Experimental

Physical Fitness and Body Composition of Engineering College Students

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ARTICLE INFO

Article history:
Submission: 15-02-2024
Review: 20 to 30-03-2024
Accepted: 01-04-2024
Available Online: 21-07-2024

Keywords: Fitness, AAHPERD, Body Composition, Test Battery

ABSTRACT

The purpose of the study was to observe the physical fitness and body composition of engineering college students. Considered one of the six AAHPERD youth physical fitness test traits, it assesses both physical fitness and body composition. The study’s fifty (50) Engineering college students were chosen as its subjects. To conduct the study, the AAHPERD youth physical fitness test battery (i.e., 50-yard dash, sit up, pull up, standing broad jump, shuttle run, and 600-yard run/walk) and the skin fold method of Durnin & Womersley for body composition were taken as criterion measures. After collecting the data, descriptive statistics and correlation analysis were adopted, and the following conclusions were drawn: (i) the Engineering college students were found having more lean body mass; (ii) % of fat was found less in Engineering college students; (iii) significant medium negative relationship between pull up and body fat %; (iv) significant small positive relationship between 600-yard run and lean body mass.

DOI: https://doi.org/10.58914/ijyesspe.2024-9.Spl.2

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Vol : 9, Special Issue, 2024, ISSN: 0975-265X
can lead to adverse effects on the physical fitness and body composition of these students. Numerous studies have highlighted the importance of maintaining a healthy body composition and physical fitness for improved academic performance, mental health, and overall quality of life (Hallal et al., 2012; Warburton et al., 2006).

Background and Rationale

Physical fitness encompasses various components, including cardiovascular endurance, muscular strength, flexibility, and body composition, each playing a critical role in maintaining optimal health. Similarly, body composition, typically assessed in terms of fat mass, muscle mass, and bone density, provides valuable information regarding an individual’s health status and risk of chronic diseases.

Studies conducted on college students across different disciplines have revealed concerning trends regarding physical fitness and body composition. Sedentary behaviors, inadequate physical activity levels, and poor dietary choices contribute to suboptimal fitness levels and undesirable changes in body composition among this population. Such trends raise concerns regarding the long-term health outcomes and quality of life of college students, warranting targeted interventions and preventive measures.

Every person’s body is ultimately made up of the same things—organs, water, muscles, bones, and fat. However, not everybody contains the same amount of these substances. To learn how much muscle or fat is in a person’s body, health professionals have developed ways to measure one’s body composition. By definition, **body composition** means the percentage of organs, water, muscle, bones, and fat found in a body. Typically, body composition can be broken down into two categories: **lean mass** and **fat**. Lean mass includes the total weight of the muscles, bones, organs, tendons, water, and other tissues found inside the human body. Lean mass is also known as the “fat-free component” because it measures everything else in the body besides the fat.

Regular exercise has positive effects on children’s somatotype classifications and anthropometric characteristics (Berg et al., 1995). Since there is a relationship especially between body height and many physical and physiological characteristics, these display significant effects on exercise and certain games (Docherty, 1996). The general aim of studies on body height, structure and composition is to determine and develop physical fitness individually (Artioli et al., 2008) and suitable anthropometric profile and body composition for physical activity are important (Canadas et al., 2010). There is a strong relationship between physical activity and body composition (Reichert et al., 2012).

Body shape is closely correlated with health, blood pressure increases with the increases of body mass and waist-to-hip ratio, and it is more obvious in males than in females, the body mass and waist-to-hip ratio (Shah Tahmasebi & Cassidy, 2015). The Relationship between Body Composition and Physical Fitness Parameters in Children, in this study significant relationship has been found with the exception of age, arm and waist measurements (Nebahat Eler 2018). The purpose of the study was to observe i.e.

- To analyzed and understand the physical fitness component of Engineering college students.
- To analyzed and understand the body composition of Engineering college students.
- To determine relationship between physical fitness and body composition of Engineering college students.

Methodology

The present study was conducted to determine the physical fitness and body composition of the engineering college students. 50 subjects were selected from Nadia district in west Bengal. The age of the subject ranged from 18 to 23 years. In the present study, age, height, and weight were considered personal data. The 4-Site Skin Fold Body Fat Calculator (Durnin & Womersley Formula) updated and the AAHPERD youth physical fitness test battery for assessing physical fitness and body composition, respectively, were selected as the measuring criteria.

