# ANTHROPOMETRY AND SOMATOTYPES PROFILE OF PHYSICAL AND HEALTH EDUCATION TEACHERS IN INDIA

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***ABSTRACT*:** This study aims to determine the anthropometric characteristics and somatotypes of physical education teachers. Methods: The study was conducted on 111 physical education teachers (91 male, 20 female) aged 51–55 years. The study assessed anthropometric measurements, including the weight, height, skinfold thickness, circumference, and width of the participants, according to ISAK norms. Somatotype was estimated using the Heath-Carter method. The data was compiled and analysed using Microsoft Excel (Version 2601) to characterise the anthropometric characteristics. The mean values of the one hundred eleven physical and health education teachers were found as follows: body mass 77.7, stature 168.5, biceps skinfold 9.5, triceps skinfold 18.0, subscapular skinfold 28.8, supraspinal skinfold 22.6, medial calf skinfold 17.2, arm girth flexed 31.1, calf girth 37.1, humerus breadth (Biepicondylar) 6.6, femur breadth (Biepicondylar) 9.4, height-weight ratio 39.7, BMI 27.4, endomorphy 6.4, mesomorphy 5.2, and ectomorphy 1.0. The mean somatotype of one hundred eleven physical education teachers was identified as the mesomorphic endomorph body type (6.44-5.1-0.9).

*Index terms*: **Anthropometric, Physical Education, Health Education, Teachers, Somatotype.**

## INTRODUCTION

Physical and health education teachers (Lynch, 2015) occupy a unique position within the educational system (Griban et al., 2020), serving simultaneously as educators, health advocates, and physical activity role models for students. Their anthropometric traits and physical fitness levels affect not only their health and career longevity but also their credibility and efficacy in advocating for healthy lifestyles among students (Bailey, R., 2006). Despite the critical importance of maintaining optimal health profiles within this profession, comprehensive anthropometric data specifically characterising physical and health education teachers is lacking. Teachers remain surprisingly limited in the scientific literature.

Given the equation of physical education with 'sport' and 'health,' this social identity (Stevens et al., 2017) was constituted by an athletic, muscular, skilled, and attractive body and self-disciplined behaviors (Claver et al., 2020), with strong prohibitions against the young teachers being seen in public eating junk food, drinking alcohol, or smoking (Macdonald & Kirk, 1996). Many physical and health education teachers claim that a fit, athletic-looking body relates to pedagogical authority; without one, they do not see themselves as trustworthy (Parkinson & Burrows, 2019). Understanding the anthropometrics and somatotype of physical and health education teachers is significant for obtaining information about their body type and individual health considerations.

The Greek words "anthropos," which means "human," and "metron," which means "measure," are the roots of anthropometry. (Padilla et al., 2021b). Body measures are the focus of anthropometry, namely those related to size, form, and composition (Pheasant, S.T. & Steenbekkers, B. 2005). It is one of the widely used methods for measuring obesity (Rashmi & Snekhalatha, 2019). Anthropometry, often known as posture, has a significant impact on exercise and athletic performance (Kurniawan et al., 2019). It covers the body composition, proportion, size, growth, and somatotype and their relationship with health and performance (Eston & Reilly, 2001). We can obtain a description of the physical dimensions of athletes through anthropometric profiling (Norton et al., 1996). Anthropometry is a non-invasive, portable, and easy-to-use technique for health personnel; it may be convenient to create predictive equations where variables are used to reveal health status (Padilla et al., 2021).

Somatotyping is a unique method for the classification of human physique that was first invented by Sheldon et al. (1940) and later modified by Heath and Carter (1967). It reflects an overall outlook of the body and conveys a meaning of the totality of morphological features of the human body (Singh, S., 2007).

Somatotype provides meaning to the body's entire morphological state and represents the body's overall look (Jakovljević et al., 2022). Thus, somatotyping is a quantification of the human body's shape and composition. It is expressed in a three-digit rating, which represents endomorphy, mesomorphy, and ectomorphy components (Florescu, O., 2016), respectively, always in the same order. Endomorphy refers to the relative fatness; mesomorphy is the relative musculoskeletal robustness; and ectomorphy is the relative linearity or slenderness of a physique (Kapoor et al., 2021).

