Compatibility Of Body Dimensions Of Nigerian Students To The Classroom Armchairs In An Asian University

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Abstract: This study determined the Compatibility of the Body Dimensions of Nigerian BS Marine Engineering and BS Marine Transportation Students to the Classroom Armchairs of Lyceum of the Philippines University – Batangas LIMA Campus. This study used a descriptive method of research wherein the quantitative data were gathered using a survey questionnaire to determine the body dimensions of the respondents (lower and upper extremities), and to identify the extent of problems encountered by the Nigerian Students in the academic performance related to classroom armchair. The respondents of the study were Bachelor of Science in Marine Engineering and Bachelor of Science in Marine Transportation. The students from all groups of different class hours have the possibility to encounter very little problem in their academics due to their classroom armchair. The body dimensions of First Year Nigerian students were larger than the classroom armchairs at the LIMA Building but fitted in the armchairs of new building. The results also showed that there is no significant difference between the problems encountered by male and female Nigerian students when it comes to their classroom armchair. The LIMA administration must continually improve the resources of the University and investing for the safety and comfort of the students can be an opportunity for the school to grow for the next coming years..

Index Terms: Academic Performance, Anthropometry, Body Dimension, Classroom Armchair, Compatibility, Nigerian Students, Ergonomics.

1 INTRODUCTION

Ergonomics is the application of scientific principles, methods, and data drawn from a variety of disciplines to the development of engineering systems in which people play a significant role. Among the basic disciplines are psychology, cognitive science, physiology, biomechanics, applied physical anthropometry, and industrial systems engineering [1]. To design things to fit the human body, we must know the dimensions of people. Anthropometry measures all physical aspects of your body. Simple measurements include height and width. But a more thorough body of measurements is usually needed for Human Factors work. Measurements such as the length from your elbow to the tip of your finger or the circumference of your skull are some examples. In a complete anthropometric survey measurements are taken between every joint and across hinge joints (such as the knee and elbow). Range of motion is also recorded. Thickness or girth is measured as well [2]. In the human body, some groups o anthropometry data vary with each other in such a way that as one increases (or several other increase) as well; this is true among many body heights, weights, age, and circumstances. Conversely, as on dimension increases, others may decrease; for example, as one advances into old age, many body heights decreases. In statistics, this relationship is called co-variation [1]. Most people today spend more time sitting than they do in any other position. Unfortunately, many people will eventually experience unnecessary pain, predictable degenerative changes, and even physical impairments and workplace disability as a result of poor posture habits [3].

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The detrimental effects of improper classroom furniture on the spine have been known for a long time. The dynamics of sitting can best be understood by studying the mechanics of both the relevant body parts and the external support system involved [4]. In any given population on the planet women are smaller than men, so if the population set is for both men and women then the smallest extreme is the 5th percentile woman with the larger extreme being the 95th percentile male. This is the most common anthropometric range used when "everyone" needs to be able to do whatever is being looked at. If it is not required that "everyone" needs to do it, but only most then the 50th percentile is commonly used meaning that about half of the population is supported [2]. This study will help the Nigerian students to know the compatibility of their body dimensions in the existing classroom armchairs at LPU-B LIMA campus. In addition, this study can also prevent the problems encountered by the Nigerian students in the academic performance related to classroom armchair. Through this research, engineering students and the future researchers will encourage them to continue pursuing engineering program and other discipline which require sort of analysis about anthropometric measurements.

2 Objective of The Study

The main purpose of the study is to determine the compatibility of the body dimensions of Nigerian students to the classroom armchairs, specifically; to determine the profile of the Nigerian students in terms of gender and average class hours in a day; to determine the body dimensions of Nigerian students in terms of Stature Height (Sitting), Popliteal Height (Sitting), Buttock-to-popliteal length, Elbow height (Sitting), Lower arm length(Sitting), Knee height (Sitting), Hip width (Sitting), Shoulder Width (Sitting); to identify the degree of pain experienced by Nigerian students while seating on classroom armchairs in terms of upper extremities and lower extremities; to determine the extent of problems encountered by the Nigerian Students in the academic performance related to classroom armchair; to test the compatibility of classroom armchair to the body dimension of the Nigerian Students using anthropometrical measurement; to test the differences in the