Each subject was performed of the test with in stipulated time. The test includes flex arm hang for muscular endurance and strength of arm, bent-knee sit up for abdominal muscular strength, standing broad jump for explosive strength, 4 x10 meter shuttle run for agility, 50-yard dash for speed and 600-yard run for cardio vascular endurance. The subject was encouraged and instructed to perform their best. All the tests were conduct through standard procedure as per test manual and all the raw scores were convert in to standard score according to the AAHPERD norms. For measured the body composition of the subject 4-site (i.e. Biceps, triceps, suprailia, and Subscapular.) Skin fold body fat calculation (**Durnin & Womersley formula**) technique was used.
To conduct the study, the researcher collects Age, Height and Weight as personal data and also take six tests one for physical fitness test and for body composition. For measuring physical fitness AAHPERE youth fitness test was taken.

- Pull-up for judging arm shoulder girdle strength.
- Bent Knee Sit-up
- Shuttle Run
- Standing broad jump
- 50-yard dash- for measuring speed.
- 600-yard run-walk for judging cardiovascular efficiency.

**Statistical tool used** – Mean, Standard deviation and Pearson Correlation

**Test of Body Composition**

Test: (Durnin & Womersley formula)

- **Purpose**: Estimate body fat % based on measurements of subcutaneous fat.
- **Equipment**: Skinfold calipers
- **Procedure**: Measurements are taken on the right side of body. Caliber needs to be perpendicular to the site analysed. The participant must relax the muscle group that is being assessed. When skin fold is pinched, the practitioner should be taking reading at the middle of the pinched skin, not apex or base. Wait 1 to 2 seconds after releasing Caliber, record closest 0.5mm. Retake each site in order to obtain accurate readings.

- **Bicep**: vertical fold at the midpoint of the anterior side of bicep between shoulder and elbow with arm relaxed at the side.
- **Triceps**: vertical fold at the midpoint of the posterior side of triceps between shoulder and elbow with arm relaxed at the side.
- **Subscapular**: diagonal fold 2cm from inferior angle of the scapula.
- **Suprailia**: diagonal fold parallel and superior to the iliac crest

**Results and Discussion**

Results of the study were presented in separated headings namely- Personal data, Physical fitness and Body composition.

**Analysis of personal Data**

<table>
<thead>
<tr>
<th>Personal data</th>
<th>(Mean &amp; SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs.)</td>
<td>18.72 ± 2.16</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>54.64 ± 6.57</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>161.96 ± 6.84</td>
</tr>
</tbody>
</table>

Table no.1 indicates that the mean and SD values of selected personal data of Engineering college students. The mean and SD of Age, Weight, and Height of Engineering college students were 18.72±2.16 years, 54.64 ± 6.57kg, and 161.96 ± 6.84 cm, respectively.
The descriptive graphical figures of Mean and Standard Deviation (Mean ± SD) of personal data of subjects in Figure-1

![Graphical Representation of Personal Data of Subjects](image)

**Fig:1 Graphical Representation of Personal Data of Subjects**

**Table 2**
The mean and SD value of physical fitness components

<table>
<thead>
<tr>
<th>Components</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PULL UP in number</td>
<td>9.98</td>
<td>2.10</td>
</tr>
<tr>
<td>Sit up in number</td>
<td>36.22</td>
<td>4.29</td>
</tr>
<tr>
<td>Shuttle run second</td>
<td>10.43</td>
<td>0.90</td>
</tr>
<tr>
<td>SBJ in m.</td>
<td>2.30</td>
<td>0.13</td>
</tr>
<tr>
<td>50-yard-dash in second</td>
<td>5.81</td>
<td>0.47</td>
</tr>
<tr>
<td>600-yard run</td>
<td>1.68</td>
<td>0.31</td>
</tr>
<tr>
<td>Total Physical Fitness</td>
<td>66.42</td>
<td>8.49</td>
</tr>
</tbody>
</table>

From the table no 2 it was found that the mean and SD value of total physical fitness on Engineering college students.
The mean and SD value of pull up of engineering college students were 9.8 and 2.10 respectively.
The mean and SD value of sit up of engineering college students were 36.22 and 4.29 respectively.
The mean and SD value of Shuttle run of Engineering college students were 10.43 and 0.90 respectively.
The mean and SD value of SBJ of Engineering college students were 2.30 and 0.13 respectively.
The mean and SD value of 50 yrd. run of engineering college students were 5.81 and 0.47 respectively.
The mean and SD value of 600 yrd. run of engineering college students were 1.68 and 0.31 respectively.
The descriptive graphical figures of Mean and Standard Deviation (Mean ± SD) of Physical Fitness in Figure-2
The descriptive figures of Mean and Standard Deviation (Mean ± SD) of Body Composition in Figure- 3

<table>
<thead>
<tr>
<th>Components</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body fat %</td>
<td>11.41</td>
<td>2.52</td>
</tr>
<tr>
<td>Fat mass in kg</td>
<td>6.32</td>
<td>1.86</td>
</tr>
<tr>
<td>LBM in kg</td>
<td>48.32</td>
<td>5.39</td>
</tr>
</tbody>
</table>

