

ANTROPOMETRIC STUDY OF BODY COMPOSITION VARIABLES IN SELECTED MALE AND FEMALE ATHLETES IN RIVERS STATE, NIGERIA

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ABSTRACT

The research was directed towards the study of anthropometric variables of body composition in selected male and female athletes of Rivers State, Nigeria. A total of 10 athletes, 5 males and 5 females volunteered for the study. The anthropometric variables investigated include height, weight, skin fold and girth measurements of the body composition of participants. Descriptive statistics of mean, standard deviation and anthropometric equations were used to describe the data. While parametric statistics of students' t-test was used to compare both groups i.e. males and females to see if any significant difference exists between them. The result obtained showed that there was a significant different between the participants determined values in body density and percent body part of the variable investigated. It was concluded that differences existed between body composition variables of the participants in the muscle mass and absolute fat.

Keywords: Anthropometry, body composition, athletes, muscle mass, absolute part

INTRODUCTION

Anthropometry is an emerging scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function as related to nutrition, growth, exercise and sport performance (Arthur and Bailey, 1998). Anthropometry is viewed as the quantitative interface between anatomy and physiology, which puts the individual athlete into objective focus and provides a clear appraisal of his or her structural status at any given time or more importantly, provides for quantification for different growth and training influence. While body composition refers primarily to the distribution of muscle and fat in the body, its measurement plays an important role in both sports and health. Excess body fat may lead to obesity and increase the risk of getting many diseases in sports, excess fat hinders performance as it does not contribute to muscular force production and it is additional weight that requires energy to move about (Elizabeth, 2003).

Furthermore, anthropometry measurement can be analyzed statistically and utilized in a number of ways. These include: Somatotyping, fractionalization of body mass into bone, muscle, fat residual components, body density and other indices of growth.

Body composition consists of fat and non-fat components. The fat components are usually called fat mass or percentage body fat. The non-fat component is termed lean body mass. Total fat in the human body is classified into two types: essential fat and storage fat. Essential fat is needed for normal physiological function. Without it, human health deteriorates. This type of fat is found within tissues such as muscles, nerve cells, bone marrow, intestines, heart, liver and lungs (Ogunleye, 1999). This essential fat is 3% in men

and 12% in women. The percentage is higher in women because it includes sex specific fat, such as that found in the breast, tissue, the uterus and other sex related fat deposits (Hoeger and Hoeger, 1999). They further stated that the amount of storage fat does not differ between men and women, except that men tend to store fat around the waist and women around the hips and thighs.

The techniques to assess body composition include skinfold measurements, girth measurement underwater weighing, Bioelectrical impedance, Bod Pod (Air Displacement), Dual energy X-Ray Asorptiometric (DEXA), Near Infrared Interactance (NIR) Futrex 5000.

Anthropometric variables of body composition of men and women are known to differ in body strength, particularly of the upper body (Nindle, Water, Clerys and Katch, 2001).

A partiel explanation for strength disparity between genders is that men have more of their muscle mass in the upper body. They found out that men and women differ with respect to the relative proportionality of leg regional adiposity observed for women (a range of 27 – 34%) than men (a range of 18 – 19%), with women exhibiting an accentuated relative deposition towards the arm region. When expressed as a percentage of total fat mass, men had a greater percent deposited in the trunk than women (51 vs 45% respectively), whereas women have a greater percentage deposited in their legs (39 vs 35% respectively, and arms 16 vs. 15% respectively than men. The above observation was made on a ratio score based on body mass or fat free body mass. According to these authors, when men and women were matched before testing for body size and composition and training status, the results revealed that males are still stronger. They pointed out that the statistical method of ratio scaling (equating for sex difference in body size) might not truly equalize women and men in terms of the underlying physiology.

PURPOSE OF THE STUDY

The purpose of this investigation was to ascertain the anthropometric differences of variables of body composition that exist between the body density, absolute fat, percent body fat and muscle mass of male and female athletes in Rivers State. Also to ascertain whether male store fat around the waist and women around the hips and thigh due to their anthropometric status.

