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Ergonomics Workstation Assessment of Musculoskeletal Disorders in University of Port Harcourt

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study examines the experiences of musculoskeletal discomfort among staff and students of the University of Port Harcourt as it relates to their workstations. Questionnaires were designed to extract information from respondents on their experience of musculoskeletal pains and other discomforts. A total of 320 questionnaires were distributed randomly to staff and students across the three campuses of the University of Port Harcourt. One hundred and forty (140) questionnaires were distributed to staff (academic, 60 and non-academic, 90) out of which 115 were retrieved. Similarly, 170 questionnaires were distributed to students out of which 163 were retrieved; altogether 278 out of 320 yielded a 86.9% response rate. The study revealed that there is a strong relationship between the workstation set up and development of musculoskeletal discomfort in classrooms and offices at the University of Port Harcourt. Most staff and students experienced low back and neck pains due to poor ergonomic practices. Furthermore, most of the students respondents spent their reasonable time sitting in class receiving lectures (47%) and

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studying/reading (18.3%), respectively. While a handful of students (9%) stood for most of the time receiving lectures; due to limited number of seats. A multiple regression analysis on workstation against MSDs (lower backaches, headaches, neck & upper backaches and neck & shoulder aches) yielded a coefficient of variance, R^2 of 87%. The sensitivity analysis on the regression model gave the following results: R^2 = 29.94, 1.23, 41.7, and 14.12% for workstation against i) lower backaches; ii) headaches; iii) neck & upper backaches; iv) neck & shoulder aches, respectively. The result of Kruskal-Walli's test of significance on the questionnaire response to simple ergonomic workstation (the cause) and those of musculoskeletal disorder (the effect) showed not significant. This confirmed the consistency of responses (that is, the samples were from the same distribution). Kendall's w-statistic for staff and students level of agreement < 50% in all cases.

Keywords: Ergonomics workstations; assessment; musculoskeletal disorder; University of Port Harcourt.

1. INTRODUCTION

The academic environment is not usually thought of when considering occupational health issues, yet, this environment demands high productivity and excellent performance from staff and students. These demands come with some penalty on staff and students particularly with respect to Musculoskeletal Disorders (MSDs). Musculoskeletal Disorders, are prevalent where ergonomic workstation setups are not practiced [1]. The academic institution is a highly active environment with multi-disciplinary programs, activities and individuals with various functions that are exposed to different hazards. However, due to the nature of most of the activities, it is likely that musculoskeletal disorder (such as body aches and pains) may be a problem. The classroom for instance just like any other work environment, good implementation of ergonomics is required for the maintenance of good health, improvement in work performance, learning and motivation [2].

According to the Centre for Disease Control and Prevention [3], musculoskeletal disorders are classified as injuries that affect the joints, muscles, nerves, cartilages, tendons and discs in the spine. Musculoskeletal disorders are pains which can be caused by the sedentary nature of a job or task. It is said that holding same position slowly diminishes elasticity in the soft tissues in the back. Triano and Selby [4] affirmed that a healthy body can only tolerate staying in a position for about twenty (20) minutes. There have been widespread agreements that ergonomics workstation set up fosters creative and innovative performance [5], and lack of it would result in a decline in higher situational control, thereby threatening the performance and productivity [6]. The use of a good workstation design improves the posture of the staff and students in their daily functions to enhance performance and productivity and thus, the possibility of musculoskeletal disorders associated with these functions are significantly reduced [7,8].

Some studies have identified among other things poor health status of workers arising from constant exposure to occupational health hazard as one of the cardinal factors militating against employees' effective performance and productivity [3,9]. According to Patron [2], students spend at least eight (8) or more hours in the academic environment and many of the chronic diseases that may manifest later in their lives may be due at least in part to unfavourable environment or exposure. A number of related studies on musculoskeletal disorders have been carried out in Nigeria with respect to healthcare workers [10]; construction workers [11]; Nigerian computer workstations [12]; influence of workstation and work posture ergonomics for librarians in State and Federal Universities in Nigeria [13]; and prevalence of MSDs among bankers [14]. This study assessed the prevalence of Musculoskeletal Disorders (MSDs) and the associated factors with workstation setup among staff and students at the University of Port Harcourt and established some relationship that exist between MSDs and workstation setup.

