

Comparing Average Body Measurements of Early Adolescent Girls in Sekondi-Takoradi Metropolis and that of the Western World

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Abstract

There are no standardized body measurements developed from the body measurements of Ghanaians and more so adolescent girls. The purpose of this exploratory study was to establish average body measurements of early adolescent girls of ages 12 to 14 with the view to compare the body measurements with that of the western world. Survey and quasi-experimental designs were used for the study. The accessible population of the study consisted of adolescent girls from 95 public JHS in Sekondi-Takoradi estimated at 9,761. The Multistage Sampling method was used to select respondents after using the Taro Yamane's formula to determine the sample size of 384. Body measurements were established using means and standard error of measurement. The study revealed a significant deference in the mean body measurements for bust, waist, hip and nape to waist of early adolescent girls of ages 12, 13 and 14 in Sekondi-Takoradi and those in the western world at an alpha level of 0.05. It was therefore recommended that standard body measurements be developed for used by the Fashion industry in mass production of garments for adolescent girls.

Keywords: body measurements, early adolescent, standardized, fashion industry, fit

INTRODUCTION

An admirable appearance is the desire of every individual and this can be accomplished among other things through adequate clothing and well fitted garments. Clothes play an important role in the lives of all individuals with appearance being the most apparent individualistic characteristic (Damhorst, Miller-Spillman & Michelman, 2005). A perfect fit of clothes is important to all individuals and measurements play a key role in obtaining an ideal fit. According to Hwang and Istook (2001) it is impossible to address the consumer's problems with fit without a set of accurate body measurements. Strydom and de Klerk (2006) added that in order to ensure well-fitting garments and good fit in general, it is of the utmost importance that manufacturers of apparel should have a sound knowledge on exactly how and where on the body the various measurements should be taken.

Tailors and seamstresses in Sekondi-Takoradi till date depend heavily on taking individual measurements of customers or clients whenever they want to construct a garment. Obviously, it will be difficult to satisfy the demand for clothing with this small scale method of production. Presently, there is no conclusive study on average body measurements of Ghanaians that can be used in drafting patterns for different categories of persons. It is therefore essential to establish average body measurements for early adolescent girls.

STATEMENT OF THE PROBLEM

Standard body measurements are very essential to manufacturers of clothing especially in the production of perfectly fitted garments. It is unfeasible to attain a good fit without a set of precise physical measurement, a basic knowledge and a skill in taking body measurement. Igbo and Iloje (2003) affirmed this by saying that producing well fitted clothes for adolescents is a function of accurate body measurements.

Currently, the sizing system used in the construction of patterns in Ghana are made for Caucasians whose body measurements according to Ashong (2004) are different from Ghanaians who are of the black race. To the writer, the Ghanaian female figure is different from that of the Western female's and thus will not fit into the western sizing system accurately because of the apparent difference in body structure and postural alignment. To Kaka (1990) these problems are magnified where children's garments are concerned since growth rates are more rapid and varied in their age ranges. The Western world's sizing system sometimes makes it difficult for adolescent African girls to get their correct sizes and fits. It makes it necessary for Ghana and for that matter the black race to develop its own standard body measurements.

PURPOSE OF THE STUDY

The purpose of the study was to establish average body measurements of early adolescent girls in

Sekondi -Takoradi with the view to compare the body measurements with that of the western world.

SIGNIFICANCE OF THE STUDY

Large scale clothing construction industries such as producers of school uniforms will find the average body measurements and block patterns useful as these average body measurements and block patterns produced from this study could be used to mass-produce garments for early adolescent girls.

Findings from this study will be very useful to many groups of individuals including Clothing and Textiles students as it will help them to learn how to develop block patterns which can be adapted to various styles. It will also help clothing and textiles teachers through the provision of information on how to draft and prepare block patterns for early adolescent girls. The findings of this study have implications for tailors/dress makers as they can adopt and adapt the block patterns produced from this study into various styles and use them in mass production of clothes for early adolescent girls. Average body measurements and block patterns produced in this study could be of help to novices in clothing construction and home sewers in the area of producing garments for early adolescent girls. The study has inference for entrepreneurs who could adapt the basic blocks in varied styles for mass production and thus fill the gap of the scarcity of commercial patterns in Ghana.