problems encountered by the Nigerian Students in the academic performance related to classroom armchair when they are grouped according to profile. Ho: There is no significant difference in the problems encountered by the Nigerian Students in the academic performance related to classroom armchair when they are grouped according to profile. According to National Health and Nutrition Examination Survey (NHANES) [5] Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. Measures of subcutaneous adipose tissue are important because individuals with large values are reported to be at increased risks for hypertension, adult-onset diabetes mellitus, cardiovascular disease, gallstones, arthritis, various forms of cancer, and other diseases. Combined with the dietary and related questionnaire data, and the biochemical determinations, anthropometry is essential and critical information needed to assist in describing the data collected from persons. Matching furniture to anthropometric measurements is an important factor that should be taken into account in school furniture design [6], [7]). Anthropometric measures vary among individual, races and nations and it changes over time as populations and their environmental conditions change. Due to that, it is very important to get the students' body measurement and to alter the school furniture size so that the furniture provided is suitable with the user and enhance good sitting and standing posture [8]. Molenbroek, et al., [9] stressed that based on anthropometric data, every country can design furniture for their own fitting schoolchildren. This would require up to date measures from the relevant population. Base on that, a study has been made to evaluate mismatch percentage between Malaysian secondary students' anthropometry with existing school science laboratory furniture and also the new design of furniture that being proposed by manufacturer to government. Percentiles serve the designer in several ways. First, they help to establish the portion of a user population that will be included in (or excluded from) a specific design solution. Percentiles are easily used to select subjects for fit tests. Anybody dimension, design value, or score of a subject can be located exactly. The use of percentiles helps in the selection of persons who can use a given product [1]. According to the bulletin that releases by Labyad [10] suitable height for laboratory workbench or table in doing light work is from 86.4 to 94.0 cm. Prior to that, some general comparison can be made between the results from this study and recommendations in the literature whereby table height that been measured in this study either from old type or new type are in the range or specification where the values is 92.0 cm and 90.0 cm. Furthermore, performing tasks at an appropriate workstation table height would help reduce low-back loading and potentially disability [11]. The major part of the research on the seated working position is focused on the forward leaning posture, probably because of the predominant interest in adult subjects, and their occupations in offices or factories. Therefore, the results obtained from studies on adults cannot automatically be applied to school children. In the school setting, it is quite important to note the different ways of seating through different school activities. Such activities are leaning backward while resting or watching the blackboard, and leaning forward when writing or reading [7]. Chaffin, et al [12] confirmed that the feet should firmly rest on the floor or foot support to prevent the thighs from supporting the weight of the lower leg. For the maintenance of a good sitting posture for students, classroom furniture plays a prominent role [13]. Knight and Noyes [14] observed that two major functions of school furniture are to support the student when attending the lecture and when writing or drawing on the working surface, and these activities require adoption of different physical positions by the student. Molenbroek, et al [9] noted that various designs of school furniture have been promoted to improve the posture and mobility of the user. Jung [15] also noted that adjustable prototype tables and chairs were developed and evaluated. A mismatch between the length of thigh and seat depth has been shown to be related to discomfort while a mismatch in seated elbow height and desk height is related to neck and shoulder pain [16]. Helander, et al [17] observed that anthropometric dimensions of the user population are essential in the design of workstations for a healthy and comfortable posture. The study of the mechanics of the relevant body parts and external systems while sitting have shown that seventy –five percent (75%) of the body weight is supported by only 26cm² of sitting surface resulting in high compressive stress [18]. In these studies, Generally, Pearson correlation and regression coefficients have been used to determine the bivariate relationships between body weight and various body measurements. For analyzing multiple relationships among all traits, use of Multiple Regression Analysis (MRA) is the simple way to predict body weight using these body measurements. However, MRA produces biased estimates under some, especially multicollinearity problem etc. [19]. However, use of Regression Tree method which is more advantageous compared to classic methods is scanty in animal science [20], [21]. Children spend a large part of their times in the classroom. School age is a vital period for child development. Regarding low back pain, sitting posture is the most troublesome situation. Some studies showed that design of school furniture is one of the contributing factors to back pain among pupils [22]. Research has implicated that mismatch between school furniture and body size may be regarded as a causative factor for musculoskeletal disorders amongst pupils [4]. For this reason, conducting a study to help develop appropriate design strategies for school furniture design is necessary. In order to reach an optimal fitness between school furniture and the pupils, the furniture should be designed according to psychophysical characteristics of the users as well as educational environment specifications. There are very few developing countries, which have anthropometrical data of school children for the purpose of furniture design [23]. Data obtained from anthropometric dimensions indicates that there are a lot of differences even between people of the same race and nationality differences who make up the population of students in universities across Malaysia. The purpose of this study is to find the mismatch between the anthropometric dimensions and the current furniture used in classrooms of universities in Malaysia. Several mismatches are found and this leads to the conclusion that the design of furniture used in the classroom needs to be improved to better accommodate the studying process of the students [24]. The student's sitting posture is influenced by the activities performed in the classroom, but also by the anthropometric measures of the children and the measurements and design features of the school furniture they use [25]. According to Melemez, et al [26], furniture has a significant effect on human health. Thus, it is essential to use anthropometric data to guide the design of school desks and chairs. However, because anthropometric

