GENDER DIFFERENCE IN THE BODY MASS INDEX (BMI) AND SOMATOTYPE STATUS USING THE SOMATOTYPING PONDERAL INDEX (SPI): THE INFLUENCE ON THE RELATED HEALTH CHALLENGES OF THE STAFF OF THE FACULTY OF EDUCATION IN UNIVERSITY OF UYO

By

UDOBONG HENRY MORRISON
DEPARTMENT OF HUMAN KINETICS AND HEALTH EDUCATION
FACULTY OF EDUCATION
UNIVERSITY OF UYO

AND

UBONG JOHN INYANG
DEPARTMENT OF OCCUPATIONAL HEALTH AND SAFETY
INSTITUTE OF PETROLEUM STUDIES
UNIVERSITY OF PORT HARCOURT

ABSTRACT

The study investigated gender difference in the means of body mass index (BMI) and somatotype status using the somatotyping ponderal index (SPI): an evaluation of their individual influence on the related health challenges of the staff members of the faculty of education in university of uyo. Ex post facto survey design was used for the study. The study was conducted in the University of Uyo community is in Akwa Ibom State. The population of the study comprised the males and females of the Faculty of Education of the University. A sample size of 82 staff members of the Faculty of Education, comprising 42 males and 40 females were used for the study. Standard-constructed instruments were adapted and used to measure the body weight, standing height, heart rate and blood pressure as done by some notable authors the instruments for the study was a standardized questionnaire titled: Gender difference in the means of body mass index (BMI) and somatotype status using the somatotyping ponderal index (SPI) (GDBDISPI). The consistency of the instruments was certified reliable at 0.9. The data collected on the subjects were treated with the descriptive statistics to obtain the answers the research questions. The Z-test statistics was used to treat the hypotheses, set at probability significant level of .05.The study concluded that there is a significant difference in the Body mass index (BMI) among the Education Faculty staff members. On the average, the females are significantly with more BMI value than their male counterpart, although descriptively both genders are in the overweight BMI health implication status. There is a significant gender difference in the Somatotype status by the means of somatotyping ponderal index (SPI) among the Education Faculty staff members. On the average, the females are significantly endomorphous with lesser SPI value than their male counterpart, who are in the mesomorphous somatotype status. It was recommended that the staff club should be well organized to afford a better avenue for physical exercises for members while the Physical and Health Education Department should project physical exercise programmes to the University community.

KEYWORDS: Gender Difference, Body Mass Index (BMI), Somatyping Ponderal Index (SPI), Health Challenges and University of Uyo.

INTRODUCTION

There is no doubt that preventing a health challenge should continue to be a primary focus of an individual since it is timely and less expensive than applying curative measure later. It is noted that many persons never take preventive measures as an important goal in maintaining good health. Health Education places great emphasis on preventive and remedial measures which include undertaking medical tests and examinations so as to avoid costly and risky curative measures in future. In trying to combat these health challenges, many countries have sought through researches to find solutions to them, because the good health of the citizens and especially the working populace is often said to be the nation's wealth and asset. The good health of the citizens is very important to a nation. In offices like the University of Uyo, healthy staff members are expected to contribute more meaningfully to the economic, political and all other forms of the nation's growth than the unhealthy ones are expected to.

The human body has been a focus of many studies that began as early as 1966 by Benjamin Heath and Joel Carter (Heath and Carter, 1966) to promote good health care.Various tests and measurements have been done to classify the body into body structural types by somatotypes or from the body typology. It is also shown in other studies (Hassanein, 2015; Pizzorno and Joiner-Bey, 2016) that there is a suitable body type, an ideal body mass and a suitable fitness level that every individual should seek to have so as to avoid health challenges that do occur in the negative variations in body types, body mass and in poor fitness. The appraisal and classification of body types is referred to as "somatotyping"; and previous researches (Hassanein, 2015; Pizzorno and Joiner-Bey, 2016), had disclosed considerable evidence that physique patterns are significantly and definitely related to some human problems. Therefore interest in health care programmes to ensure suitable body structure in body weight, body height, body mass and body types have become necessary for maintaining good health.

Somatotyping is used extensively by coaches and games teachers to select athletes, in selecting military personnel, para-military personnel and in various professions where certain body sizes are found suitable for the duty. For an example, models in the fashion and modeling industries are specifically selected based on their body shapes (Quinn, 2017). It is common to note that the military even has a required height for recruitment and so do the police and some other paramilitary services.