POPULATION AND SAMPLE

Out of 15 athletes who volunteered for the study from Rivers State, 10 were selected, amongst them 5 males and 5 females who were matched on some variables such as age, weight and height.

Research Instrument and Equipment

The following instruments and equipment were used to collect the data needed for this study.

1. Calibrated Wall: Calibrated from 5.0cm to 2.5m was used to obtain the nature measurement.
2. Slim Guide Skinfold Caliper: Was used for the measurement of the skinfold of the various sites of the body required for this study.
3. Anthropometric Box: Was used when measuring lengths and breadths where the participants were required to be seated (on the box).
4. Anthropometric Tape: Was used to accurately locate number of skinfold site, mark distances from body landmarks and to measure body girths.
5. Weighing Scale: Was used to measure the body weight in kilogram.

6. Marker: Was used for indicating the body landmarks of the participants.

Validity of Instrument

The instrument used for the study was standardized instruments.

Test Location

University of Port Harcourt Sports Centre Gymnasium

Procedure for Data Collection

All the participants were informed about the nature and purpose of the measurements. Research assistants helped to record and observed the participants. The recorder verified the accuracy of site location and ensures the correct sequence of measurement. The recorder repeats the value as it was being recorded thereby enabling an immediate check. All measurements were taken three times and the median values were used for data analysis.

All anatomical landmarks for skinfolds and girths measurement of the participant were taken at the right side of their body.

Order of Testing

On reporting for the test, participants were made to rest for 30 minutes after which their age, stature and body weight were taken.

Thereafter, the skinfold measurement and body girths of the participants were taken after the identification of their body landmarks. All body composition measurements were taken on the right side of the body of the participants.

The Order of measurements was as follows:

- a. Stature
- b. Body weight
- c. Skinfold
- d. Body girths

In measuring skinfold and girths, the following measurements were made:

Skinfold: Triceps, subscapular, supraspinale abdominal, front thigh, medial calf.

Girths: arm (relaxed) wrist, chest, waist, gluteal, thigh), calf (maximum), Ankle (minimum).

Dependant Variables

Body density, absolute fat, recent body fat, muscle mass.

Statistical Data Analysis

Equations by Withers (2005) and Martin; (1990) were used to compute body density, percent body fat and muscle mass. The means and standard deviations of the variables were calculated for the two groups. Frequent counts and percentages of the two groups were calculated to determine where fat are mostly stored in the body of the two groups. Parametric statistics of student's t-test was used to determine whether there was any significant difference between the two groups on the variables under study.

Statistical significance was set at 0.05 alpha level.

RESULTS

Table 1. Characteristics of the Participants used in the Study

<i>Participants</i>	<i>Variables</i>		
	<i>Age</i>	<i>Weight</i>	<i>Status</i>
1	21 years	72kg	1.75m
2	21 years	60kg	1.64m
3	25 years	67kg	1.71m
4	24 years	73kg	1.65m
5	21 years	73	1.65m
X	21.8 years	55.6kg	1.63m

Results in Table 1 show the age distributions and anthropometric characteristics (weight and stature) of the participants with a mean of 21.8 for age, 55.6kg for weight and 1.63m for the stature respectively.

Table 2. Comparison of anthropometric variables of participants

<i>Variables</i>	<i>Mean</i>		<i>Standard Deviation</i>		<i>t-test</i>			<i>Remarks</i>
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>Df</i>	<i>t-critical</i>	<i>t-observed</i>	
	Variables Body density	2.83	7.07	1.08	1.07	8	2.31	
Percentage body fat	5.88	2.05	3.99	12.59	8	2.31	9.80	“
Absolute fat	9.91	9.91	2.7	5.71	8	2.31	3.07	“
Muscle mass	3.0	1.63	2.8	3.08	8	2.31	2.31	“

* Significant, $P < 0.5$

Table 2 shows the descriptive and inferential statistics of mean, standard deviation and t-test of the variables for the two groups of participants. The student's t-test was used to compare the variables between the two groups. The result show that there was significant difference between the two groups on all the variables investigated body density 6.94 percent body fat 9.80, absolute fat = 3.07. Muscle mass = 2.31, as shown in the table above.