measures vary among nations and ethnic groups and change over time as populations and their environmental conditions change. As a result, the anthropometric data used in the design of the equipment used in Turkish higher education are based on anthropometric data from other countries and thus do not represent the average body measurements of the Turkish people. The 84 to 88 percent of students time will be spend at school while they are in sitting position. There are other complementary reports which shows that 80% of student's time will be spend while their arms are on the desk or in writing position and only 32 percent of their time are spending on learn on the padding of the chair [27].

3 Method

Research Design

This study used a descriptive method of research wherein the qualitative data were gathered using anthropometry to determine the average sitting preference in the proposal of the armchair for the Nigerian student in the Lyceum of the Philippines University - Batangas at Brgy. Cuta Batangas City.

Participants

The participants of the study were composed of 41 Nigerian students, 26 students are male and 15 students are female of Lyceum of the Philippines University – Batangas LIMA Campus. The researchers come up to a decision in selecting the participants of the study by means of fish bowl method, 30 percent of all of the first year Marine Engineering and Marine Transportation Nigerian students were randomly selected.

Instrument

Researchers measured the body dimension of Nigerian students to determine the average sitting preference. The measurement was composed of sitting position of the Nigerian students. The researchers measured the following: Stature or Height, Elbow Height, Knee Height, Popliteal Height, Buttock-to-Popliteal Length and Hip Breadth. The researchers validated the instrument for the problems encountered in academic performance related to classroom armchair with the verbal interpretations; Very Serious, Serious, Less Serious, and Not a Problem.

Procedure

The researchers asked the permission of the Registrar's Office and Mrs. Amy Delos Santos, the Head Coordinator of the LPU-B Dormitory to be allowed them to conduct and administer survey questionnaire and measure the body dimensions of Nigerian students. There are only few problems encountered when dealing with the participants of the study. Some of the Nigerian students were asking for money in exchange for their cooperation for the study and some of the Nigerian students don't want to participate in the study. The assistant coordinator pursues them and explained what the study all about. The researcher also used a figure of the anthropometrical measurement in order for the respondents to understand the part of the body that the researchers would measure.

Data Analysis

Data were analyzed using descriptive statistical tools.

Weighted mean will be used to analyze the mismatch of classroom armchair at the LPU-B Lima Campus and the common problems encountered by the respondents. Weighted mean is one of the most straightforward and dependable means of computing an average of several numerical values while taking into account possible variations.

Percentage was used to determine the percent distribution of the responses. These are the 25th percentile is also known as the first quartile (Q_1), the 50th percentile as the median or second quartile (Q_2), and the 75th percentile as the third quartile (Q_3). In general, percentiles and quartiles are specific types of quartiles.

