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GENDER DISPARITY IN ANTHROPOMETRIC AND FITNESS CHARACTERISTICS OF UNIVERSITY STUDENTS

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Abstract

Status of anthropometric and fitness characteristics are usually considered as vital tools for health assessment. Although studies have reported that university students exhibit different health-related lifestyles, gender comparative information on anthropometric and fitness characteristics in Ghana is scarce. The study examined gender disparity in anthropometric and fitness characteristics of apparently healthy university students. A cross-sectional descriptive design approach was utilized. 120 randomly recruited university students (mean age 22.01 ± 2.29years, male, 67 and female, 53) participated in the study. Body weight, height, body mass index, waist and hip circumferences, trunk flexibility and static body balance were measured in a laboratory setting. Results showed that male had higher age (P < 0.05), height (P < 0.05), waist circumference (P < 0.05), waist-hip ratio (P < 0.05) and static balance (P < 0.05) significantly. Weight (P < 0.05) and body mass index (P < 0.05) were significantly higher in female. The proportion of anthropometric and static balance characteristics of male university students was higher than female while trunk flexibility of male compared favourably with their female counterparts. To encourage healthy living of female in this study, flexibly modified and friendly physical activity programmes are recommended.

Key word: Gender, Body mass index, Waist-to-hip, Trunk flexibility, Static balance

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Introduction

Gender refers to the array of socially constructed roles and relationships, personality traits, attitudes, behaviours, values, relative power and influence that society ascribes to the two sexes on a differential basis (Vlassoff, 2007). Vlassoff (2007) is of the opinion that gender characteristics do not exist in isolation but are defined in relation to one another and through the relationships between women and men, girls and boys. Gender connotes socially constructed roles, behaviours, expressions and identities of girls, women, boys and men as against sex - the biological characteristics such as anatomy and physiology that distinguish males and females (Health Canada, 2017) as applied in this study. Body size and shape related health problems are some of the concerns of the twenty first century. Also, lack of will-power to take healthy decision exposes most university students to health risk factors and inactivity. Adolescents' health is influenced by lifestyles, access to health care, schools and leisure opportunities, family background, communities and towns (Lazzeri et al, 2014). Being inactive has been adjudged to be one of the main factors declining life expectancy (Lee et al, 2012).

Physical inactivity is associated with becoming overweight or obese and therefore exposes one to the risk of high cholesterol, high blood pressure, bone and joint problems, diabetes, sleep apnea, low self-esteem and social stigmatization (Lieberman, Tybur & Latner, 2013; Pulgarón, 2013; Friedman, 2000; American Psychological Association, n.d.). Physical activity participation to improve range of motion, food consumption and growth prevalence is high in children irrespective of gender. Studies however revealed that participation of female in physical activities drop with aging without reduction in other components (Skelton & Beyer, 2003; Commodore, 1998). Aging has also been linked to more stability (balance) decline in female than male (Iosa, Fusco, Morone & Paolucci, 2014; Addo, 2011; Trudelle-Jackson, Jackson, & Morrow, 2006). These tend to increase susceptibility of female gender to illness or diseases. Gender differences are associated with how illness affects men and women, health-seeking behaviours, availability of support networks, and the stigma associated with illness and disease (Baxter et al, 2016). Men and women respond differently when ill: time before acceptance of illness, recovery time, and treatment women and men receive from family members and society (Vlassoff, 2007).

The field of international health and nutrition has recognised gender discriminations and dynamics as major social determinants of health and nutrition outcomes (United Nations Children's Fund, 2011). Appearance of body sizes sometimes designate condition of health of an individual (American College of Sports Medicine - ACSM, 2014). Measurement of body size is mostly centered on circumference which provides general representation of body composition for both male and female (Tran & Weltman, 1989; 1988). Body composition has meaningful influence on possible range of motion at the anatomical joints when undertaken daily course. Sit and reach is commonly used to assess low back and hamstring flexibility (Jackson & Baker, 1986). The relative importance of hamstring flexibility to activities of daily living supports the inclusion of the sit and reach test for health-related fitness testing (ACSM, 2014).

