

Comparison of Health of Height-Weight Matched Young-Adult Female Athletes and Non-Athletes in Selected Anthropometric Measurements

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Abstract: Height and weight are the major two determinants for various anthropometric properties at any age in life. People of different racial origins and geographical locations have specific anthropometric features. Purpose of this study was to compare health status of height-weight matched young-adult females of athlete and non-athlete through selected anthropometric measurements. Sixty (N=60) 18–25 years female, thirty from the athlete and non-athlete groups were the subjects. The height range was 157.5cm – 162.5 cm and weight was 52.5 kg– 55.5 kg. Seven skin-folds, seven body circumferences and three body composition measures, namely – body mass index (BMI), waist-to-hip ratio (WHR) and body fat percentage (%BF), derived from respective anthropometric measurements, all were the variables of the study. Out of seven skin-folds, athlete group was significantly higher ($P>0.05$) at sub-scapula, suprailiac, abdomen, thigh and medial calf site, but no difference existed at biceps and triceps. Among the seven body circumferences, at upper limb, lower limb and waist of the non-athlete group was superior. Among the three body composition measures, at %BF was higher in non-athlete group and LBM was greater in athlete group; however, BMI of the two groups did not differ. The WHR of the non-athlete group was superior. The young adult athlete females with similar height and weight to the non-athlete females were higher in LBM with less %BF. Both the groups were having greater value in the selected anthropometric measurements; yet, the anthropometric profile of the athlete females were towards healthier category than the non-athlete groups. Thus, the study was concluded that young-adult athlete females were healthier than the non-athlete females of the similar height and weight according to the anthropometric measurements.

Keywords: Anthropometric profile, health, young-adult females, plane athlete, non-athlete.

1. Introduction

Height and weight are the major two determinants for various anthropometric properties at any age in life. People of different racial origins and geographical locations have specific anthropometric features. Human beings can be classified in many ways. Each and every people have certain unique characteristics in their form, action and their thought. Researchers, who keen to focus their work in determining and understanding those characteristics to know the highest form of the living being in a better way. Study findings reveal that there are lot of differences exists between the plane and hill people. These differences are due to the life style pattern of the both groups.

Anthropometric and morphological parameters are the sensitive indicators for sport persons and people of all walks of their lives in terms of their physical growth and nutritional status [1]. These indicators depend largely on genetics, correlated with age, sex, socio-economic status, ethnicity, altitude, nutritional status, personal hygiene and exercise practice. Proper evaluation of these parameters projects the quantification of morphological characteristics of elite athletes which can be vital in relating the body structure and sports performance [2]. Anthropometry comprises techniques that readily contribute to a more in-depth understanding of body composition and nutritional status, allowing the quantification of observations and the changes with time. Championship performances no longer occur at random or as a result of chance alone. International sports performance in various disciplines is influenced by many factors, such as, level of physical, physiological and psychological abilities. Body measurements help to talk about nutritional status and highlight the changes due to physical activities [3]. Purpose of this study was to compare the anthropometric profiles of

height-weight matched young-adult females of hilly and plane regions.

2. Methodology

A total of 60 young-adult females 30 from athlete (AT) and 30 from non-athlete (NAT) and the age between 18-25 years with similar height and weights were selected as the subjects of this study. Height range of the subjects was 157.5cm to 162.5 cm and weight of the subjects was between 52.5kg to 55.5 kg. Anthropometric profile was the criterion for this study to predict the health status of two groups. Seven skin-folds were – biceps, triceps, sub-scapular, supra-iliac, medial calf, mid-thigh and abdomen. Six body circumferences considered were shoulder, chest, abdomen, thigh, fore-arm and wrist. Three body composition variables were – body mass index (BMI), waist-to-hip ratio (WHR) and body fat percentage (%BF). BMI was derived from height-weight ratio (weight in kg/height in m^2). WHR predicted from waist circumference divided by hip circumference. Body fat percentage (%BF) predicted by skin-fold method [4]. Tools used for this study was to measure different dimension of anthropometric measurements. For example, for height and circumferences - anthropometric tape; for weight - weighing machine and for skin-folds – skin-fold caliper were used. Measurements were taken following appropriate guidelines [3]. Mean, standard deviation (SD) and independent t- test were the statistics used in this study for data interpretation. Level of significant difference between two groups was set at $p<0.05$.

3. Results and Discussion

Table-1 represents the means, SDs and t-values of height, weight and the four body composition variables on two

groups. As the subjects of this study were selected within the specific sample of height and weight, consequently, no difference was observed in group mean height, weight and BMI of two groups.

Table 1: Mean, SD and t-value on height, weight and body composition variables

| Variables | AT Group Mean±SD | NAT Group Mean ±SD | t- value |
|-------------------------|---------------------|-----------------------|---------------------|
| Height (cm) | 155.83±4.04 | 155.99±3.59 | 0.155 ^{NS} |
| Weight (kg) | 49.60±4.53 | 50.73±3.01 | 1.141 ^{NS} |
| BMI(Kg/m ²) | 20.43±1.68 | 20.88±1.46 | 1.100 ^{NS} |
| % BF | 17.60±4.08 | 24.89±4.33 | 6.710* |
| LBM(Kg) | 40.77±2.88 | 37.98±2.41 | 4.063* |
| WHR | 0.76±0.06 | 0.80±0.07 | 1.915* |

*Sig. at the .05 level, $t_{0.05}(58)=1.645$, NS = Not significant

There was a significant difference at BF% of these two groups. The LBM did differ between the two groups, and with similar body weight athletic females were having greater LBM than the non-athlete (NAT) females. WHR of the non-athlete (NAT) girls were higher (0.80) than the athlete girls (0.76). Therefore, in body composition aspect the athlete (AT) young adult females were in better health status than their non-athlete counterparts.

