

## PERCENT BODY FAT VARIABILITY OF HEALTH RELATED FITNESS WITH SEX AMONG FEDERAL UNITY SECONDARY SCHOOL STUDENTS IN FEDERAL CAPITAL TERRITORY (FCT) ABUJA

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### ABSTRACT

*Health and fitness of the individual have been the concern of every society. Today, awareness is on the increase about the difference in health related fitness status among students. School authority and organizations therefore deem it necessary to embark on regular fitness exercise that will promote health and fitness of their people. The purpose of this study was to compare the variability of health related fitness with sex among Federal Unity Secondary School students in Federal Capital Territory Abuja. To achieve this purpose, two hundred and forty (240) male and female students were randomly selected from the six (6) Federal Unity Secondary Schools in Federal Capital Territory, Abuja. Skinfold measurements was used to determine percent body fat; t-test statistical analysis was used to compare the difference between students' health related fitness variable. The results of the analysis showed significant difference in the percent body fat between male and female students. The results further revealed that; Female students had higher percent body fat than their male counterparts.*

**Keywords:** Percent body fat, health related fitness, sex, secondary school students.

### 1. INTRODUCTION

There is substantial evidence to show that physical inactivity and lack of exercise have negative influence on health and productivity. Physical fitness, like other aspects of personal health, is more of a behavioural problem than a medical one. Modern technology has made it much easier for us to become less healthy. Many of our daily activities have become physically less demanding, and automation has reduced the need for physical labour (Ahsan, & Mohammad, 2018). As a result, we no longer stimulate ourselves through physical effort and our physical condition deteriorates affecting health, fitness and productivity (Haruna, 2005). An inactive lifestyle would increase a person's risk for coronary heart disease only if other primary risk factors were present (Mohammad, & Tareq, 2016). Paffenbarger, Hyde, Wing, and Hsieh, (1986), Powell, Thompson, Caspercen, and Kendrick (1987), and Siscovick, Weiss, Fletcher, and Lasky, (1984) in related studies suggest that physical inactivity is primary risk factor for coronary heart disease, similar to smoking, hypertension, and high serum cholesterol.

Body composition is one of the major health related components of fitness. The amount of body fat, muscular development and body structure dimensions are the measurable factors used in estimating and evaluating the body physique of the individual (Mohammad, 2015a,b,c). Body composition largely depends on dietary and exercise habits sex and genetic factors (Hussain, Ahmed, Mohammad, & Ali, 2013; Ali, & Mohammad, 2012). Edgerton, 1976). Maintaining the same view, Gkتهhell, (1976) state that sex and genetic background influence the distribution of fat deposit in the body. He further stressed that, exercise is an important means for the control of body fat and the overall body builds. This suggests that physical exercise can re-distribute body weight by making the muscles firmer and aiding the loss of excess body fat.

According to McArdle, Katch, and Katch, (1981), the total amount of body fat exists in two depots or storage fat sites. The first depot, termed essential fat, is the It stored in the marrow of bones as well as in the heart, lungs, kidneys, liver, spleen, intestine muscle and lipid rich tissues throughout the central nervous system. This fat is required for normal physiologic functioning. In females, essential fat is thought to be stored in other additional sites such as the breast. The other fat depot, the storage fat consists of it that accumulates in adipose tissue. This nutritional reserve includes the fatty tissues that protect the various

internal organs from trauma, as well as the large subcutaneous fat volume deposited beneath the skin surface.

Dikki (1995) observed that evaluation of body composition changes is considerably difficult during normal growth and maturation, making it uneasy to separate training effects from those associated with growth. There are equations used for converting skin fold measurements into estimate of body density or percentage of fat. Researchers, however, have noted that many prediction equations are specific to the population from which they were derived (Maud, & Foster, 1995; Heyward, 1998). The equation developed for subjects of particular age, sex, and fitness level may not apply to a different population, because each population may have different factors influencing the prediction of body density.

The introduction of automation has greatly affected our vigorous active life that enables us to perform numerous activities without being fatigued. According to Heyward (AAHPERD) (1980) published a Separate health related physical fitness test manual to distinguish between Performance testing (e.g. fifty-yard dash) and fitness testing (e.g. skinfold thickness). This health related test battery is consistent with the direction of lifetime fitness programs being concerned with obesity.

These components directly relate to the enhancement of good health status of the individual. The components help in protecting against developing degenerative diseases like coronary heart infection, obesity, hypertension, low back pain and musculoskeletal disorders. Health related fitness improves a person's functional and structural appearance and soundness. Thus, this study was conducted to find out the differences between male and female students of these schools in their body composition (percent body fat).