T-test was used to determine the difference in the problems encountered by the Nigerian students in Academic Performance Related to classroom armchair when grouped according to gender.

Analysis of Variance (ANOVA) was used to test the differences in the problem encountered when grouped according to average class hour per day. The given scale was used to interpret the result of the problems encountered by the respondents: 3.50 – 4.00: Very Serious; 2.50 – 3.49: Serious; 1.50 – 2.49 - Less Serious; 1.00 – 1.49: Not a Problem; scale used to analyze the degree of pain experienced: 3.50 – 4.00: Unbearable; 2.50 – 3.49: Moderate; 1.50 – 2.49 - Slight; 1.00 – 1.49: None

4 Result and Discussion

This section discusses and interprets the data collected through the survey by using generally accepted statistical tools and principles. Primary source of the data for study came from the questionnaires distributed to the Nigerian students in the Lyceum International Maritime Academy. Table 1 shows the profile of the Nigerian students in terms of gender and average class hours per day

Table 1
Profile of the Nigerian Students in Terms of Gender and Average Class Hours Per Day

Gender	**f**	**%**
Male	26	63.4
Female	15	36.6
Average Time of Class Per Hour	**f**	**%**
1-3	20	48.8
4-6	12	29.3
7-10	9	22.0

The table represents the Nigerian students' gender and the results show that the respondents were mostly males with 26 or 63.4 percent and 15 females with 36.6 percent. Majority of the respondents answered that the average hours of their class per day is 1-3 hours with 48.8 percent, while 29.3 percent said that they have 4-6 hours and the least of the respondents stated that they have 7-10 hours of class a day with the 22 percent.

Table 2
Body Dimensions of Nigerian Students (cm)

Stature Height (Seating)	**f**	**%**
75-81	7	17.1
82-88	29	70.7
89-95	5	12.2
Shoulder Width (Seating)	**f**	**%**
35-40	7	17.1
41-46	26	63.4
47-52	8	19.5
Elbow Height (Seating)	**f**	**%**
31-35	13	31.7
36-40	23	56.1
41-45	5	12.2
Lower arm length (Seating)	**f**	**%**
30 – 38	3	7.3
39-47	14	34.1
48-56	24	58.5
Hip width (Seating)	**f**	**%**
27-32	7	17.1
33-38	28	68.3
39-44	6	14.6
Knee Height (Seating)	**f**	**%**
35-43	1	2.4
44-52	20	48.8
53-61	20	48.8
Buttock-to-popliteal length (Seating)	**F**	**%**
40-48	13	31.7
49-57	18	43.9
58-66	10	24.4
Popliteal Height (Seating)	**F**	**%**
35-43	3	7.3
44-52	34	82.9
53-61	4	9.8

Table 2 shows the Body Dimensions of Nigerian Students. The results shows that majority of the respondent's stature height measures 82-88 with 70.7 percent, shoulder width measures 41-46 with 63.4 percent, elbow height measures 36-40 with 56.1 percent, lower arm length measures 48-56 with 58.5 percent, hip width measures 33-38 with 68.3 percent, knee height measures 44-52 and 53-61 with 48.8 percent, buttocks-to-popliteal height measures 49-57 with 43.9 percent, and popliteal height measures 44-52 with 82.9 percent, while the least of the respondent's stature height measures 89-95 with 12.2 percent, shoulder width measures 35-40 with 12.2 percent, elbow height measures 31-35 with 31.7 percent, lower arm length measures 39-47 with 34.1 percent, hip width measures 39-44 with 14-6 percent, knee height measures 35-43 with 2.4 percent, buttocks-to-popliteal height measures 40-48 with 31.7 percent, and popliteal height measures 35-43 with 7.3 percent.

