> .	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5.	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 4.	2 <sup>1/2</sup> , 3 <sup>1/2</sup> , 3 <sup>1/2</sup> .
3 <sup>1/2</sup> , 2 <sup>1/2</sup> , 2 <sup>1/2</sup> .	3, 3 <sup>1/2</sup> , 3 <sup>1/2</sup> .	3 <sup>1/2</sup> , 3, 4.	4, 7, 1 <sup>1/2</sup> .	1 <sup>1/2</sup> , 1 <sup>1/2</sup> , 6.
2, 5, 5.	2, 3, 4 <sup>1/2</sup> .	2 <sup>1/2</sup> , 4, 2 <sup>1/2</sup> .	2, 4, 3 <sup>1/2</sup> .	3 <sup>1/2</sup> , 5, 4.
3 <sup>1/2</sup> , 3, 3 <sup>1/2</sup> .	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5 <sup>1/2</sup> .	4, 4, 4 <sup>1/2</sup> .	2 <sup>1/2</sup> , 3 <sup>1/2</sup> , 4 <sup>1/2</sup> .	2, 3 <sup>1/2</sup> , 4 <sup>1/2</sup> .
2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5.	2 <sup>1/2</sup> , 3, 4 <sup>1/2</sup> .	2 <sup>1/2</sup> , 3, 4.	1, 3 <sup>1/2</sup> , 4.	2 <sup>1/2</sup> , 2, 5.
2 <sup>1/2</sup> , 3 <sup>1/2</sup> , 4 <sup>1/2</sup> .	1 <sup>1/2</sup> , 4, 3.	3 <sup>1/2</sup> , 5, 3.	1 <sup>1/2</sup> , 4 <sup>1/2</sup> , 4.	2 <sup>1/2</sup> , 5, 2 <sup>1/2</sup> .
3 <sup>1/2</sup> , 4 <sup>1/2</sup> , 2.	1, 2 <sup>1/2</sup> , 5.	2 <sup>1/2</sup> , 3, 5 <sup>1/2</sup> .	2, 3, 4 <sup>1/2</sup> .	2 <sup>1/2</sup> , 3 <sup>1/2</sup> , 3 <sup>1/2</sup> .
3 <sup>1/2</sup> , 4, 3 <sup>1/2</sup> .	3, 4 <sup>1/2</sup> , 2 <sup>1/2</sup> .	2, 2, 5 <sup>1/2</sup> .	3, 3, 4.	1 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5.
2 <sup>1/2</sup> , 3 <sup>1/2</sup> , 4 <sup>1/2</sup> .	3 <sup>1/2</sup> , 2 <sup>1/2</sup> , 2 <sup>1/2</sup> .	2 <sup>1/2</sup> , 2 <sup>1/2</sup> , 5.	2, 2, 5.	3, 2, 5.
3, 4 <sup>1/2</sup> , 2 <sup>1/2</sup> .	3, 3 <sup>1/2</sup> , 4.	2, 4, 3 <sup>1/2</sup> .	3, 3 <sup>1/2</sup> , 3.	3, 4 <sup>1/2</sup> , 2 <sup>1/2</sup> .
3 <sup>1/2</sup> , 4 <sup>1/2</sup> , 2 <sup>1/2</sup> .	1 <sup>1/2</sup> , 3, 4.	2, 4, 4.	3 <sup>1/2</sup> , 3, 3 <sup>1/2</sup> .	3, 3 <sup>1/2</sup> , 3.

The mean values for each component are shown in Table no 2.

**Table 2: Showing the mean values for Endomorphy, Mesomorphy and Ectomorphy.**

Subjects	No.	Endomorphy		Mesomorphy		Ectomorphy	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Students	65	2.53	0.72	3.25	1.02	4.03	1.24

**Regression Equation:**

These were derived for each component, using the minimum measurements

Endomorphy – for this used total skin fold

$$(R=0.97) = 0.0182 \text{ P.E} + 0.1133 (\text{Total skin fold}) - 0.4034$$

Mesomorphy – for this used Biceps girth

$$(R=0.8705) = 0.7657 \text{ P.E} - 0.2047 \text{ P. Endo} + 0.1191 \text{ Biceps girth} + 895$$

Ectomorphy – for this used Height, Weight and Subscapular skin fold

$$(R=0.9035) = 0.3299 \text{ Ht} - 0.0648 \text{ Wt P. Endo} + 0.1191 \text{ Biceps girth} + 895$$

**DISSCUSSION**

For the present study, 65 male students from medical college were selected and they were Somatotyped by the modified anthropometric method of Somatotyping described by Heath and Carter. This was the new method at the time when study was conducted. The results of the present study were compared with the study of Berry and Deshmukh [4].

Polar Somatotype: It was the somatotype, which has scored 7 rating in any one component. In the present

study 4, 7, 1<sup>1/2</sup>. Was the polar somatotype that had scored 7 ratings in mesomorphy while Berry had found 23 polar somatotypes in ectomorphy?

Sum of the components: It ranged from 8 to 12<sup>1/2</sup> in present series while in Sheldon’s study [1] it was strictly between 9 to 12, either less or more.

Mean Somatotype: The Table no 3. Shows the comparison of the mean somatotype of present study with various other studies.

**Table-3: Comparison of the mean somatotype of present study with various other studies.**

Sr No	Studies	Mean Somatotype
1	Berry [8]	2.83, 2.95, 4.49
2	Deshmukh [6]	2.85, 2.96, 4.56
3	Haronian <i>et al.</i> ; [6]	3.47, 4.27, 3.34
4	Present study	2.42, 3.25, 4.03

The above two study and the present study was conducted in Indian population in various regions. The present study shows mean somatotype found to be lower in mean Endomorphy and mean Ectomorphy but higher in mesomorphy. The Haronian *et al.*; study conducted in population of Yale showed marked deviation from the other three Indian studies.

So from this study we derived somatotype of in western Maharashtra students. This study also showed that mean somatotype was 2.42, 3.25, and 4.03 which is lower in mean endomorphy and mean ectomorphy but higher in mean mesomorphy when compared with Nagpur and Chandigarh students. We also derived regression equations for each component using the minimum measurements.

In the present context this study is primitive but somatotype can be very useful in measure in epidemiological an study that highlight the overall health status of the people through anthropometric characteristics, but is more useful in physical evaluation of athletes [9].

#### CONCLUSION:

From the study we concluded that western Maharashtra student Somatotype was comparative similar other studies in India than foreign studies. We also concluded that mean endomorphy and mean ectomorphy but higher in mean mesomorphy than Nagpur and Chandigarh students. This study can be used as baseline study for further research.

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