## **2. METHODS AND MATERIALS**

### **2.1 Research Design**

Ex-post facto research design was used in this study, as this research did not involve manipulation of any independent variable. In this design, male and female students were tested in four (4) components of health related physical fitness.

### **2.2 Population, Sample and Sampling Procedure**

The population for this study consisted of male and female students, totaling five thousand eight hundred (5800) students, of the six (6) Federal Unity Secondary Schools in Federal Capital Territory (FCT), Abuja. A total of two hundred forty (240) students were drawn from the total population. In this 240 students 120 were male students, and remaining 120 were female students. To achieve the purpose of this study, a systematic simple random sampling method was used. The students were formed into two groups according to gender. Each subject was selected from each group using a systematic random sampling method.

### **2.3 Tools for the Study**

The purpose of the study was to compare the health related fitness status of male and female students of Federal Unity Secondary School in Federal Capital Territory Abuja. To achieve this purpose, the following instruments were used for this investigation.

- (a) Hana power Bathroom model BR 9013 weighing scale was used to measure the subjects weight.
- (b) Skinfold calipers (Lange model) for skinfold measurement
- (c) A wall marked in metres for measuring height.

### **2.4 Test Description and Procedure**

**2.4.1 Skinfold Measurement:** Skinfold measurement has been used in determining body composition (percent body fat) (Gwani, 1996). The thickness on the skinfold was measured with skinfold caliper. Lange skinfold calipers was used on selected sites of the body, which included: - (a) Triceps (b) Biceps (c) Subscapular, and (d) Suprailiac. The folds at these sites were held with the thumb and index finger and held with the caliper jaws about a centimeter from the thumbs and finger. The value obtained from the reading of the caliper was recorded in millimeters (mm), which was then converted into an estimate of percentage fat. The right side of the body of the subject was used to determine the sites where the folds could easily be obtained. There are two steps in conversion of the skinfold thickness into an estimate of percentage fat using Durnin and Rahman procedure (Gwani, 1996). The first one is Skinfold thickness - estimate body density, and the second one is Body density - estimate of percentage fat. The skinfold thickness can be

converted to an estimate of body density by adding up all four skinfolds and substituting it in one of the following equations as applied to the sex of the subjects.

Boys: body density =  $1.1533 - 0.0643 \log_{10}(\text{Total skinfold})$

Girls: body density =  $1.1369 - 0.0598 \log_{10}(\text{Total skinfold})$

For conversion of body density to an estimate of percent fat. Siri equation for estimate was used and was the same for all types of subjects (Gwani, 1996).

$$Bf = \frac{(4.95 - 4.5)}{\text{Body Density}} \times 100$$

## 2.5 Statistical Analysis

The statistical methods which were used to analyze the data after knowing the results of the central tendency and variability were- Descriptive statistics used to analyse the demographic information of the students like sex, weight and height with reference to health related fitness of the students, male and female based on their ages. Inferential statistics particularly *t*-test, was used to find the differences between the independent variables. One-way analysis of variance (ANOVA) was used to find the significant level of the differences based on sex of the students. The acceptance of the null hypothesis was based on the Alpha value of  $p < 0.05$ .

## 3. RESULTS

**Table 1: Demographic characteristics of the respondents**

Group	Variable	Gender	Number	Mean	SD
1	HT(m)	M	20	1.53	0.07
		F	20	1.54	0.05
	WT (kg)	M	20	38.25	5.82
		F	20	40.40	6.41
2	HT(m)	M	20	1.54	0.05
		F	20	1.57	0.07
	WT (kg)	M	20	38.35	5.80
		F	20	43.90	9.27
3	HT(m)	M	20	1.62	0.09
		F	20	1.60	0.04
	WT (kg)	M	20	45.25	7.14
		F	20	48.10	7.93
4	HT (m)	M	20	1.63	0.08
		F	20	1.62	0.05
	WT (kg)	M	20	45.15	6.62
		F	20	49.05	8.11
5	HT(m)	M	20	1.70	0.05
		F	20	1.65	0.04
	WT (kg)	M	20	53.20	4.37
		F	20	54.15	6.51
6	HT(m) 1	M	20	1.72	0.05
		F	20	1.66	0.05
	WT (kg)	M	20	56.90	7.73
		F	20	51.55	6.06

Table 1 shows the mean, and standard deviation for the demographic characteristic information of the students. Information regarding the mean scores of male and female respondents in Percent body fat test is shown in Table 2.