Positive association between body size and physical activities contributes to improved range of motion, and center of gravity needed to maintain both static and dynamic balance. Literature recommends that strategic use of flexibility training be considered with caution for populations desiring maximum strength development (Stathokostas, Little, Vandervoort & Paterson, 2012; Kovacs, 2006).

Lifestyles of inactivity have been considered high among most university students and in particular female (Agopyan, 2015). These inactive habits expose university student to numerous health risk factors and diseases. Higher institutions of learning remain an experimental stage for youths to exhibit many lifestyles such as trying specific meal and drink without recall to side-effects. University life is connected to health risk drinking of male and female students. Fat accumulation due to poor eating habits is usually associated with the large body size or frame of female gender. Female are also labeled with low fitness center patronage

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and physical activity participation thereby perform poorly in flexibility assessment.

Gender related articles on Ghanaians have been published (Addo, 2011; United Nations, 2014) but none of them considered body frame, trunk flexibility and static balance of university students. Although university students exhibit different lifestyles, anthropometric and fitness characteristics are vital tools for health assessment with many reported significant association of these health indices between male and female, comparative information on body mass index, waist-hip ratio, flexibility and balance body equilibrium in Ghana is scarce. The study examined gender disparity in anthropometric and fitness characteristics of apparently healthy university students.

Methodology

Participants

A cross – sectional descriptive design approach was utilized in this study. One hundred and twenty (120) randomly recruited students (aged between 17 and 32 years) of *Kwame Nkrumah University of Science and Technology, Kumasi* served as participants. The students were sampled from six colleges and consented to participate in the study after awareness discussion about the study objectives. The participants were year two, three or four students who had experience of university lifestyles more than one year. The participants' age were recorded in years. Measurements of body weight, height, waist and hip circumferences, trunk flexibility and static body equilibrium was carried out during the Trade and Technology (TRATECH, 2015) talents exhibition of the Department of Sports and Exercise Science in a laboratory setting using ACSM (2014) procedures.

Instrumentation

PRESTIGE stadiometer (Model HM0016D, India) with weighing scale was used to measure height in meters (m) and weight in kilograms (kg). Body mass index (BMI in kg/m^2) was calculated by dividing weight (kg) with the square of height (m) (Fryar, Gu & Ogden, 2012). Waist-to-hip girth ratio (WHR) was computed as abdominal girth in centimeters (cm) divided by hip girth (cm); waist girth represents the narrowest girth around the natural waist and hip girth reflects the widest girth measured around the buttock (Katch, McArdle & Katch, 2011). Trunk flexibility was measured using the Canadian Trunk Forward Flexion test box. In the trunk flexibility test, the participants removed their shoes, sat and made soles of the feet flat against the sit and reach box at 26cm mark. Inner edges of the soles were placed within 2cm of the measuring scale. Slowly reached forward with both hands as far as possible, the position was held for approximately two seconds. Researchers ensured that the participants kept hands parallel, do not lead with one hand, fingertips overlapped and in contact with the measuring portion of the sit and reach box. The better of two trials of the most distant point in centimeters reached with the fingertips was recorded. Static balance of the participant was measured with standing stroke test that requires the participant to stand on one leg. Participants removed their shoes and placed both hands on the hips, positioned non-supporting foot against the inside knee of the supporting leg. After one minute practice, participant raised the heel to balance on the ball of the foot. The stopwatch was started as the heel is raised from the floor. The stopwatch was stopped if the hand(s) came off the hips, or the supporting foot swiveled or moved (hopped) in any direction, or the non-supporting foot lost contact with the knee, or the heel of the supporting foot touched the floor. The total time in seconds of three attempts, when any of the aforementioned occurred, were recorded.

Statistical Analysis

Data obtained were analyzed using SPSS Statistics 17.0 Data Editor for statistical analysis. Descriptive and independent T-Test analyses were reported in tables 1 to 3.