Additionally, the scarcity of research concerning anthropometric characteristics and somatotype in the educational domain limits our understanding of the impact of work environment, teaching specialisation, and career stage on body composition and health outcomes. Understanding these variables is critical to designing targeted interventions, establishing professional health standards, and ensuring the long-term effectiveness of physical education programs in schools (Neil-Sztramko et al., 2021).

## OBJECTIVE OF STUDY

The objective of the study was to analyse the anthropometric characteristics and somatotypes of the physical and health education teachers.

## METHODOLOGY

The plan and technique for the study are described in the methodology section, which includes selection of subjects, criterion measures, findings of the study.

### 3.1 Selection of Subjects

One hundred eleven physical and health education teachers (91 male, 20 female) who were actively involved in their schools participated in the study. The purpose and subject matter of the study were explained to the participants. The tests for the selected variable were administered in order to get the required data. The ISAK rules were used to measure the entire test.

### 3.2 Criterion Measures

1. Body mass & Stretch stature were measured by Seca 284, a digital measuring station for height and weight; the body mass was recorded in kilograms (kg), whereas stretch stature was recorded in centimetres (cm).

2. The biceps, triceps, subscapular, supraspinale and medial calf were measured by use of the Harpenden skinfold calliper, a precision instrument, designed for use in the performance of skinfold thickness measurements, and the measurements are recorded in millimetres (mm).

3. Arm girth flexed, Calf girth (max.) was measured by steel tape and recorded in centimetres (cm).

4. Humerus breadth (biepicondylar), Femur breadth (biepicondylar) was measured by sliding calliper and recorded in centimetres (cm).

5. Endomorphy, Ectomorphy, and Mesomorphy were measured by the Heath-Carter somatotype chart.

The following equations were uses for calculating somatotype (Carter, J. E. L., 2002).

i. The equation to calculate Endomorphy is:

Endomorphy = - 0.7182 + 0.1451 (X) - 0.00068 ($X^2$) + 0.0000014 ($X^3$)

Where:

- $X =$ (sum of triceps, subscapular, and supraspinale skinfolds) $\times \left(\frac{170.18}{\text{height (cm)}}\right)$
- This correction accounts for stature differences and is considered the preferred method for estimating endomorphy.

ii. The equation to calculate mesomorphy is:

Mesomorphy = 0.858 x humerus breadth + 0.601 x femur breadth + 0.188 x corrected arm girth +

0.161 x corrected calf girth – height 0.131 + 4.5.

iii. The equation to calculate ectomorphy is:

Three different equations are used to calculate ectomorphy according to the height-weight ratio (HWR):

$$HWR = \left(\frac{Height\ (cm)}{\sqrt[3]{Weight}(kg)}\right)$$

The following conditional equations were applied:

- If HWR ≥ 40.75:

Ectomorphy=0.732(HWR)−28.58

- If 38.25 < HWR < 40.75:

Ectomorphy=0.463(HWR)−17.63

- If HWR ≤ 38.25:

Ectomorphy=0.1

15. Body mass index (BMI) (World Health Organisation, 2000)

The equation to calculate BMI :

Body mass index = weight (kg) / [height (m)]²

STATISTICAL ANALYSIS

To characterise the anthropometric and somatotype of the Physical and Health Education teachers, descriptive statistics were used.

To analyse the somatotype of Physical and health education teachers in this study, heath-carter method was used (Carter, J. E. L., 2002).

**3.3 Findings of Study**

The data was analysed using descriptive statistics to determine the anthropometric characteristics and somatotype of the Physical and Health Education teachers.

Table 1- Descriptive statistics of Anthropometric characteristics of Physical and Health Education teachers.

| VARIABLES | MEAN | STD. DEVIATION |
|---|---|---|
| Body mass (kg) | 77.7 | 11.6 |
| Stretch stature (cm) | 168.5 | 8.9 |
| Biceps skinfold (cm) | 9.5 | 5.7 |
| Triceps skinfold (cm) | 18.0 | 7.4 |
| Subscapular skinfold (cm) | 28.8 | 10.1 |
| Supraspinal skinfold (cm) | 22.6 | 8.7 |
| Medial calf skinfold (cm) | 17.2 | 8.0 |
| Arm girth flexed (cm) | 31.1 | 3.4 |
| Calf girth (cm) | 37.1 | 3.5 |
| Humerus breadth (cm) | 6.7 | 0.5 |
| Femur breadth (cm) | 9.4 | 0.6 |
| BMI (kg/m²) | 27.4 | 3.6 |