Table 3. Comparison of fat stored in the trunk (using Girths measurements)

<i>Variables</i>	<i>Value</i>	<i>Percent</i>	<i>Cum. %</i>
Male	717.5	49.8	49.8
Female	722.8	50.2	100
<i>Total</i>	<i>1440.3</i>	<i>100</i>	

Result in Table 3 shows that the percentage of fat in females (50.2%) is higher than that of males (49.8%). Girths measured, arm relaxed), Arm (flexed and tensed), wrist and chest.

Table 4. Comparison of fat stored in the waist (using Girths measurement)

<i>Variables</i>	<i>Value</i>	<i>Percent</i>	<i>Cum. %</i>
Male	378.8	50.05	50.05
Female	374	49.95	100
<i>Total</i>	<i>748.8</i>	<i>100</i>	

Result in Table 4 shows that the percentage of fat in males (50.05) is higher than that of female (49.95%). Girths measured – waist (minimum).

Table 5. Comparison of fat stored in the hip (using Girths measurement)

<i>Variables</i>	<i>Value</i>	<i>Percent</i>	<i>Cum. %</i>
Male	378.8	50.05	50.05
Female	374	49.95	100
<i>Total</i>	<i>748.8</i>	<i>100</i>	

Result in Table 5 shows that the percentage of fat in females (50.52%) is higher than that of male (49.48%). Girths measured – Gluteal (hips).

Table 6. Comparison of fat stored in the thigh (using Girths measurement)

<i>Variables</i>	<i>Value</i>	<i>Percent</i>	<i>Cum. %</i>
Male	260.3	50.50	50.50
Female	255.1	49.50	100
<i>Total</i>	<i>515.4</i>	<i>100</i>	

Result in Table 6 shows that the percentage of fat in males (50.50) is higher than that of female (49.50%). Girths measured – thigh (midtorch – tib. Lat.).

Table 7. Comparison of fat stored in the leg (using Girths measurement)

<i>Variables</i>	<i>Value</i>	<i>Percent</i>	<i>Cum. %</i>
Male	541.3	50.99	51.82
Female	520.2	48.01	100
<i>Total</i>	<i>1061.5</i>	<i>100</i>	

Result in Table 7 shows that the percentage of fat in males (51.82%) is higher than that of female (48.17%). Girths measured – arm (relaxed), Arm (flexed and tensed), wrist (distal stybids).

DISCUSSION

This study was carried out to ascertain whether differences exist between body comparison variables of male and females' athletes. A total of ten participants volunteered for the study, five male and five female athletes of Rivers State, Nigeria.

The result obtained from the statistical comparison of the variables showed a significant difference in body density, percent body fat, absolute fat and muscle mass between the groups. This is in line with literature that postulates that essential fat constitutes about 3 percent of the total weight in men and 12 percent in women. The percentage is higher in women because it includes sex-specific fat, such as that found in the breast tissue, uterus and other sex related fat deposits (Hoeger & Hoeger, 1999).

The result obtained from the comparison of trunk, waist, hip, thigh, leg and arm showed that fat stored in the waist of males is higher than that of females, and the females are superior to males in terms of the trunk and hip, this is in line with literature that postulates that men tend to store fats around the waist and women around the hips and thighs (Hoeger & Hoeger, 1999). The result of this study showed that the fat stored in the thigh of the males is higher than that of the females (50.50% to 49.50%) although, the difference is negligible which is not in line with the submission of Hoeger & Hoeger, 1999) above, the reason might be attributed to the events in which the male athletes were involved which is football, which involves the use of legs muscles mostly, thereby causing an increase in their thigh muscle (muscular hypertrophy). Unlike their female counterparts who participated in track and field events (Withers, 2005).

CONCLUSION

The research showed that differences exists between body composition variables of male and females athletes in terms of regional fat deposition. The percent body fat in females is higher than that of males with lower mass. Also, the result can help to identify individuals with growth disorders, as well as assess the nutritional status of the healthy and unhealthy subjects.

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