2. MATERIALS AND METHODS

2.1 Study Area

University of Port Harcourt was selected as the study area on the basis of size (see Fig. 1). It is located within the coordinates of Latitude 4°5′19.24″ and Longitude 6°55′25.41″ in Choba, Port Harcourt, the administrative capital of Rivers State. Port Harcourt metropolis is predominantly made up of traders, civil servants and oil

company workers, with an estimated population of 1,005,904 (2006) inhabitants. The city is host to the University of Port Harcourt, Choba; University of Port Harcourt Teaching Hospital, Alakahia; Rivers State University of Science and Technology, Nkpolu; University of Education, Rumuolumini; College of Arts and Science, several broadcast stations and many oil servicing companies, respectively.

2.2 Study Population

The study population comprises of teaching staff, non-teaching staff and students of the University of Port Harcourt. The probability sampling technique, precisely the stratified sampling technique was used to select the respondents for the study. The estimation of sample size using prevalence formula [15] was adopted as Equation (1)

$$N = \frac{z^2 P(1-P)}{T^2} \quad (1)$$

Where

N = sample size; and T = Tolerance error, P = Prevalence from previous studies and z = 1.96, level of significance or standard normal deviation

In this study, P = 0.07 and Tolerance error, T = 0.03

Thus, the sample size for the study is obtained via Equation (1) as follows:

$$N = \frac{1.96^2 (0.07)(1-0.07)}{0.03} = 277.88$$

For attrition rate of 15.1%, then N = 320 persons

2.3 Data Collection

Data collection involved selection of the sample population, questionnaire design and distribution, collation, and tabulation in frequency tables for analysis. The data for this study were obtained through questionnaire as the primary source while the secondary sources were those from literature, observations and personal communication with the participants

2.3.1 Inclusion criteria

The criterion includes academic and non-academic staff as well as students who were 18 years and above at the time of study.

2.3.2 Exclusion criteria

The criteria excluded women who were pregnant and other staff and students that were sick at the time of data collection (questionnaire distribution) or those that may have suffered one kind of pain or another due to physical deformity.

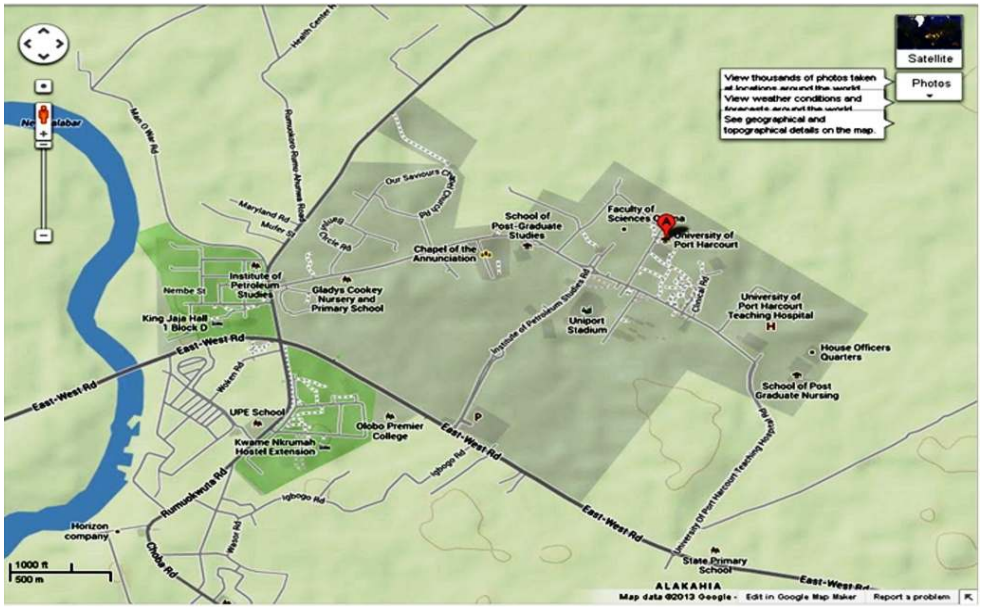


Fig. 1. Map of the study area (University of Port Harcourt)
Sources: Google map, 2015

2.3.3 Participants

Essentially, the population of this study comprises teaching staff, non-teaching staff and students of the University of Port Harcourt. The experience of musculoskeletal discomforts among staff and students at different workstations associated with the University environment was investigated using sampled population. Given the entire population of both staff and students of the University numbering over 25,000, a study population of 320 was selected. The participants distribution is as follows: for academic staff 60 and non-academic staff 90 and 170 for students, respectively. The staff-student ratio is approximately 1:2. However, we observed from personal communication with the university staff that non-academic staff are more prone to completing questionnaires than academic staff. This explains why more questionnaires were distributed to the non-academic staff. The socio-demographic information of the sampled population (participants) is all about gender, age distribution, education, hour spent on work stations, etc (see Table 1).