This study also has implications for Nutritionist and researchers in Nutrition as the body measurements could serve as anthropometric data which could be used for nutritional assessment. The study further has connotations for the government of Ghana since the findings could help in job formation in Ghana as some entrepreneurs could get into the business of pattern making thereby providing employment for the youth. Some researchers could be encouraged by the government of Ghana to get into mass production of patterns which in turn will be of great use to clothing manufacturers and uniformed organizations like, the police, the army, the air force, the navy and other uniformed groups.

Finally, findings from this study have added to information about body measurements among early adolescent girls and their classification in relation to age and the corresponding block patterns.

OBJECTIVES

The specific objectives of the study were to:

1. determine the average body measurements of early adolescent girls aged between 12 and 14 years.
2. identify body measurement(s) that showed marked variation(s) for the study group.

HYPOTHESES

1. Ho: There is no significant difference between the mean body measurements for bust, waist, hip and nape to waist of early adolescent girls of ages 12, 13 and 14 in Sekondi-Takoradi and those in the western world.

LIMITATIONS OF THE STUDY

There were several limitations to the study. The cross-sectional design used in the research provided a snapshot of the variables included in the study at one particular point in time. The situation may provide differing results if another time-frame had been chosen. The design cannot measure change because it studies a cross-section of a population at a single point in time (Ary, Jacobs & Razavieh, 2002). Another limitation of the study was the relatively small sample size. For this reason, the result from this study may not be generalized to the entire early adolescent population of Ghana.

Other limitations included factors relating to subjects being measured such as illness, fatigue, mood, posture, physical features and external factors such as markings on the measuring instrument, flexibility of tape measure and illumination of space where the measurements took place. Also, there was a limitation with the measurements taken as research assistants employed had varying skills of measuring with tape. According to Minott (1978) this has effect on measurements because each person has a different "hand" with the tape measure with the most common error being measuring too tightly. Finally the study did not account for fit problems caused by postural problems.

LITERATURE REVIEW

The figure of an individual goes through change from day to day and the physical state and mood of an individual may affect some measurements. Also, it is very essential that during measurements a careful look at the personal features or characteristics of the individual figure, shape and stance whether ideal or not, upright posture, sloping or rounded shoulders, hollow back should be carried out as this will help in producing accurate average measurements. Other factors come from the personnel taking the measurements. These factors include the knowledge of the personnel in taking accurate measurements and the sight of the personnel. External factors such as markings on measuring instruments, flexibility of tape measure and illumination of space also affects the accuracy of body measurement. For measurements to be accurate, a number of guidelines which include measuring over non-bulky overdresses must be observed (Mathews, 1986). With these factors being positive, accurate physical measurements were obtained leading to accurate average body measurements for adolescent girls in Sekondi-Takoradi.

Conceptual Framework

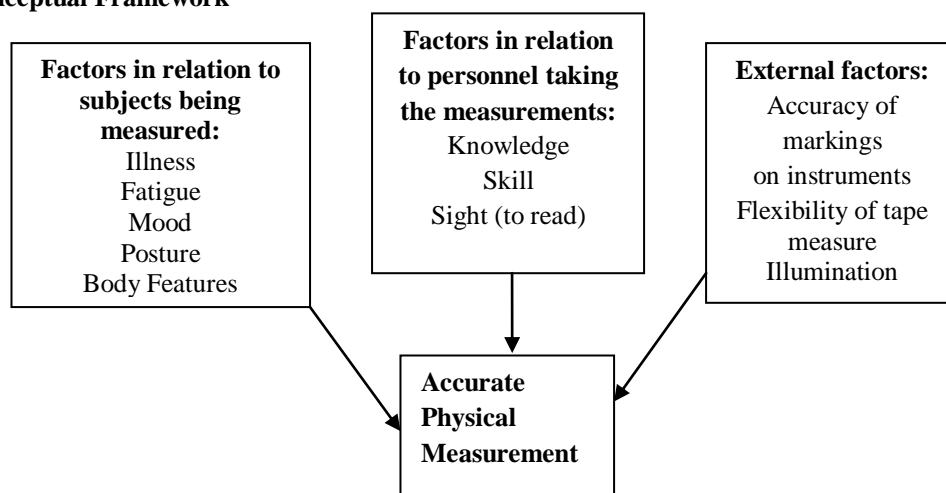


Figure 1. Schematic Representation of the Factors that Affect the Accuracy of Standard Body Measurements