Studies from Stewart*et al*. (2014);Willgoose and Rogers (2014) have shown that endomorphous sedentary persons are at greatest risk for obesity and overweight thereby carrying unnecessary adiposity that can lead to diabetes and postural deformities. The obese and overweight staffers may not be aware of these risk factors in such an excessive body mass. The native and cultural belief that an obese looking body denotes a sign of wealth and beauty had been debunked by many scientific researches that showed that health complications of high body mass index is detrimental to good health (Oladapo*et al*., 2010; Quinn, 2017;;Wolf, 2017).

Medical tests and anthropometric measurements have been made available today to assist individuals to determine their health statuses in respect to somatotypes and fitness levels. The health challenges could be from poor somatotyping and from inadequate fitness level according to these investigators (Oladapo, *et al*, 2010).

The University of Uyo is an academic community to which staff members' body dispositions and health statuses should be of great concern to the authorities. There are a number of researchers on gender differences in many aspects of health challenges (Rosenberg, 2010; Sandberg, 2012). Though some specific health challenges are respectively for men and for women,

there are those health challenges common to both genders that need to be investigated among the members of the University environment. Finding the gender differences among the staff members of the Faculty of Education of the University will go a long way in to determining which gender is more affected by the health challenges related to body structure and fitness capability of their cardiovascular system.

STATEMENT OF PROBLEM

The staff members of the University of Uyo, Uyo, are subject to health challenges as all other humans, including those arising from poor body structure and vital organic malfunctioning. The Faculty of Education as a whole and the Department of Physical and Health Education in particular is among Faculties and Departments respectively, where researches on health issues are also studied. It is assumed that some health issues arising from poor body types, excessive body mass and poor body fitness may not be known to the Faculty of Education staff members and those who might know may not understand the risk factors inherent in their health conditions. Somatotyping is a measure for body types and the knowledge of the characteristics of the classes of somatotypes, namely ectomorphy, mesomorphy and endomorphy is important to the staff members because every work or physical task carried out by a staff member involves some fitness components of the body and the greatest is the cardiovascular fitness component. From the usually mobile security staffers to the classroom lecturers and the office personnel workers, some forms of the body fitness components are required of them for effective work productivity.

RESEARCH OBJECTIVE

1. The gender difference in the body mass index (BMI) and the related health challenges among the staff members of the Faculty of Education.
2. The gender difference in the somatotype status using the somatotype ponderal index (SPI) and the related health challenges among the staff members of the Faculty of Education.

RESEARCH QUESTION

1. What is the gender difference in the mean of body mass index (BMI) and the related health challenges among the staff members of the Faculty of Education?
2. What is the gender difference in the mean of somatotype status using the Somatotyping Ponderal Index (SPI) and the related health challenges among the staff members of the Faculty of Education?

RESEARCH HYPOTHESIS

1. There is no significant gender difference in the mean of body mass index (BMI) and the related health challenges among the staff members of the Faculty of Education.
2. There is no significant gender difference in the mean of somatotype status using the Somatotyping Ponderal Index (SPI) and the related health challenges among the staff members of the Faculty of Education.