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Results

Table 1: Descriptive Summary of Anthropometric, Flexibility and Balance Characteristics of Participants

N = 120		Age	Height	Weight	BMI	WC	HC	WHR	Flexibility	Balance
Mean		22.01	1.67	64.92	23.67	72.99	93.79	.77	10.56	80.67
Std. Er of M		.21	1.16	1.12	.58	.89	.92	.01	.74	6.76
Std. Dev.		2.29	1.27	12.26	6.40	9.78	10.06	.10	8.08	74.09
Skewness		1.83	-4.86	.67	6.26	-.47	-1.21	-2.39	-.80	4.19
Percentiles	25	20.66[a]	1.61[a]	56.17[a]	20.52[a]	67.00[a]	88.57[a]	.72[a]	6.14[a]	46.00[a]
	50	21.72	1.68	63.40	22.65	72.62	93.00	.76	11.91	61.00
	75	22.87	1.74	71.25	25.02	78.50	99.20	.81	15.75	87.00

a. Percentiles were calculated from grouped data.

BMI= Body mass index WC = Waist Circumference (cm) HC = Hip Circumference (cm) WHR = Waist-hip Ratio (cm)

Results in table 1 showed the participants' average age (22.01 ± 2.29years), height (1.67 ± 1.27 meters), weight (64.92 ± 12.26 kg), BMI (23.68 ± 6.40 kg/m^2), waist circumference (72.99 ± 9.78 cm), hip circumference (93.79 ± 10.06 cm), waist to hip ratio (0.77 ± 0.10), trunk flexibility (10.56 ± 8.08 cm) and balance (80.67 ± 74.09 seconds). All the variables assume positive kurtosis whereas only age, weight, BMI and balance were positively skewed. 75 percentile ranks of the participants have BMI of 25.02 kg/m^2

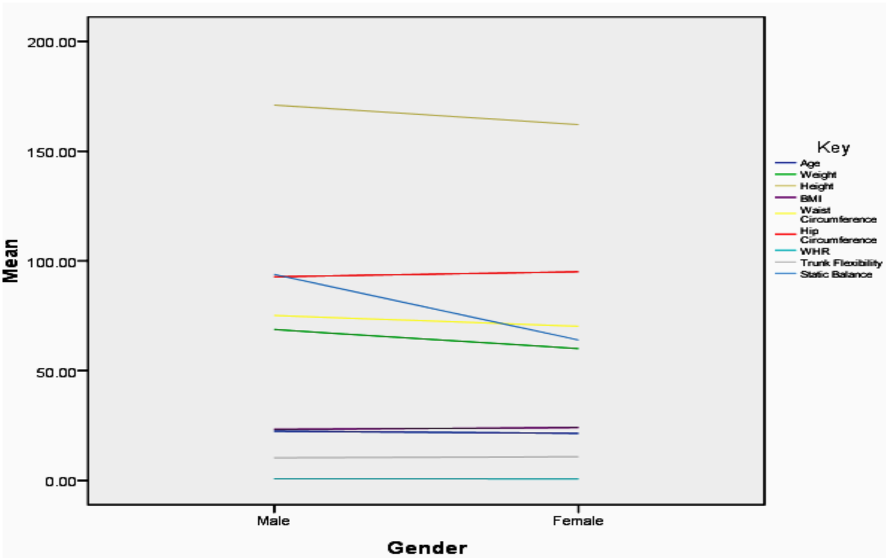

Fig. 1: Gender Anthropometric, Flexibility and Balance Characteristics Distribution

Figure 1 reveals the slope of line of mean of the various variables between male and female.

Table 2: Gender Comparison of Anthropometric, Flexibility and Balance Gender Comparison

Profiles	Gender	Mean	Std. Deviation	Std. Error Mean	Tvalue	Pvalue
Age (yr)	Male	22.42	2.35	.28	2.258	.026*
	Female	21.49	2.11	.28		
Weight(kg)	Male	60.74	10.49	1.28	4.095	.000*
	Female	68.07	12.69	1.74		
Height (m)	Male	1.70	1.53	1.87	4.059	.000*
	Female	1.62	4.93	.67		
BMI (kg/m^2)	Male	22.89	2.95	.36	-.664	.018*
	Female	25.94	9.06	1.24		
Waist Circumference (cm)	Male	75.15	10.08	1.23	2.800	.006*
	Female	70.25	8.73	1.20		
Hip Circumference (cm)	Male	92.78	10.79	1.31	-1.231	.221
	Female	95.06	8.99	1.23		
Waist-to-hip Ratio (cm)	Male	.80	.08	.01	4.807	.000*
	Female	.71	.11	.02		
Trunk flexibility (cm)	Male	10.33	9.06	1.11	-.332	.741

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	Female	10.83	6.71	.92		
Static Balance (sec)	Male	93.86	83.32	10.17	2.231	.028*
	Female	63.98	56.93	7.82		

*Significant at p<0.05.