Table-1 revealed that the average values of anthropometrical variable of Physical and Health Education teacher were: Body Mass 77.±11.6, Stretch Stature 168.5±8.9, Biceps Skinfold 9.5±5.7, Triceps Skinfold 18.0 ±7.4, Subscapular Skinfold 28.8±10.1, Supraspinale Skinfold 22.6±8.7, Medial Calf Skinfold 17.2±8.0, Arm Girth Flexed 31.1±3.4, Calf Girth 37.1±3.5,Humerus Breadth(Biepicondylar) 6.7±0.5, Femur Breadth (Biepicondylar) 9.4±0.5, Height-Weight Ratio 39.7±1.9, BMI 27.4±3.6.

Table 2- Descriptive statistics of Anthropometric characteristics of female Physical and Health Education teachers.

| VARIABLES | MEAN | STD. DEVIATION |
|---|---|---|
| Body mass (kg) | 69.0 | 10.6 |
| Stretch stature (cm) | 156.1 | 8.2 |
| Biceps skinfold (cm) | 17.6 | 6.3 |
| Triceps skinfold (cm) | 25.5 | 7.6 |
| Subscapular skinfold (cm) | 26.0 | 7.6 |

| | | |
|---|---|---|
| Supraspinal skinfold (cm) | 27.8 | 7.5 |
| Medial calf skinfold (cm) | 23.6 | 7.4 |
| Arm girth flexed (cm) | 30.1 | 3.3 |
| Calf girth (cm) | 36.6 | 2.8 |
| Humerus breadth (cm) | 6.0 | 0.4 |
| Femur breadth (cm) | 9.2 | 0.7 |
| BMI (kg/m²) | 28.3 | 4.1 |

Table-2 revealed that the average values of anthropometrical variable of Physical and Health Education teacher were: Bodymass 69.0±10.6, Stretch 156.1±8.2, Biceps skinfold 17.6±6.3, Triceps skinfold 25.5±7.6, Subscapular skinfold 26.0±7.6, Supraspinal skinfold 27.8±7.5, Medial calf skinfold 23.6±7.4, Arm girth flexed 30.1±3.3, Calf girth 36.6±2.8, Humerus breadth 6.0±0.4, Femur breadth 9.2±0.7, Height-Weight Ratio 38.3±2.1, BMI 28.3±4.1.

Table 3- Descriptive statistics of Anthropometric characteristics of male Physical and Health Education teachers.

| VARIABLES | MEAN | STD. DEVIATION |
|---|---|---|
| Body mass (kg) | 79.6 | 11.0 |
| Stretch stature (cm) | 171.2 | 6.4 |
| Biceps skinfold (cm) | 7.8 | 3.6 |
| Triceps skinfold (cm) | 16.4 | 6.3 |
| Subscapular skinfold (cm) | 29.4 | 10.5 |
| Supraspinal skinfold (cm) | 21.5 | 8.6 |
| Medial calf skinfold (cm) | 15.8 | 7.5 |
| Arm girth flexed (cm) | 31.4 | 3.4 |
| Calf girth (cm) | 37.2 | 3.6 |
| Humerus breadth (cm) | 6.8 | 0.4 |
| Femur breadth (cm) | 9.5 | 0.5 |
| BMI (kg/m²) | 27.2 | 3.5 |

Table-3 revealed that the average values of anthropometrical variable of PE teacher were: Bodymass 79.6±11.0, Stretch 171.2±6.4, Biceps skinfold 7.8±3.6, Triceps skinfold 16.4±6.3, Subscapular skinfold 29.4±10.5, Supraspinal skinfold 21.5±8.6, Medial calf skinfold 15.8±7.5, Arm girth flexed 31.4±3.4, Calf girth 37.2±3.6, Humerus breadth 6.8±0.4, Femur breadth 9.5±0.5, Height-Weight Ratio 40.0±1.8, BMI 27.2±3.5.