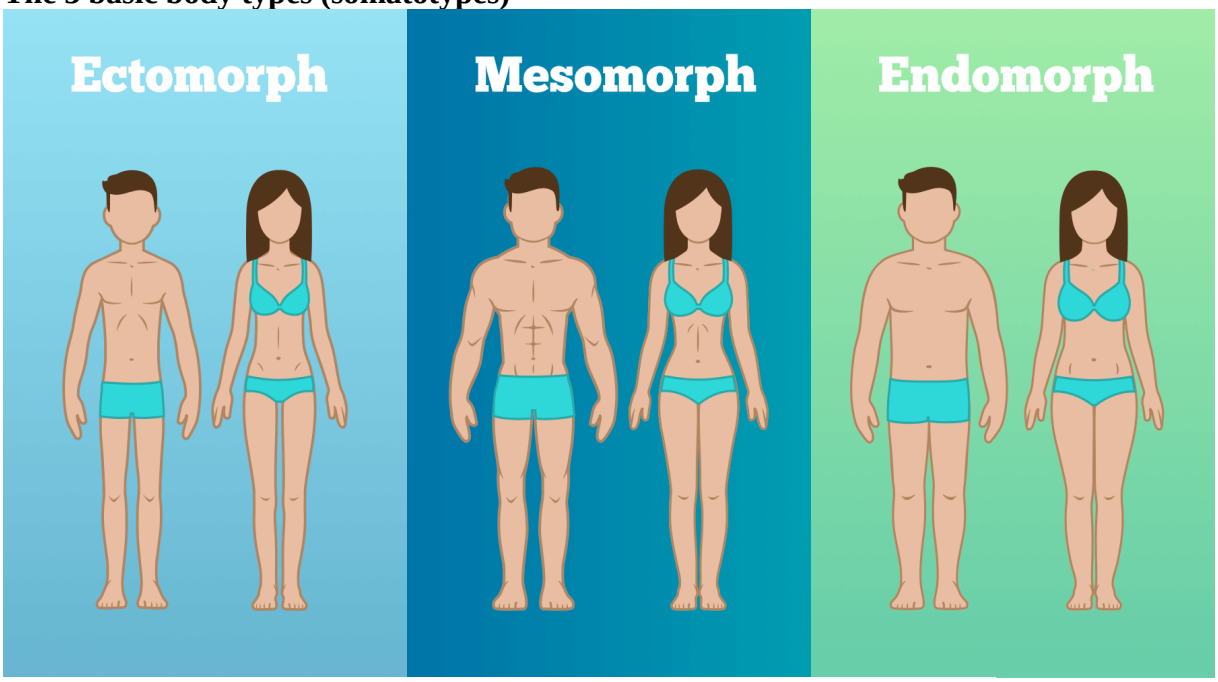
CONCEPTUAL REVIEW

Somatotyping

Somatotypes are a set of generalized body types. Psychologist William Sheldon came up with somatotypes in the 1940s and they were one of the biological theories developed in his time

period that attempted to explain and predict crime based on a person's body type. These body types were broken down into three categories: ectomorphs, endomorphs, and mesomorphs.

The 3 basic body types (somatotypes)



ECTOMORPHY MESOMORPHY ENDOMORPHY

Figure2.4: The Somatotyping Categories
Source: Sheldon (1940)

Sheldon developed these categories based on existing knowledge at the time of how embryos developed in layers, namely the inner layer, or the endoderm; the middle layer or the mesoderm; and the outer layer, or the ectoderm. Generally speaking, ectomorphs are thin and slender and may appear fragile, endomorphs are round and solid and often appear overweight, andmesomorphstend to have developed muscles and appear strong and powerful.

Sheldon examined a group of 200 young men who were referred to as a community center focused on helping young male delinquents. During a 10-year period, Sheldon compared these individuals to a group of 200 non-delinquent college students, ranking individuals in the study according to their body type. Sheldon found that many of the juvenile delinquent men had mesomorphic body types, whereas most of the college students had ectomorphic body types. He also noted specific behavioural and personality traits associated with a predominance of each body type. Studies from Stewart*et al*. (2014);Willgoose and Rogers (2014), have now proven that somatotypes are associated with health challenges, which is the focus of the study.

THE SOMATOTYPE PONDERAL INDEX (SPI) COARSE APPROACH

The Body Mass Index has been used consistently in the absence of skinfold instrument (vernier instrument) to arrive at health complications from body mass through body height and weight measurements without measuring the fat-percentage of the body **(**Willgoose and Rogers, 2014; Quinn, 2017). The health complications range from underweight, ideal weight, overweight to obese weight as the BMI increases or decreases. Likewise, the investigators listed above noted

that in the absence of skinfold measurement, a coarse approach method was also possible in somatotyping with its relationship to the BMI of an individual. The authorshad found strong relationship of somatotype to Body Mass Index (at.82 r.). He had noted the overweight and the obese were more related to the endomorphy, while the underweight were more related to the ectomorphy and the ideal weight were more related to the mesomorphy. They came up with the Somatotyping Ponderal Index (SPI) that places an individual accordingly into respective small, medium and large body frames as estimated somatotypes by the relationship to their BMI. They noted an individual moves from lower SPI to higher SPI which is from Endomorphy, through Mesomorphy to Ectomorphy ratings. Sick persons and pregnant women are excluded in the measurements. It is calculated by using the formula: Cube Root of Body Weight divided by Standing Height of an individual.For this study the Somatotype Ponderal Index coarse approach method is used to assess the staff members' estimated somatotype in the absence of vernier and skinfold caliper instruments so as to arrive at their health challenges.