From the table no 3 it was found that the mean and SD value of total physical fitness on Engineering college students.
The mean and SD value of Body fat % of Engineering college students were 11.41 and 2.52 respectively
The mean and SD value of Body fat mass of Engineering college students were 6.32 and 1.86 respectively
The mean and SD value of LBM (Lean body mass) of Engineering college students were 48.32 and 5.39 respectively.
The descriptive graphical figures of Mean and Standard Deviation (Mean ± SD) of Body Composition in Figure- 3
Table 4: The Pearson Correlations value of physical fitness components and Body Composition of the subjects

<table>
<thead>
<tr>
<th>Physical Fitness</th>
<th>Body composition</th>
<th>Pearson Correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BODY FAT %</td>
<td>Fat mass</td>
<td>LBM</td>
</tr>
<tr>
<td>Pull up</td>
<td>-0.3031*</td>
<td>-0.2624</td>
<td>0.0164</td>
</tr>
<tr>
<td>Sit up</td>
<td>0.2183</td>
<td>-0.04828</td>
<td>0.3552</td>
</tr>
<tr>
<td>Shuttle run</td>
<td>0.8406</td>
<td>0.07436</td>
<td>0.04463</td>
</tr>
<tr>
<td>SBJ</td>
<td>-0.1793</td>
<td>-0.1677</td>
<td>-0.03062</td>
</tr>
<tr>
<td>50-yard run</td>
<td>0.1761</td>
<td>0.1215</td>
<td>-0.102</td>
</tr>
<tr>
<td>600 -yard run</td>
<td>0.0696</td>
<td>0.1929</td>
<td>0.299*</td>
</tr>
</tbody>
</table>

Correlation is significant at the 0.05 level

Df = 48, ‘r’ value = 0.273

Form the table no- 4 There was a finding that a significant medium negative relationship between pull up and body fat %. The level of significant at 0.05 level and the significant value was found to be 0.303 respectively. There was a finding that a significant small positive relationship between 600-yard run and lean body mass. The level of significant at 0.05 level and the significant value was found to be 0.299 respectively. A significant correlation between Total Physical Fitness, Physical Fitness components and Body Composition Aspects of was not found.

Discussion

The study examined the Pearson Correlations physical fitness and Body Composition in 50 Engineering college students aged 18-23. The results showed a significant positive correlation between pull up and body fat %. The level of significant at 0.05 level and the significant value was found to be 0.303 respectively.

There was a finding that a significant small positive relationship between 600-yard run and lean body mass. The level of significant at 0.05 level and the significant value was found to be 0.299 respectively.

Similar results have been reported by Mendoza-Muñoz et al., (2020). Significant differences were found between the sexes in body composition (FM%, FM, and FFM) and physical fitness (SLJ, SA, CF, and HS) (p> 0.001) in favour of males. Significant differences were also found in speed (p = 0.002), CF (p < 0.001), and SLJ (p = 0.004) in favour of normal-weight adolescents compared to overweight and obese adolescents. Contrarily, the outcomes revealed a significantly greater HS (p = 0.014) in favour of overweight and obese participants compared to normal-weight adolescents. Moreover, the results showed that CF and SLJ correlated inversely with BMI, FM%, and total FM. There was also a direct relationship between SA and FM percentage, as well as between HS and FFM. Finally, four fitness test predictive models are proposed based on body composition, age, sex, and BMI. Maciej Kochman et al. (2022), The findings show significant differences between the groups in physical fitness, body composition and selected anthropometric measurements. Older students presented higher level of general fitness, whereas younger students were found with a lower mean value of fat index. You HW et al. (2020) all the research had been shown the positive correlation of physical fitness and Body composition. According to Jaremków, A., et al. (2023), there was a significant correlation (r~ ± (0.2–0.4) between the level of intense physical activity and the basal metabolic rate (BMR), fat, water, and muscle content, fat-free mass (FFM), bone mass, extracellular to intracellular water ratio (ECW/ICW), and phase angle (PA). There was a r<0.3–0.5 correlation between the quantity of moderate physical activity and bone mass, BMR, FFM, body mass index (BMI), and body mass. The degree to which physical activity and aspects of body composition are correlated varies depending on one’s shape. In men, higher levels of moderate-to-vigorous physical activity are linked to increased FFM and bone mass, which raises BMI (in this instance, a higher
BMI does not indicate being overweight). The positive impact of increased levels of intense physical activity on decreasing body fat percentage and building muscle mass is more noticeable in women.

On the basis of results obtained, the conclusions of the study were drawn within the limitation of the present research work. These are as follows:

i. The body fat mass was less in Engineering college students

ii. Significant medium negative relationship between pull up and body fat %.

iii. Significant small positive relationship between 600-yard run and lean body mass.

Reference