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CONCEPT OF BODY MEASUREMENTS

Accurate body measurements are of fundamental importance for obtaining best results in garment construction. Besides good fitting, accurate body measurements can also contribute towards saving time in constructing a garment. Taking body measurements is a responsible task, which should be undertaken with great care (Mathews, 1986). There are two methods of taking body measurements, namely, the direct measurement and the obtained measurement. The direct measurement is obtained by measuring a figure and recording the measurement. The obtained measurement is attained by the calculation of the proportion of one or two basic

measurements (Bray,1994). In order to construct garments that fit well, body measurements must be taken with precision. One can draft original patterns based on these measurements which can be used as the basis for a variety of styles. The preparation for taking body measurements is very important for obtaining accurate result. These culminated into how fit apparels are. Fit is the relationship between the clothing item and the body.

Early adolescence is the ages between 13 and 15, but it could begin as early as age 11 (Elkind, 1974). Progress in growth and developmental milestones is age related, occurs in stages and has a normal pattern. There are different patterns of growth for particular age groups, from the prenatal period to adolescence. However, there is a range in age at which certain body size and developmental milestone are attained (Gupta, 1990).

METHODOLOGY

The methodology utilized for the study has been discussed under the area of the study, design of the study, population, sample and sampling procedure, instruments for data collection, procedure for data collection and data analysis techniques.

The study was carried out in Sekondi-Takoradi Metropolitan Area in the Western Region of Ghana. Sekondi-Takoradi which is the only twin city in Ghana is the regional capital of the Western Region. The region had a population of 2,376,021 as at 2010 (Ghana Statistical Service, 2010). On the educational front, the metropolis has a total of 95 public basic schools with a female population of 9761. The city has been divided into 11 circuits under the Ghana Education Service (GES) and each circuit consists of at least seven public schools.

The research design was cross-sectional survey and quasi experimental design. Population comprised of all adolescent girls from public Junior High Schools (JHS) in the Sekondi-Takoradi Metropolis with a total population 9761 (Enrolment Data as at February, 2010). Sample size was calculated based on the Taro Yamane’s formula for sample size determination for estimating proportion in a finite population (Uzoagulu, 1998).

Equation 1: The formula is $n = \frac{N}{1 + N(e)^2}$

Where; n = the sample size, N= the finite population, e = level of precision, 1 = unity (constant)

$n = \frac{9761}{1 + 9761 (0.05)^2}$, n = 384

A sample size of 384 was obtained. The multistage sampling procedure was used in selecting the sample. The first stage of sampling was the selection of schools. Here, the stratified sampling technique was used to select 11 schools. Each school was randomly selected from each of the 11 circuits. The second stage of sampling had to do with the selection of adolescent girls as sample for the study. The criterion for sampling the adolescent girls was their ages. The simple proportional representational method was used in determining the number of adolescent girls selected from each school. Random sampling technique was employed in selecting the subjects in each class. The 12, 13 and the 14 year olds recorded 128 respondents each across the schools. Table 1 gives detailed report on the sampling procedure.

Table 1: The Distribution of the Sample across the Schools

School	12yrs	13 yrs	14yrs	Total
All Saints Anglican	15	15	15	45
Axim Road Key	15	14	15	44
Wesley Methodist	15	14	14	43
Anaji M/A	14	14	14	42
Essikado Catholic	14	14	14	42
Nana Katabra	14	14	13	41
Ketan Catholic	14	13	13	40
Nana K. Gyan	7	8	8	23
Dr. Wilkie Memorial	7	8	8	23
T I Ahmadiyyah	7	7	7	21
Defence Basic	6	7	7	20
Total	128	128	128	384

Body Measurements Guide (BMG) was used to collect data. The body measurement guide was developed based on essential body measurements needed for constructing basic blocks.