**Table 2: Mean performance of the students in federal unity secondary schools in percent body fat test**

Group	Gender	1	2	3	4	5	6
		Male Female	Male Female	Male Female	Male Female	Male Female	Male Female
Percent Body Fat		Mean	Mean	Mean	Mean	Mean	Mean
	M	11.76	M 11.93	M 12.78	M 12.04	M 13.42	M 13.09
	F	16.32	F 16.61	F 18.57	F 18.45	F 19.38	F 19.04
		SD	SD	SD	SD	SD	SD
	M	3.39	M 3.03	M 1.83	M 1.83	M 1.36	M 1.86
	F	1.94	F 2.63	F 2.79	F 2.53	F 3.22	F 2.72

Table 2 shows that the male students in group 1 had the mean of 11.76(mm), in percent body fat, while their female counterparts had the mean of 16.32(mm). This result shows that the female students had higher

percentage of fat from the sum of four (4) skinfold measurements taken from the 4 body sites than their male counterparts.

Male students in group 2 had the mean of 11.93(mm) in percent body fat from the four (4) sites of skinfold while the females had the mean of 16.61 (mm). This result indicates that female students had higher percent body fat than their male counterparts as they grow. Male students in group 3 had the mean of 12.78(mm) while their female counterparts had the mean of 18.57(mm) in percent body fat. This result shows that female students had higher percentage of fat in their body than the male students at each level of development. In group 4 the male students had the mean skinfold measurement of 12.04(mm), while their female students had the mean of 18.45(mm) in percent body fat. In group 5, the male students had the mean skinfold of 13.42(mm), while their female counterparts had the mean skinfold of 19.38. This result still indicated that female students maintained higher level of fat in their body than the male counterparts.

Percent body fat female students increased, steadily but decreased a little after some time but increased again a little as they grow. The male students in group 6 had the mean in percent body fat of 13.09(mm). While their female counterparts at the same age limit had the mean in percent body fat of 19.04(mm). This result shows that female students maintained higher level of fat deposition in their body than the male counterparts.

Though at this age there is slight decrease in the levels of their fat deposition compared to when they were younger, this decrease affected both male and female students at this stage. It may be due to higher level of activities they might have been performing and also due to some hormonal changes as they are growing. Health related fitness does not significantly vary with sex among students in Federal Unity Secondary Schools. To test this, the data collected from male and female students in Federal Unity Secondary Schools were analysed using *t*-test for the comparison. The results are presented in Table 3.

**Table 3: The *t*-test comparing the physical characteristics of the students in federal unity secondary schools**

Group	Variables	Gender	Number	Mean	SD	SIM	DF	t-value
1	HT(m)	M	20	1.53	0.07	0.01	38	-0.25
		F	20	1.54	0.05	0.01		
	Weight (kg)	M	20	38.25	5.82	1.30	38	1.11
		F	20	40.40	6.41	1.43		
2	HT(m)	M	20	1.54	0.05	0.01	38	-0.99
		F	20	1.57	0.07	0.17		
	Weight(kg)	M	20	38.35	5.80	1.29	38	-2.27
		F	20	43.90	9.27	2.07		
3	HT(m)	M	20	1.62	0.09	0.02	38	0.84
		F	20	1.60	0.04	0.01		
	Weight (kg)	M	20	45.25	7.14	1.59	38	-1.19
		F	20	48.10	7.93	1.77		
4	HT(m)	M	20	1.63	0.08	0.01	38	0.40
		F	20	1.62	0.05	0.01		
	Weight (kg)	M	20	45.15	6.62	1.48	38	1.66
		F	20	49.05	8.11	1.81		
5	HT(m)	M	20	1.70	0.05	0.01	38	2.85
		F	20	1.65	0.04	0.01		
	Weight (kg)	M	20	53.20	4.37	0.97	38	-0.54
		F	20	54.15	6.51	1.45		
6	MT(m)	M	20	1.72	0.05	0.01	38	4.49
		F	20	1.66	0.05	0.01		
	Weight (kg)	M	20	56.90	7.73	1.73	38	2.43
		F	20	51.55	6.06	1.35		

\*significant  $t(38) = -2.042, p < 0.05$

Table 3 shows that the male students were found to be bit taller than the female students at certain level of development in life but the female students weighed heavier than the male students when their weight and height were generally compared based on sex difference. The weight gain in females could be as a result of inactivity in life as the result generally indicated that the female students weighed heavier than their male counterparts. To test the difference between sex as in percent body fat of federal Unity Secondary School Students, the data collected were analysed using *t*-test for the comparison. The results are presented in Table 4.