Table 2: Mean, SD and t-value of seven skin-fold sites

| Variables | Group | N | Mean + SD | t- value |
|-------------|-------|----|--------------|---------------------|
| Biceps | AT | 30 | 6.43 + 2.91 | 0.980 ^{NS} |
| | NAT | 30 | 7.07 + 2.02 | |
| Triceps | AT | 30 | 11.87 + 4.13 | 1.452 ^{NS} |
| | NAT | 30 | 13.27 + 3.30 | |
| Sub-scapula | AT | 30 | 10.23 + 3.50 | 7.229* |
| | NAT | 30 | 17.57 + 4.31 | |
| Suprailiac | AT | 30 | 13.20 + 5.09 | 7.702* |
| | NAT | 30 | 25.45 + 7.07 | |
| Abdomen | AT | 30 | 15.23 + 4.84 | 7.112* |
| | NAT | 30 | 25.60 + 6.35 | |
| Thigh | AT | 30 | 17.77 + 4.26 | 6.375* |
| | NAT | 30 | 25.48 + 5.08 | |
| Calf | AT | 30 | 11.60 + 4.55 | 1.924* |
| | NAT | 30 | 13.53 + 3.10 | |

*Significant at the .05 level, $t_{0.05}(58)=1.645$

Table-2 represents means, SDs and t-values of the seven skin-fold sites. Significant difference between two groups' skin-fold sites were observed at sub-scapula, supra-iliac, abdomen, thigh and calf sites. However, at the remaining skin-fold sites i.e., biceps and triceps, there was no difference between the two groups. So, from the skin-fold distribution it is seen that the non-athlete young-adult females were having greater amount of subcutaneous body fat deposition at the most of the sites than the athlete females of similar height and weight.

Table 3: Mean, SD and t-value of seven girth sites

| Variables | Grou | N | Mean + SD | t- |
|------------|------|----|------------|--------------------|
| Thigh | AT | 30 | 48.78±5.38 | 1.02 ^{NS} |
| | NAT | 30 | 49.92±2.84 | |
| Calf | AT | 30 | 31.25±3.64 | 1.40 ^{NS} |
| | NAT | 30 | 32.61±3.90 | |
| Upper limb | AT | 30 | 34.19±16.7 | 11.14* |
| | NAT | 30 | 68.73±2.58 | |
| Lower limb | AT | 30 | 39.59±19.9 | 11.75* |
| | NAT | 30 | 83.38±4.17 | |
| Waist | AT | 30 | 67.85±7.04 | 1.73* |
| | NAT | 30 | 70.36±3.69 | |
| Abdomen | AT | 30 | 72.88±6.19 | 1.03 ^{NS} |
| | NAT | 30 | 74.41±5.34 | |
| Hip | AT | 30 | 88.94±6.00 | 0.17 ^{NS} |
| | NAT | 3 | 89.16±3.07 | |

*Significant at the .05 level, $t_{0.05}(58)=1.645$

Table-3 represents the seven girth measurements of the two groups in the form of mean, SD and t-value. It is observed that out of these seven circumferences significant difference existed at upper limb, lower limb and waist region. For the remaining four circumference measurements, i.e., thigh, calf, abdomen and hip the two groups did not differ.

4. Conclusion

Within the limited scope of the study the following conclusions were drawn on young-adult females with similarity in height and weight.

- i) Lean body mass of the athlete females were more than the non-athlete females.
- ii) Waist-to-hip ratio of the non-athlete females was higher than the athlete females.
- iii) Non-athlete females were superior at sub-scapula, supra-iliac, abdomen, thigh and calf skin-fold sites.
- iv) In girth measurements, non-athlete females were superior at upper limb, lower limb and waist site.

Behavioural characteristics and body proportions of females and males with similar height and weight can be compared to understand the differences in those two aspects.

References

- [1] Chatterjee S, Chatterjee P and Bandyopadhyay A.(2006) Skinfold thickness, body fat percentage and body mass index in obese and non-obese Indian boys. *Asia Pac. J. Clin. Nutr.* 15, 232–235.
- [2] McArdle, W. D., Katch, F. I. and Katch, V. L. (1996). *Exercise Physiology Energy, Nutrition and Human Performance* (4th Ed.). Williams and Wilkins: Baltimore.
- [3] Heyward, H. V. and Wagner, D. R. (2004). *Applied Body Composition* (2nd ed.). Human Kinetics Publishers: Champaign, IL.
- [4] Jackson, A. S. and Pollock, M. L. (1978). Generalized equations for predicting body density of men. *British journal of Nutrition* 40: 487-504.

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