Data was collected following these phases:

- 1) Training of research assistants
- 2) Administration of the instruments
- 3) Establishment of the body measurements

The data collected were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software making use of both descriptive and inferential statistics. Giving the research design, the nature of the objectives stated and the null hypotheses, the main statistical tools employed were means, standard deviations, percentages and one-sample T-test.

RESULTS AND DISCUSSION

The Average Body Measurements of Early Adolescent Girls of ages 12, 13 and 14 in Sekondi-Takoradi

The first objective of the study sought to find out the average body measurements of early adolescent girls of 12, 13 and 14 years of age in Sekondi-Takoradi Metropolis. Descriptive statistical analysis was done

to determine the mean body measurements and the standard error of measurements (SEM) of the study sample. The result is shown in Table 2.

Table 2, indicates that the mean for most of the body measurements progressed with age. The 14 year olds had the highest values followed by the 13 year olds, while the 12 year olds had the lowest mean values. From the results of the study, it can be said that age in most instances is proportional to physical growth in size. The gradual increase of values across the age ranges could be due to the higher activity of the growth hormone for attaining sexual maturity. During early adolescence period, growth could be said to be a continuous process since activity of growth hormones at this stage is high. This is affirmed by Oyewale, Ojo, Adebisi, & Danborn, (2010) where they stated that human growth and maturation is a continuous process and transition from childhood to adulthood is not abrupt. The period of adolescence encompasses rapid change in physical growth and maturation. It was also realised from the findings that, the assertion by Aldrich (1994 p. 7) which states that “during puberty, age ceases to have even a descriptive value as variations in height linked to heredity are further distorted by the variability of the

onset of puberty and the growth spurt” may not always be the case. Based on the findings (Table 2) the mean body measurements, particularly for height,

bust, waist and hip increased gradually from age 12 to age 14.

Table 2: Mean Body Measurements (cm) for the Age groups of 12, 13 and 14

Variable	12 years (N=128)		13 years (N=128)		14years (N=128)	
	Mean	SEM	Mean	SEM	Mean	SEM
Height	150.28	0.56	154.27	0.55	156.16	0.48
Bust Circumference	76.97	0.56	80.43	0.49	81.83	0.55
Waist Circumference	68.77	0.50	70.71	0.46	71.05	0.64
Hip Circumference	88.09	0.65	91.05	0.61	92.89	0.71
Width B/n Breast Pts	17.46	0.15	18.10	0.14	18.18	0.14
Shoulder length	11.78	0.23	12.07	0.13	12.87	0.36
Width across chest	29.51	0.18	30.48	0.23	31.68	0.30
Front shoulder to waist	38.61	0.25	39.52	0.27	40.84	0.28
Base of throat to waist	32.08	0.24	33.70	0.26	34.72	0.28
Nape to Waist	36.30	0.25	37.14	0.25	38.28	0.26
Back Shoulder to waist	38.34	0.23	39.21	0.24	38.80	0.22
Waist to hip	21.18	0.25	20.74	0.21	21.30	0.22
Waist to knee	52.0	0.48	54.06	0.37	64.17	0.40
Over arm length	54.84	0.28	57.01	0.26	57.83	0.24
Under arm length	38.44	0.32	38.80	0.30	38.93	0.38
Wrist	18.16	0.16	19,21	0.18	18.73	0.15
Bicep	26.36	0.26	27.64	0.25	27.86	0.29
Shoulder-to-elbow	29.10	0.26	30.65	0.18	31.24	0.16
Elbow	27.10	0.26	28.34	0.35	28.16	0.16

The second objective was to identify body measurement(s) that showed marked variation(s) for the respondents. The widest distributions of values were found in the means for bust, waist, hip and height measurements. The least spread was found in the shoulder length and wrist measurements (Table 2). Variables that showed marked variations were height, bust, waist, hip and waist to knee. For the age group of 12, the mean measurements for height, bust circumference, waist circumference, hip circumference and waist to knee had standard error of the mean of 0.56, 0.56, 0.50, 0.65 and 0.48 respectively, meaning there were significant deviations than the rest. These significant variations in the 12 year group were repeated in the 13 and 14 year groups. Bust development of a girl is the most

dramatic change in shape and the age at which the different development stages of maturity are reached can differ widely (Aldrich, 1999). This means that children of 12 to 14 years of approximately equal heights and weights can have varying measurements especially around the bust area.