Table 4- Descriptive statistics of the Somatotype of Physical and Health Education teachers.

| SOMATOTYPES | MEAN | STD. DEVIATION |
|---|---|---|
| Endomorphy | 6.4 | 1.6 |
| Mesomorphy | 5.2 | 1.4 |
| Ectomorphy | 1.0 | 0.8 |

Table-4 revealed that the average values of somatotype of Physical and Health Education Teachers were: Endomorphy 6.4±1.6, Mesomorphy 5.2±1.4, Ectomorph 1.0±0.8.

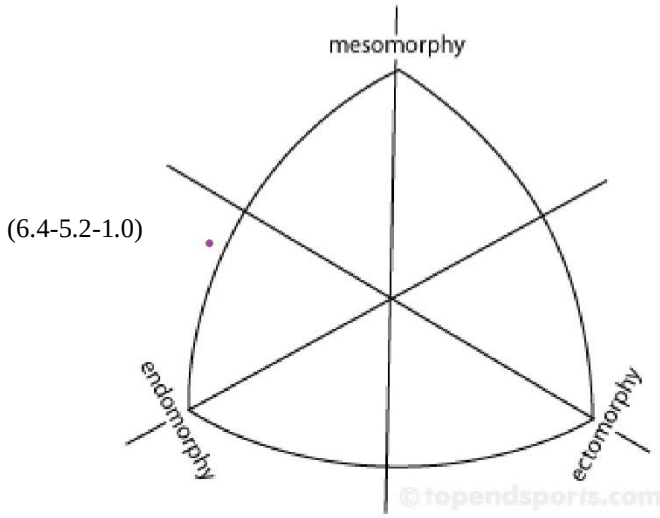


Fig. 1. Somatotype chart for Physical and Health Education Teachers.

Table 5- Descriptive statistics of the Somatotype of female Physical and Health Education teachers.

| SOMATOTYPES | MEAN | STD. DEVIATION |
|---|---|---|
| Endomorphy | 7.5 | 1.2 |
| Mesomorphy | 5.5 | 1.5 |
| Ectomorphy | 0.5 | 0.5 |

Table-5 revealed that the average values of somatotype of Physical and Health Education Teachers were: Endomorphy 7.5±1.2, Mesomorphy 5.5±1.5, Ectomorph 0.5±0.5.

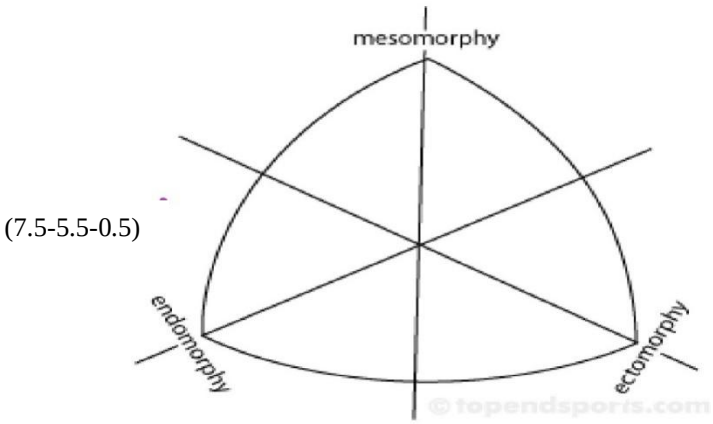


Fig. 2 Somatotype chart of Female Physical and Health Education Teachers.

Table 6- Descriptive statistics of the Somatotype of male Physical and Health Education teachers.

| SOMATOTYPES | MEAN | STD. DEVIATION |
|---|---|---|
| Endomorphy | 6.2 | 1.5 |
| Mesomorphy | 5.1 | 1.4 |
| Ectomorphy | 1.1 | 0.8 |

Table-6 revealed that the average values of somatotype of Physical and Health Education Teachers were: Endomorphy 6.2±1.5, Mesomorphy 5.1±1.4, Ectomorph 1.1±0.8.