Table 3
Degree of Pain Experienced by Nigerian Students while seating on classroom armchairs in terms of Upper Extremities

Upper Extremities	**WM**	**VI**	**Rank**
Neck	1.46	None	2
Right Shoulder	1.41	None	3
Left shoulder	1.27	None	6
Right Elbow	1.22	None	7.5
Left Elbow	1.32	None	5
Right wrist and hand	1.22	None	7.5
Left wrist and hand	1.37	None	4
Upper back	1.76	Slight	1
Composite Mean	**1.38**	**None**	

The degree of pain experienced by the Nigerian students while seating on classroom armchairs in terms of upper extremities resulted that majority of the respondents said, they don't experienced any pain on their right elbow and right wrist and hand having the weighted mean of 1.22 with the rank of 7.5. Same with their left shoulder, left elbow, left wrist and hand, right shoulder, and neck they don't experiencing any pain having the weighted mean of 1.27, 1.32, 1.37, 1.41, and 1.46 with the respective rank of 6,5,4,3, and 2. And least of the respondent stated that they are experienced slightly pain in their upper back having the weighted mean of 1.76 with the rank of 1. The reason why the respondents do not encounter any problem or pain while sitting considering the size of the chair is that because of their habit of exercising once a day like playing football, volleyball, basketball and biking. Table 4 shows Degree of Pain Experienced by Nigerian Students while Seating on classroom Armchairs in terms of Lower Extremities.

Table 4
Degree of Pain Experienced by Nigerian Students while Seating on classroom Armchairs in terms of Lower Extremities

Lower Extremities	**WM**	**VI**	**Rank**
Lower back	1.54	Slight	1
Hips/thighs	1.39	None	2
Knees	1.24	None	3
Ankles/feet	1.22	None	4
Composite Mean	**1.35**	None	

The degree of pain experienced by the Nigerian students while seating on classroom armchairs in terms of lower extremities resulted that majority of the respondents said, they don't experienced any pain on their Ankles/feet with weighted mean of 1.22 in rank number 4. Same with their knees and hips/thighs, they don't experience any pain with weighted mean of 1.24 and 1.39 on rank numbers 3 and 2, respectively slightly experienced pain by the respondents is in their lower back with the weighted mean of 1.54 in rank number 1. This explains that the respondents' lower extremities were compatible to the existing classroom armchair of LIMA campus. Table 5 shows the Extent of Problems Encountered by the Nigerian Students in the Academic Performance Related to Classroom Armchair.

Table 5
Extent of Problems Encountered by the Nigerian Students in the Academic Performance Related to Classroom Armchair

Problems	WM	VI	Rank
1. Less concentration during discussion	1.41	Not a Problem	2
2. Easily get tired and sleepy	1.68	Less Serious	1
3. Easily get destructed	1.29	Not a Problem	3
4. Obtain low scores in exams	1.07	Not a Problem	5
5. Cannot perform well in classroom activities	1.15	Not a Problem	4
Composite Mean	**1.32**	Not a Problem	

The respondents believed that easily get tired and sleepy was less serious problem being encountered by the Nigerian students in the academic performance related to classroom armchair with the weighted mean of 1.68. Less concentration during discussion was believed not a problem to the Nigerian students with the weighted mean of 1.41 in rank number 2. Easily get destructed was considered not a problem encountered by Nigerian students in their classroom performance that related to the classroom armchair with the weighted mean of 1.29. The respondents believed that they cannot perform well in classroom activities was not a problem to the Nigerian students with weighted mean of 1.15 in rank number 4. Obtain low scores in exams is the least problem encountered by Nigerian students with the verbal representation of not a problem with the weighted mean of 1.07 on the last rank. The overall composite mean score of 1.32 implied that the problems cited in the survey were considered not a problem in relation to the classroom armchair Table 6 shows Anthropometrical Measurement of the Classroom Armchair at LPU-B LIMA Campus. Table 6 shows the measurement of the old and new classroom armchairs at the LIMA campus. The researchers use a tape measure to measure the armchair.