HYPOTHESIS

The null hypothesis which states that there is no significant difference in the mean body measurement for bust, waist, hip and nape to waist of early adolescent girls of ages 12, 13 and 14 compared to those in the western world, was tested using one-sample T-test at an alpha level of 5 percent. The proprietary data obtained was compared to the body measurements in Aldrich (1994).

Table 3: T-Test Results of Early Adolescent Girls of ages 12, 13 and 14 in Sekondi-Takoradi

Measurement	Age	Mean	Std. Deviation	Std. Error
Bust	12	76.97	6.32	.56
Waist	12	68.77	5.62	.50
Hip	12	88.09	7.30	.65
Nape to Waist	12	36.30	2.78	.25
Bust	13	80.43	5.56	.49
Waist	13	70.72	5.23	.46
Hip	13	91.06	6.92	.61
Nape to waist	13	37.14	2.79	.25
Bust	14	81.83	6.26	.55
Waist	14	71.05	7.27	.64
Hip	14	92.90	7.99	.71
Nape to waist	14	38.28	2.91	.16

Table 4: Comparison of the Mean Body Measurements and Children's' International Standard Measurements for Age 12

Measurement	Test Value	T	Df	Sig.(2-tailed)	Mean Diff	95% confidence Interval of the difference	
						Lower	Upper
Bust	79	3.630	127	.000	-2.027	-3.132	-.922
Waist	67	3.572	127	.001	1.773	.791	2.756
Hip				.000	4.090	2.817	5.367
Nape to waist	35.8	2.025	127	.045	0.497	.011	.982

The mean of the bust for a sample of 128 students aged 12 years in Table 3 was 76.97. Comparing this mean with the hypothesized value (test value = 79) (Table 3) reveals a statistically significant difference (p=0.000). It can be concluded that this group of adolescents have a significantly lower mean (mean difference = -2.027) (Table 4) on the bust than 79. Again, the mean for the waist circumference for this particular sample was 68.773. This revealed a

statistically significant difference (0.01) from the test value of 67. It can be concluded that this group of adolescents had a significantly higher mean on the bust than 79. Furthermore, the mean for the hip was statistically different from the hypothesized mean of 84 (p=0.000). It can be concluded that this group has a significantly higher mean on hip than 84 (mean difference=4.090). There is also a statistically significant difference (p=0.045) on nape to waist scores of 36.2 from the hypothesized mean 35.8. It can be seen that the study sample had a significantly higher mean on nape to waist scores than that of international standard which is 35.8.

Table 5: Comparison of the Average Body Measurements (cm) Obtained with the children's International Standard Measurements for Age 13

Measurement	Test Value	T	Df	Sig.(2-tailed)	Mean Diff	95% confidence Interval of the difference	
						Lower	Upper
Bust	85	9.308	127	.000	-4.578	-5.542	-3.599
Waist	70	1.548	127	.124	0.715	-.119	1.629
Hip	90	1.724	127	.087	1.055	.155	2.265
Nape to waist	38.6	5.936	127	.000	-1.463	-1.951	.976

The 13-year old group of adolescents had a significantly lower mean on bust (p=0.000) with a mean difference of -4.570 and nape to waist (p=0.000, mean difference = -1.463) than their

hypothesized mean of 85 and 38.6 respectively. On the other hand, waist e and hip did not show any statistically significant difference.

Table 6: Comparison of Average Body Measurements (cm) Obtained with the Children's' International Standard measurements for age 14

Measurement	Test Value	T	Df	Sig.(2-tailed)	Mean Diff	95% confidence Interval of the difference	
						Lower	Upper
Bust	85	5.727	127	.000	-3.168	-4.263	-2.073
Waist	70	1.634	127	.105	1.051	-.223	2.323
Hip	90	4.096	127	.000	2.895	1.496	4.293
Nape to waist	38.6	1.253	127	.213	-.323	-.832	.187

Bust for the study sample (14 years) was statistically significant (p=0.000) and had a significantly lower

(mean difference = -3.168) than the test value of 85. There is also a statistically significant difference

($p=0.000$) on hip from the hypothesized mean of 90. It can be concluded that this group of students have a significantly higher mean (mean difference=2.895) on hip than 90. Waist and nape to waist measurement on the other hand, did not show any statistically significant difference.