**Table 4: The *t*-test comparing the student performance percent body fat test**

GROUP	1	2	3	4	5	6
GENDER	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE	MALE FEMALE
	SEM	SEM	SEM	SEM	SEM	1 SEM
Percent Body Fat	M 0.803	M 0.6792	M 0.4105	M 0.41 1	M 0.3058	M 0.4172
	F 0.4355	F 0.5881	F 0.6254	F 0.5668	F 0.7209	F 0.6087
	DF	DF	DF	DF	DF	DF
	38	38	38	38	38	38
	t-value	t-value	t-value	t-value	t-value	t-value
	*4.99	*5.20	*-7.74	*-9.15	*-7.62	*-8.17

\*Significant  $df(38) = 2.042 < 0.05$ .

**Table 5: ANOVA showing the difference in the performance of the students on percent body fat test**

Variables	Sum of squares	df	Mean Square	F	Sig
Percent Body Fat					
Between groups	1853.747	1	1853.747		
Within groups	1674.882	238	7.037	*263.417	.000
Total	3528.628	239			

\*Significance  $F(1.238) = 3.84, p < 0.05$

Table 4 & 5 shows the differences in percent body fat between male and female students of Federal Unity Secondary Schools. The results indicated that there is significant difference in percent body fat between male and female students. The *t*-calculated is greater than the *t*-critical, which shows that the female students had higher percent body fat than their male counterparts. Though the male students also showed increase in percent body fat but not as high as their female counterparts, although a slight decrease was noticed in body fat deposit in both sexes at the certain level of development, which could be attributed to some physiological factors. Physical activities seem likely to be also contributory factors. However, table 5 shows that female students had higher percent body fat than their male counterparts.

#### 4. DISCUSSION

The result in on percent body fat of the students indicated a significant difference between the sampled groups. The female students had more fat in their body than their male counterparts at all age levels. Similarly, Getchell (1976) observed that sex and genetic background influence the distribution of fat deposit in the bone. Physical activities could redistribute the body weight by making the muscle firmer and aiding the loss of excess body fat. High percentage of fat in children is influenced by “modifiable” factors such as- socio economic status, diet, body fitness, feeding habit, environmental and social factors as well as non-modified factors, like hormonal level, growth and maturation or age, genetics, gender and psychological factors.

Body composition is dependent on diet and exercise habits. Sex and genetic background influence the distribution of fat deposit in the body. This study revealed that among people of the same height, women will weigh less than a man and they will have less power to propel the same mass. Exercise is an important means of controlling fat and overall body build. Physical exercise could re-distribute the body weight by making the muscle more firmly thereby reducing excess body fat. Wilmore and Costill (1999) observed that “the number of fat cells become fixed early in life. This led to the belief that maintaining low total body fat content during early period of development would minimize the total number of fat cells thereby reducing the likelihood of obesity as in adult.

This finding is in agreement with Otinwa and Ogundare (1995) who reported that girls had higher percent body fat than boys. Wilmore and Costill (1999) reported that the body changes during puberty in females and male tend to be more active than females. Generally, fat is required for physiological functioning. In females’ essential fat is thought to be stored in other additional sites such as the breasts. Similarly, Malina (2001) reported increase body fatness as age increases. Guo, Huang, and Maynard, (2000) reported pubertal decrease in the skinfold thickness of boys that coincides with the peak of the pubertal growth spurt in boys represented by age. Maximal velocity of BMI occurs at the age of years and corresponds to the age of 14 years at which decreases in mean TBF/ stature values were first observed. In a society where sedentary life style and intake of excess calories of diet is prevalent, a large population of both adults and children store too much fat, and many become over fat to the extent that they can be classified obese.



Gasser et al. (1997), reported decrease in the skinfold thickness of boys that coincide with the peak of the pubertal growth spurt in boys, represented by the age at maximal velocity of body mass index, which occurs at age 14.3 years and corresponds to the age of 14 years, at which decrease in mean total stature was observed for girls in the present investigation. Sex differences in TBF' stature were observed at most ages Sex difference in TBF during puberty are well known.

## 5. CONCLUSION

Within the limitation of this study it is concluded that the male and female students were comparable in their physical growth level but there was significant difference in their weight. It is also concluded that the male and female students perform differently in any health related fitness activities. Sex affects performance, which increases with age.

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