BODY MASS INDEX (BMI) AND HEALTH CHALLENGES

Agrawal and Agrawal (2016), in a cross-sectional study investigated the association between Body Mass Index and prevalence of health challenges in Low-income and Middle-income Countries (LMIC)**.** A cross-sectional data of total of 40,166 participants from China (n=13,970), India (10,915), Mexico (2,4 26), Russia (3,892), South Africa (4,000) and Ghana (4,971), aged 18 years and above included in the WHO Study on Global Ageing and adult health (SAGE), 2007-2010 were analyzed. Multi-morbidity was measured as the simultaneous presence of two or more of the nine chronic conditions including angina pectoris, arthritis, asthma, chronic lung disease, and diabetes mellitus, hypertension, stroke, depression, and vision impairment. Multivariable logistic regression models were fitted to test for associations between overweight/obesity and prevalence of non-communicable multi-morbidity after adjusting for age, sex, rural/urban residence, education, marital status, occupation, household wealth, tobacco smoking, alcohol drinking, fruits and vegetable intake and health insurance status.

Data were analyzed country wise as well as pooled together to give overall LMIC estimates. The result showed the mean BMI was 24.4 [±7.3SD] in the pooled countries, being as low as 20.8 [±8.0 SD] in India to 23.4 [±6.3 SD] in Ghana, 23.9 [±4.9 SD] in China, 28.4 [±5.4 SD] in Mexico, 28.6 [±6.3 SD] in Russia, to as high as 30.5 [±12.0 SD] in South Africa. The prevalence of overweight was 13% and obesity was 24% in the pooled sample. The prevalence of non-communicable disease multi-morbidity was 23% in the pooled sample of six countries-the highest being in Russia (50%), followed by Mexico (27%), India (24%), Ghana (23%), South Africa (32%) and China (22%). The prevalence of multi-morbidity was 37% among obese population and 27% among overweight population in the pooled sample-highest prevalence was in Russia (59% among obese; 45% among overweight) and lowest in Ghana (28% among obese; 23% among overweight). Being obese was associated with significantly higher likelihood of having multi-morbidity as compared to normal.

GENDER DIFFERENCE IN SOMATOTYPES AND HEALTH CHALLENGES

Urrutia-García *et al*. (2015, had examined Somatotype of patients with type 2 diabetes in a University hospital in Mexico. The aim of the study was to determine the somatotype of Mexican type 2 diabetes patients, using the Heath and Carter somatotype method. The study was conducted on 180 subjects, who underwent an anthropometry following the restricted format established by the International Society for the Advancement of Kinanthropometry (ISAK). A database was

elaborated and they obtained descriptive measures such as age, weight, height and the 3 somatotype components. The results showed that the average age was 58 years (±11 SD); 58.6 years (±10.9 SD) for males and 56.8 years (±11 SD) for females. The average weight was 77.5 kg (±16.7); 80.7 kg (±14.6 SD) for males and 75 kg (±17.8 SD) for females. The results indicated that the mean somatotype for Mexican type 2 diabetes patients was 6.3, 6.4, 0.6. Diabetic females have higher mean values for endomorphy (7.3) and mesomorphy (6.7) and lower mean values for ectomorphy (0.4) than their male counterparts (5.0, 6.0 and 0.8, respectively). It is evident that endomorphy is predominantly in females, in contrast to males, since there are known differences in fat and muscular mass between both genders. The study concluded that **t**he results are similar to previous studies presented for other diabetic populations. Sex differences are significant and especially higher for the endomorphic somatotype, with generally higher values in females. Physically inactive staff members may be prone to obesity and these findings need be taken seriously.

Cappiello (2020) carried out a study at the University of California reviewed results of researches correlating somatotypes to diseases and showed that there are a lot of benefits to being tall on the other hand, but there is also a huge drawback; tall people may be more likely to develop cancer. He concluded that tall people have more cells in the body that can undergo mutation later thereby leading to cancer. He showed fat and obese people do not have more body cells as commonly believed but have more adipocytes (fat containing cells). He found from 10,000 cases of cancer patients that cancer risk rose by 10 percent for every four inches above average height a person is - average being 5’4″ (160cm) for women and 5’9″ (183cm)for men. By this the ectomorphy therefore tends to be affected more than the endomorphy and least affected is the mesomorphy.