Table 2 shows that 67(55.8%) of the participants were males and 53 (44.2%) females. Females' BMI was more than the males ($25.94 \pm 9.06 > 22.89 \pm 2.95$ kg/m^2). Males have more static balance than females ($93.86 \pm 83.32 > 63.98 \pm 56.93$seconds). In WHR, males have higher value than females ($0.80 \pm 0.08 > 0.71 \pm 0.11$cm). Significant difference exists in age, weight, height, BMI, waist circumference, waist to hip ratio and balance ($p<0.05$).

Discussion

The study compared anthropometric and fitness characteristics of apparently healthy male and female university students. Our findings showed that these university students generally have WHR and BMI value regarded as normal by ACSM (2014). Female students in this study were younger in age, shorter in height and had higher weight and BMI compared to their male counterparts. These findings corroborate the work of Agopyan (2015) who found that male students had higher means than females in all anthropometry parameters except percent body fat of students among school of Physical Education and Sports in Turkey with regard to gender and three different departments. Earlier studies also reported that females usually have higher BMI and overweight values compared to males (WHO, 2011; Huxley, Mendis & Zheleznyakov, 2010). The waist circumference of these university males was higher than that of the females as against higher hip circumference in female participants. A study on the abdominal obesity as indicators of waist circumference or waist-to-hip ratio in Malaysian adults' population showed that males had higher mean of WC and WHR compared to female in a study (Ahmad et al, 2016). This is in line with earlier submission that males have higher waist to hip ratio than female (Klein et al, 2007).

The sit and reach flexibility value of the females (non-athletes) in our study was not significantly different from that of males although studies have shown that female athletes have better range of motion than males (Mitani, 2017; Merino-Marban, Romano & Mayorga-Vega, 2014). Physical activities, exercises and athletic trainings are reported vital core indicators of differences in hamstring and low back range of motion between male and female (Egwu, Mbada & Olowosejeje, 2012).

Literature in support of favourable disposition of females to flexibility at the expense of males abounds (Egwu et al, 2012; Decker et al, 2003; Sullivan et al, 1994; Battié et al, 1987). This study however admits contrary view but rather concedes possible effects of physical activities as documented by ACSM (2014). ACSM, (2014) stressed that flexibility depends on distensibility of the joint capsule, adequate warm-up, muscle viscosity, compliance of ligaments and tendons. Physical activity participation of male could be possible reason for their better static balance performance.

Our study showed that university male students performed better in static balance than female. This connotes that males have higher and fixed base of support that allows easy movements around the center of gravity (Melo et al, 2017; Dorneles, Pranke & Mota, 2013). Study has documented a significance correlation between balance and sports skill performance (Sekulic et al, 2013). Study conducted by Iosa, Fusco, Morone & Paolucci (2014) documented that development of balance has sexual implications as permanent sexuality which replaced female estrus has effect on the phylogenetic development of upright gait. With respect to gender, Sekulic et al, (2013) showed that balance skills were significantly related to sports performance for men but not for women. Outcome of this study does not support the assertion of Mazzà et al, (2009) who reported that females have better control strategy to reach higher accelerations than males.

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Conclusion

This study replicates previous findings of disparity in genders' anthropometric and static balance characteristics but admit no difference in trunk flexibility performance. The proportion of anthropometric and static balance characteristics was higher in male university students than female while trunk flexibility of male compared favourably with their female counterparts. Age differences may account for the observed disparities as male university students were averagely older than their female counterparts. Active physical activity participation, friendly physical activity programmes and specific stretching exercises wound play vital roles in bridging identified disparities and enhance healthy living.

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