Table 6
Anthropometrical Measurement of the Classroom Armchair at LPU-B LIMA Campus

Furniture Measurement	Dimensions in cm		
	Old type	New Type	Difference
1. Seat height (SH)	44.0	45.0	-1.0
2. Footrest height (FH)	41.5	42.7	-1.2
3. Seat depth (SD)	39.0	43.0	-4.0
4. Seat width (SW)	45.0	46.0	-1.0
5. Backrest width (BW)	45.0	37.0	8.0
6. Armchair desk height (AH)	66.0	66.9	-0.9

The unit of measurement of the tape measure is centimeter. The measurement of the Seat Height of the in the old type is 44cm while the new type is slightly higher than the old type which is 45 cm. The Footrest Height of the new type is higher than the old type which is 42.7cm while the old type is 41.5cm. Seat Depth and Seat Width of the old type is lower than the new type which is 39cm and 45cm, while the new type is 43cm and 46cm. The Backrest Width of the old type has the same measurement of the seat width which is 45cm, slightly wider than the new type that is 37cm. The height of the Armchair Desk in the old and new type is almost the same which is 66cm, the only difference in the new type of Armchair Desk is 0.9cm

Table 7
Anthropometrical Body Measurement of the Nigerian Students at LPU-B LIMA Campus

Category	Mean	SD	90th Percentile
1. Stature Height (SH)	83.9	3.4	89.0
2. Popliteal Height (PH)	47.9	3.3	52.0
3. Buttocks - Popliteal (BP)	52.5	6.2	59.0
4. Hip Width (HW)	34.6	2.9	38.7
5. Shoulder Width (SW)	43.7	3.2	48.5
6. Knee Hieght (KH)	47.9	3.5	58.0

Table 7 shows the anthropometrical body measurement of the Nigerian students at Lyceum of the Philippines University-Batangas. In the design of the armchair gender is not one of the considerations, because most of the measurements of the female respondents are not far from the measurements of male Filipino student of the LIMA Campus. It means that they can accommodate the classroom armchair of the LIMA Campus both old and new classroom armchair. The mean value measurement is calculated for the Nigerian respondents to come up with a 90th percentile values. We chose the 90th percentile because 90 percent of the Nigerian Students can accommodate the classroom armchair. These are critical to the comparison of the measurements of the classroom armchair.

Table 8
Comparison of Old and New type of Classroom Armchair and its Compatibility to the Body Dimension of the Nigerian Students using Anthropometrical Measurement

	90th Percentile	Armchair Measurement		Percentile Relation
		Old Type	New Type	
1. Seat height (SH) and Stature Height (SH)	89.0	44.0	45.0	Low
2. Footrest height (FH) and Popliteal Height (PH)	52.0	41.5	42.7	Low
3. Seat depth (SD) and Buttock-Popliteal length (PB)	59.0	39.0	43.0	Low
4. Seat width (SW) and Hip Width (HW)	38.7	45.0	46.0	High
5. Backrest Width (BW) and Shoulder Width (SW)	48.5	45.0	37.0	Low
6. Armchair Desk Height (AH) and Knee Height (KH)	58.0	66.0	66.9	High

Table 8 shows compatibility of old and new type of classroom armchair to the body dimension of the Nigerian students using Anthropometrical measurements. As seen in the table, the percentile relation in the respondents' hip width and knee height to armchair measurement are high which means that some of the lower extremities of the respondents is fit to the classroom armchair, while popliteal height and buttock-to-popliteal length are low which means that this lower extremities of the respondents are not fit to the classroom armchair. The percentile relations in the stature height and shoulder width of the respondents to the chair are low, means that the upper extremities of the majority of the respondents are not fit to the classroom armchair.

Table 9
Differences in the Problems Encountered by the Nigerian Students in the Academic Performance Related to Classroom Armchair When They are Grouped According to Gender

		Male	Female	t	p-value
1.	Less concentration during discussion	1.31	1.60	-1.170	.249*
2.	Easily get tired and sleepy	1.58	1.87	-.929	.359*
3.	Easily get destructed	1.31	1.27	.208	.837*
4.	Obtain low scores in exams	1.08	1.07	.118	.906*
5.	Cannot perform well in classroom activities	1.19	1.07	.916	.365*

*df = 39; *NS – Not Significant at 0.05*

Table 9 shows the Differences in the problems encountered by the Nigerian Students in the academic performance related to classroom armchair when they are grouped according to Gender There is no significant difference between the problems encountered by male and female Nigerian students when it comes to their classroom armchair as manifested by the computed p-values which are all greater than the 0.05 level of significance. Therefore, the null hypothesis is accepted. Table 10 shows Differences in the problems encountered by the Nigerian Students in the academic performance related to classroom armchair when they are grouped according to Average Class Hour per Day