Pizzorno and Joiner-Bey **(**2016) studied the prevalence of obesity and somatotypes, and asserted that the obese persons have a 5- to 7-year shorter life expectancy, with greater relative risk for mortality associated with greater degree of obesity. Most of the risk is from cardiovascular causes which include type 2 diabetes mellitus (T2DM), elevated cholesterol, hypertension, and atherosclerosis. In the determination of body composition, obesity is defined as body fat percentage above 30% for women and above 25% for men. Indirect methods of measurement were used with visual observation of the qualitative analysis of obesity. Classification by body types (somatotyping) was by the physical anthropologic classification of physique based on body size and proportion. Observations were that the Endomorphswere relatively with large body, short arms and legs. The Mesomorphswerewith large muscular chest that dominates abdomen and prominent bony joints, while the Ectomorphswerewithrelatively small frame (slender, delicate bone structure), long arms and legs. It was concluded that Endomorphs are at greatest risk for obesity; Mesomorphs are at moderate risk, and Ectomorphs are extremely unlikely to develop obesity.

METHODOLOGY

Ex post facto survey design was used for the study. The study was conducted in the University of Uyo community is in Akwa Ibom State. The population of the study comprised the males and females of the Faculty of Education of the University. A sample size of 82 staff members of the Faculty of Education, comprising 42 males and 40 females were used for the study. Standard-constructed instruments were adapted and used to measure the body weight, standing height, heart rate and blood pressure as done by some notable authors The instruments for the study was a standardized questionnaire titled: Gender difference in the means of body mass index

(BMI) and somatotype status using the somatotyping ponderal index (SPI) Questionnaire (GDBDISPIQ). The consistency of the instruments was certified reliable at 0.9. The data collected on the subjects were treated with the descriptive statistics to obtain the answers the research questions. The Z-test statistics was used to treat the hypotheses, set at probability significant level of .05.

RESULTS AND DISCUSSIONS

Research Question 1: What is the gender difference in the mean of Body Mass Index (BMI) and the related health challenges among the staff members of the Faculty of Education?

Table 1: Descriptive Statistical Analysis of Gender Difference in Means of BMI.

Variables	N		SD	Results
Males	42	26.2	2.4	Females have higher means of BMI value
Females	40	28.5	3.9	than the males by a difference of 1.5 BMI

Source: Appendix IV

Result: Descriptively in Table 1, the females have a mean BMI value of 28.5, while the males have a mean BMI value of 26.2. The result is that the females have a higher mean BMI status than the NTS by the mean BMI value difference of 2.3.

Table 2: Descriptive Analysis of Body Mass Results and Health Challenges

BODY MASS INDEX RESULTS AND HEALTH CHALLENGES			
BMI EXPONENTS	BMI HEALTH IMPLICATIONS	MALES	FEMALES
16-16.99	Severely thin	-	-
17-18.49	Moderately thin	-	-
18.50-24.99	Mildly thin	13 (15.9%)	6 (7.5)
25-25.99	Ideal weight	11 (13.8%)	2 (2.5%)
26-29.99	overweight	15 (18.3%)	13(15.9%)
30-34.99	Pre-obese	3 (3.7%)	17 (21.3%)
35-39.99	Mildly obese	-	1 (1.3%)
40 and above	Morbidly obese	-	-

Source: Appendix IV

Further analysis of the somatotype status in the study had descriptively showed there were 31 (38.8%) males in the mesomorphous status and 13 (15.9%) females in the mesomorphous status. Males had 11 (3.8%) endomorphous members while the females had 27 (33.8%) endomorphous members

Research Question 2: What is the gender difference in the mean of somatotype status using the Somatotyping Ponderal Index (SPI) and the related health challenges among the staff members of the Faculty of Education?

Table 3: Descriptive Statistical Analysis of Gender Difference in means of SPI.

Gender	N		SD	Results

Males Females	42 40	40 SPI 38 SPI	1.3 2.2	Males have more SPI than their female counterpart
Source : Appendix IV				

Result: Descriptively in Table 3, the males have a mean SPI of 40 while the females have a mean SPI of 38. The result is that the males on the average were in the mesomorphous status; while the females on the average are in the endomorphous status.

Table 4: Descriptive Analysis of Somatotypes and Health Challenges

ECTOMORPH	-	-	
MESOMORPH	31 (38.8%)	13 (15.9%)	Males are more mesomorphous
ENDOMORPH	11 (13.8 %)	27 (33.8%)	Females are more endomorphous

Source: Appendix IV

Further descriptive analysis of the somatotype status in the study in percentages showed there were 31 (38.8%) males in the mesomorphous status and 13 (15.9%) females in the mesomorphous status. Males had 11 (3.8%) endomorphous members while the females had 27 (33.8%) endomorphous members. That means the females were predominantly endomorphous than their male counterparts.