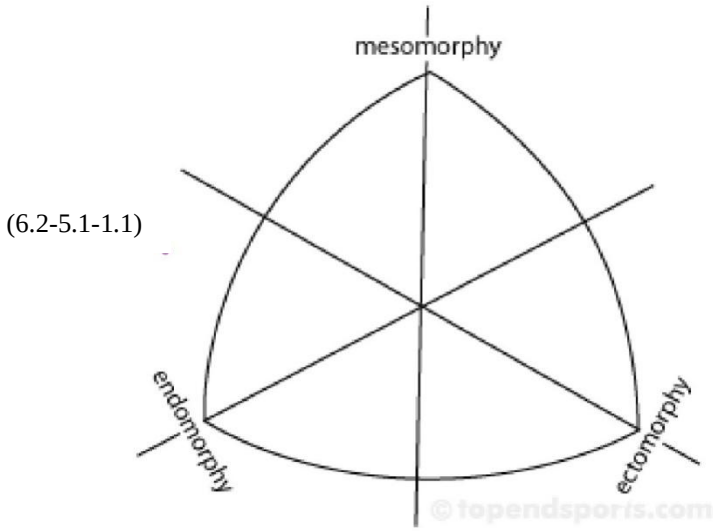


Fig. 2 Somatotype chart of Female Physical and Health Education Teachers.

Table 7- BMI Classification of Physical and Health Education teachers.

| CATEGORY | COMBINE | MALE | FEMALE | PERCENTAGE |
|---|---|---|---|---|
| Underweight | 0 | 0 | 0 | 0 |
| Normal range | 29 | 23 | 6 | 26.1 |
| Overweight | 61 | 54 | 7 | 55.0 |
| Obesity class I | 16 | 11 | 5 | 14.4 |
| Obesity class II | 5 | 3 | 2 | 4.5 |
| Obesity class III | 0 | 0 | 0 | 0.0 |

Table-7 revealed that the BMI of 26.1% falls under the normal range, 55.0% under the overweight, 14.4% under the obese class I and 4.5% under the obese class.


Fig. 4 BMI classification of Physical and Health Education Teachers

## RESULTS AND DISCUSSION

Physical and Health Education Teachers are base of a student's sports career. The fitness and health (Griban et al., 2020) of Physical and Health Education Teachers influence the confidence of teachers (Spittle et al., 2022) as well as the students' motivation to pursue the sports field.

The study indicates that the average height of Physical and Health Education Teachers is 168.5 cm (±8.9), with an average body weight of 77.7 kg (±11.6), resulting in an average BMI of 27.4 (±3.6) kg/m², categorising them as overweight. Additionally, both female and male Physical and Health Education Teachers have BMIs of 28.9 (4.1) kg/m² and 27.2 (3.5) kg/m², respectively, which also places them in the overweight classification (Nishida, C. & WHO., 2004).

For the population that falls within the overweight category with a BMI between 25.0-29.9 kg/m², moderate weight loss is recommended, but weight loss per se should not be the main target of intervention. A large proportion of the adult population will usually fall into this category, and most will receive advice on healthy nutrition and physical activity appropriate for the general population (Safety, 1995). Table-7 shows that the majority of our participants are overweight, with 26.1% being within the normal range, 55% being overweight, 14.4% being obese class I, and 4.5% being obese class II.

According to the aforementioned study's average somatotype rating of 6.4-5.2-1.0, Physical and Health Education teachers show a mesomorphic endomorph, which is defined by a low ectomorphy and a preponderance of endomorphic and mesomorphic components (Carter, J. E. L., 2002). Somatotype composition tends to change with age and activity level — particularly showing increased endomorphy and decreased ectomorphy in middle-aged adults, a pattern influenced by reduced physical activity and body composition alterations (Malina et al., 2004). Similarly, the somatotype of female and male Physical and Health Education Teachers, i.e. 7.5-5.5-0.5 and 6.2-5.1-1.1, falls under the mesomorphic endomorph category.

## CONCLUSION

The findings reveal that most Physical and Health Education teachers fall within the overweight category, with an average BMI of 27.4 kg/m², indicating a need for improved weight management and lifestyle practices. The predominant somatotype of mesomorphic endomorph among both male and female teachers reflects higher fat accumulation with moderate muscular development and limited linearity. This physique pattern, commonly observed in middle-aged adults, may result from reduced physical activity and age-related body composition changes. Given their influential role in shaping students' health and fitness attitudes, maintaining optimal fitness and body composition among Physical and Health Education Teachers is essential for enhancing self-confidence and motivating students toward active participation in sports and physical education.

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