Table 10
Differences in the Problems Encountered by the Nigerian Students In terms of Average Class Hour Per Day

		1-3	4-6	7-10	F	p-value
1.	Less concentration during discussion	1.20	1.25	2.11	5.815	.006**
2.	Easily get tired and sleepy	1.65	1.67	1.78	.055	.947
3.	Easily get destructed	1.25	1.50	1.11	1.183	.318
4.	Obtain low scores in exams	1.10	1.00	1.11	.647	.529
5.	Cannot perform well in classroom activities	1.20	1.00	1.22	1.030	.367

*df = 39; **Highly Significant (HS) at 0.01;*

There is a significant difference on the average class hour per day wherein those Nigerian Students with 7 – 10 class hour per day have encountered higher possibility of experiencing less concentration during discussion due to long hours of sitting compared to those students with 1 – 3 and 4- 6 hours of classes as denoted by the computed p-value of 0,006 which is less than the 0.01 level of significance. Therefore, the null hypothesis of no significant difference on this particular statement is rejected. However, Nigerians students from three different groups of class hour per day do not significantly differ on the remaining cited problems which include Easily get tired and sleepy, destructed, Obtain low scores in exams and Cannot perform well in classroom activities as indicated by the computed p-values which are greater than the 0.05 level of significance. Therefore, the null hypothesis of no significant difference on these statements is accepted. This implies that the students from all groups of different class hours have the possibility to encounter very little problem in their academics due to their classroom armchair.

5 Conclusion

Most of the Nigerian student is male with 1-3 average class hours per day. The body dimensions of Nigerian students are compatible with the existing classroom armchair at the LIMA Campus. They do not really affect by the existing measure of classroom armchair at LIMA campus in relation of their pain being experience. The Nigerian do not experience any problem with the armchair being used in the classroom. Their body dimensions of Nigerians were larger than the classroom armchair measurements at the LIMA building, but fit on the classroom armchair at the new LIMA building. There is no significant difference between the problems encountered by male and female Nigerian students when it comes to their classroom armchair. Even though the right ergonomic chair and table should fit the size of the users, the chair and table design for use at educational institution must be compatible and suit the larger population of the students [28].

6 Recommendation

The use of new type of armchair in the Nigerian students. The reason is the new type of armchair is slightly larger than the old type of armchair which can be suitable to the Nigerians and other foreign nationalities of the same type of body build. To the LIMA administration, continually improving the resources of the university and investing for the safety and comfort of the students can be an opportunity for the school to grow for the coming years. Nigerian students may be constantly reminded to report any discomfort or uneasiness they might feel while sitting to prevent the occurrence of major problem. Future researchers may deal with other factors that could be the possible source/cause of physical and health problems of Nigerian students and to determine the compatibility or mismatch of other facilities of Nigerian students to the school equipment.

REFERENCES

[1] K.H.E. Kroemer, H.B. Kroemer, and K.E. Kroemer-Elbert, Ergonomics: How to Design for Ease and Efficiency (2nd Edition), 2001

[2] What-Is-Anthropometry., URL: http://ergonomics.about.com/od/ergonomicbasics/f/What-Is-Anthropometry.htm, July 2014.,

[3] G. J. Carb, The Science of Sitting Made Simple: How to Look and Feel Better with Good Posture in Ten Easy

Steps, pp 1-18, 2008

[4] C. Parcells, M. Stommel, RP Hubbard, Mismatch of classroom furniture and student body dimensions. Journal of Adolescent Health.; 24(4): 265-273, 1999

[5] National Health and Nutrition Examination Survey (NHANES): ANTHROPOMETRY PROCEDURES MANUAL, pp 1-2, 2004

[6] L.M. Cotton, D.G. O'Connell, P.P. Palmer, MD Rutland. Mismatch of school desks and chairs by ethnicity and grade level in middle school, Work, 18:269-280, 2002.