HYPOTHESIS TESTING

Hypothesis 1: There is no significant gender difference in the means of Body Mass Index (BMI) and the related health challenges among the staff members of the Faculty of Education.

Table 5: Summary of Z-test statistical analysis of no significant gender difference in the BMI.

Gender	N		SD	Df	SE	Z-cal	Decision
Males Females	42 40	26.2 28.5	2.4 3.9	80	0.73	3.2	H_o Rejected

***Significant at P ≤ .05, df. 80 = 2.000 Z-critical value.**
Source: Appendix IV

Result: In Table 5, the Z-calculated value of 3.2 is greater than the Z-critical value of 2.000. Therefore the hypothesis that there is no significant gender difference in the means of BMI among the staff members of Education Faculty is rejected. The finding is that there is a significant gender difference in the BMI among the Education Faculty staff members. On the average, the females are significantly with more BMI value than their male counterpart, although descriptively both genders are in the overweight BMI health implication status.

Hypothesis 2: There is no significant gender difference in the Somatotype Status using the means of Somatotyping Ponderal Index (SPI) and the related health challenges among the staff members of the Faculty of Education.

Table 6: Summary of Z-test statistical analysis of no significant gender difference in Somatotype status by SPI.

Gender	N		SD	Df	SE	Z-cal	Decision
Males Females	42 40	40 38	1.3 2.2	80	0.4	5	H_o Rejected

***Significant at P ≤ .05, df. 80 = 2.000 Z-critical value.**
Source: Appendix IV

Result: In Table 6, the Z-calculated value of 5 is greater than the Z-critical value of 2.000. Therefore the hypothesis that there is no significant gender difference in the somatotype status by means of SPI among the staff members of Education Faculty is rejected. The finding is that there is a significant gender difference in the somatotype status by the means of SPI among the Education Faculty staff members. On the average, the females are significantly endomorphous with lesser SPI value than their male counterpart, who are in the mesomorphous somatotype status.

DISCUSSION OF THE FINDINGS

The two parameters of body height and body weight had produced the Body Mass Index in which the females also significantly surpassed the males by a mean BMI difference of 2.3. The female members had 28.5 while the male members had 26.2. The BMI results showed that both genders were averagely in the overweight health complications. The BMI does not measure body fat percentage. It is used extensively in the absence of standard equipment like veneer skin-fold caliper. The BMI becomes a useful tool to determine how thin, how overweight and how obese one is (WHO, 2011). WHO, 2018). It is of interest to note that no member in both groups had been in the seriously underweight class. This would have portrayed a nutritional deficiency. Looking back at the descriptive analysis of the related health implications on the two genders, the study revealed that there was no severely thin and moderately thin member. However, there is 13 (15.9 %) males and 6 (7.5%) female members in the mildly thin weight class, which may need nutritional intervention if the cause is not of hereditary/genetic origin. Males have 11 (13.8 %) and females have only 2 (2.5%) members in the ideal weight class.

One major finding is the somatotype status of the staff members. Using the SPI (the somatotype ponderal index) to measure for the somatotype status, the study findings showed that there is significant mean difference in the somatotype status. The males had SPI of 40 that put the average male in the mesomorphous status, while the females had mean SPI of 38 that put them in the endomorphous status. Many studies had noted same trend in the findings (Sodjinou*et al*. 2016; Deswal, and Bozkur 2016), that women are predominantly endomorphous. Further analysis of the somatotype status in the study had descriptively showed there were 31 (38.8%) males in the mesomorphous status and 13 (15.9%) females in the mesomorphous status. Males had 11 (3.8%) endomorphous members while the females had 27 (33.8%) endomorphous members. This means the females were predominantly endomorphous than their male counterparts.

CONCLUSION

The study concluded that there is a significant difference in the Body mass index (BMI) among the Education Faculty staff members. On the average, the females are significantly with more BMI value than their male counterpart, although descriptively both genders are in the overweight BMI health implication status. There is a significant gender difference in the Somatotype status by the means of somatotyping ponderal index (SPI) among the Education Faculty staff members. On the average, the females are significantly endomorphous with lesser SPI value than their male counterpart, who are in the mesomorphous somatotype status.

RECOMMENDATIONS

1. The staff club should be well organized to afford a better avenue for physical exercises for members while the Physical and Health Education Department should project physical exercise programmes to the University community.
2. The staff should be enlightened to check their BMI, heart rate and blood pressure measurements from time to time to ensure that they subject themselves to ideal weight class to avoid the related health challenges.

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