From Table 4, Table 5 and Table 6 it is evident that many of the measurements obtained from the current study did not seem to comply with measurements from Aldrich (2006) and Bray (1994). This might be as a result of the fact that the figures of the subjects measured in this study were different from figures of adolescents in Europe and America. The study affirms the assertion made by Ashong (2004) that the Ghanaian female figure is different from that of the Western female figure and thus the Ghanaian female figure will not fit into the western sizing system accurately because of the apparent difference in body structure and postural alignment. This assertion is also affirmed by Kaka (1990) when he stated that these differences are magnified where children's garments are concerned since growth rates for the Caucasians are more rapid and varied in their age ranges. Armstrong reiterated that every country sets its own standards because of the variations in the physical composition from the sub region.

The adolescents of Caucasian origin may be slimmer in size than the children used for the study nonetheless some of the measurements were similar for the two localities. This may be due to the small sample involved in the research. The difference may also be as a result of the type of food eaten in Ghana. The staple foods of Ghanaians are more of carbohydrate and energy giving foods. The adolescents in this study might be stockier than their counterparts in Europe when considering the measurements in Aldrich (1994). Their counterparts from Europe and America seem to be taller. Poverty might be the contributing factor to this effect since protein foods like fish, meat and poultry are not easily within reach of many of the inhabitants especially in the rural areas.

Eveleth and Tanner (1990) concurred that adolescent anthropometry varies significantly worldwide and that many of the differences observed according to chronological age categories are attributable to variation in maturational timing and diminish when the timing of the adolescent spurt is considered. It is clear however, that growth differences among groups are related to nutritional status, socioeconomic levels, degree of industrialization/urbanization and altitude of residence. For individual adolescents, growth may be limited by factors as prolong under nutrition, infection and chronic disease.

SUMMARY

Ghana has no standard body measurements for its fashion industry and as a result only the western world body measurements are used. These western standard body measurements have been in use over a long time in Ghana. The study was to find out the difference between standard body measurement of adolescent Ghanaian girls and that of the people of the western world. Exploratory Survey and quasi-experimental designs were the research designs used in this research. Total population for the study consisted of adolescent girls from 95 public JHS in Sekondi-Takoradi estimated at 9,761. The Multistage Sampling method was used to select respondents after using the Taro Yamane's formula to determine the sample size of 384. Body measurements were established using means and standard error of measurement. The study revealed a significant deference in the mean body measurements for bust, waist, hip and nape to waist of early adolescent girls of ages 12, 13 and 14 in Sekondi-Takoradi and those in the western world at an alpha level of 0.05. It was therefore recommended that standard body measurements be developed for used by the Fashion industry in mass production of garments for adolescent girls.

CONCLUSIONS

Naturally, at adolescent certain parts of the bodies such as busts and hips enlarge whilst other parts reduce to provide a good shape. The body stores fat at the hips, buttocks, legs whilst the waist become smaller and back waist length increases as they grow taller. Statistical analysis revealed significant differences in the average body measurements of early adolescent girls from Sekondi-Takoradi as against those in the western world. Growth difference among groups are related to nutritional status, socioeconomic levels degree of industrialization and altitude of residence. Significant developmental changes occurring in the growth of adolescents from both groups required consideration in terms of developing sizes since there were increases in nearly every one of the mean values for each body measurement recorded across the ages. The period of adolescence encompasses rapid changes in physical growth and maturation hence, the mean body measurements of the early adolescents which progressed with age suggest it would be impossible to use same measurement for basic block of same ages across the world.

RECOMMENDATIONS

Based on the findings, the following recommendations have been made:

1. The Mean Body Measurements obtained from this study should be made available to students and teachers of Clothing and Textiles in Ghana for use in their pattern drafting courses.

2. Seminars should be organised for persons in clothing construction industry on the use of blocks to improve their output both in quality and quantity.
3. Data obtained from this study will serve as basis for further research in body measurements.
4. Where a standard body measurement is created for Ghanaians and for that matter Africans because of this report, garments will be produced efficiently hence using little time and resources. This will go a long way to help sustain and improve national development.

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