[7] M.Z. Ramadan. Does Saudi school furniture meet ergonomics requirements? Work 38:93-101, 2011

[8] N.K. Nazif, Ahmad., Hani, S. Ezrin., Lee, C.K. and Rasdan, I. Ahmad., A study on the suitability of science laboratoryfurniture in Malaysian secondary school, pp 1-2, 2011

[9] J. F. M. Molenbroek, Y. M. T. Kroon-Ramaekers, and C. J. Snijders, Revision of the design of a standard for the dimensions of school furniture', Ergonomics, 46, 7, 681–694, 2003.

[10] M. Abyad, Laboratory ergonomics, URL:http://d.umn.edu/ehso/ergonomics/labergo.htm

[11] H. J. Arzi, Enhancing science education through laboratory environments: more than walls, benches and widgets, International Handbook of Science Education, pp. 527-564, 1998.

[12] D. B. Chaffin, G. B. Andersson, and B. Martin, Occupational Biomechanics. New York: Wiley, 2006.

[13] S.A. Oyewole, J.M. Haight, and A. Freivalds. The ergonomic design of classroom furniture/computer work station for first graders in the elementary school', International Journal of Industrial Ergonomics, 40, 437-447, 2010.

[14] G. Knight, and J. Noyes., Children's behaviour and the design of school furniture', Ergonomics, 42, 747- 760, 1999.

[15] S.H. Jung, A prototype of an adjustable table and an adjustable chair for schools', International Journal of Industrial Ergonomics, 35, 955–969, 2005.

[16] P. Grimes, and S. Legg, Musculoskeletal disorders (MSD) in students as a risk factor for adult MSD: a review of the multiple factors affecting posture, comfort, and health in classroom environments, Journal of the Human Environmental System, 1–9, 2004.

[17] M.G. Helander, S.J. Czaja, C.G. Drury, J.M. Cary and G. Burri, An ergonomic evaluation of office chairs, Information Technology and People, Vol. 3 247–263, 1987

[18] E. Tichauer, The biomechanical basis of ergonomics: Anatomy applied to the design of work situations, New York: Wiley, 1978.

[19] S.A. Keskin Kor. and S. Karaca. Use of factor analysis scores in multiple linear regression model for determining relationships between milk yield and some udder traits in Goats. 31: 185-188, 1978.

[20] E. K. Eyduran, S. Karakuş, Keskin and F. Cengiz, Determination of factors influencing birth weight using regression tree (RT) method. 34: 109-112, 2008.

[21] M. Mendeş, and E. Akkartal. Regression tree analysis for predicting slaughter weight in broilers. 8: 615-624, 2009.

[22] J. Aagaard-Hansen, P. Saval, P. Steino, A. Storr-Paulsen. Back health of students. Eur J Appl Physiol.; 85(2): 41-8, 2001.

[23] W.A. Evans, A.J. Courtney, K. F. Fok. The design of school furniture for Hong Kong school children: an anthropometric case study design. Applied Ergonomics.; 19(2):122-134, 1988.

[24] F.I. Romli and N. O. Aminian, Mismatch between Anthropometric Body Dimensions and Classroom Furniture in Malaysian Universities Proc. Canadian Engineering Education Association (CEEA12) Conf. p 4, 2012.

[25] G. Panagiotopoulou, K. Christoulas, A. Papanckolaou and K. Mandroukas., Classroom furniture and body dimensions. Empirical findings and health implication. J Adolescent Health 24: pp 265-273, 2004.

[26] K. Melemez and M. Tunay. An analysis of biomechanical and anthropometric parameters on classroom furniture design, pp 1081 – 1082, 2008.

[27] D. Zacharkow. Posture: Sitting, Standing, Chair design and exerciseCharles Thomas publisher. USA., 1988.

[28] A.M. Pagcaliwagan, M.K.E. Alvar, J.K.V. Mapa, A. B. Tarcelo, M.A.L. Marasigan, Compatibility of Chairs and Tables in Computer Laboratory to the Students' Body Dimension: An Assessment, Academic Research International, 4(4): 133-140, 2013.