2.3.4 Questionnaire

The questionnaire design was of two major parts. The first part addressed the background information of the participants with respect to age, gender, and status on campus, that is, staff (academic/ non-academic) or students (see Table 1). The second part consisted of thirty one questions distributed as follows: i) five questions on time at various work schedules; ii) six questions on Break schedules; iii) seven questions on simple ergonomics checklist for eliminating possible MSDs; iv) eight questions on experience with lower back pains; and v) five questions on experience with neck and shoulder pains. Examples of the questionnaires (part 2) are found as "key" in Figs. 3-7 (see Results & Discussion Section) and in Appendix as questionnaire response frequency tables (see Tables A1 – A5).

2.3.5 Procedure

Prior to the questionnaire administration a pre-test was carried out on twenty randomly selected staff and students from a sister institution, State University of Science and Technology to get their inputs and know where improvement could be made. The questionnaires were subsequently revised based on the information and feedback provided by these participants. The questions were based on information obtained from literature and personal communications with staff and students of the study Area.

2.4 Data Analysis

The questionnaire was designed on three answer options with the following ratings: 3 for '*yes'*, 2 for '*no',* and 1 for '*undecided',* respectively. Frequency tables were constructed to record the responses for each question (see Appendix A) which were subsequently transcribed to bar graphs/ tables. Kendall's coefficient of concordance (w) was adopted to test for the degree of agreement between respondents (staff and students) on the questionnaire parameters. Kendall's coefficient is a non-parametric statistic used to assess degree of agreement among respondents [16]. Its values range from zero (no agreement) to unity (complete agreement). Intermediate values signify low or high degree of unanimity between respondents.

The formula for calculating Kendall's coefficient (w) is given as Equations (2) – (4):

$$w = \frac{12\sum\left(R_i - \overline{R}\right)^2}{m^2 n\left(n^2 - 1\right)} \tag{2}$$

$$R_i = \sum_{j=1}^{m} r_i \times j \tag{3}$$

$$\overline{R} = \frac{1}{2} m\left(n+1\right) \tag{4}$$

Where R_i is given by Equation (3) and it represents the total rank or rating given by respondents; *i* is an object, given a rank/rating, r_i by respondent *j; m* represents the total number of respondents while *n* represents the total number of objects (in this case, questions); and $\overline{R}$ is the mean value of the total rating and is given by Equation (4).

The students and staff responses were analyzed using Kruskal-Walli's test of significance. The test is not only a non-parametric statistic but is a method for testing if sampled observations originate from the same distribution. If the test of staff and students responses are not significant that implies that it is of the same distribution; that means that their responses are consistent. Furthermore, regression analysis was carried out to establish the degree of relationship between

workstation setup and musculoskeletal disorders as multiple regression (see Equation 5):

$$y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 \quad (5)$$

Where

y = Ergonomic workstation setup; x_1 = lower backache; x_2 = headache; x_3 = neck & upper back ache; and x_4 = neck & shoulder ache.

A sensitivity analysis was carried out on Equation (5) to determine the contribution of each of the independent variables (x_1, x_2, x_3, & x_4) as measured by the coefficient of variance (R^2). In effect, this analysis offered the opportunity to rank the independent variables in their order of importance based on the experiences of the respondents on MSDs.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic Data Distribution

Table 1 shows the demography survey of the respondents. The socio-demographic feature of the respondents, showed that more males than females were among sampled population. Available in the table are three distinct age groups of 18-30, 31–50 and 51 years & above. The highest to the least in number of respondents follow the order of the age groups (see Table1).

3.2 Relationship between Workstation and Musculoskeletal Disorders

For multiple regression analysis, the 'cause' is taken as the questionnaire responses on ergonomic workstation setup (see Table A1) while 'effect' represents four questionnaire groups (see independent variables in Equation 5) on neck, back (lower & upper), shoulder aches, etc (see Tables A2 – A5). Adopting the positive responses on the applicable questionnaire parameters as input data for XLSTAT simulation yielded a multiple regression of Equation (6) with coefficient of variance, R^2 of 0.8696, indicating high positive relationship (see Fig. 2). Physical inspection of various workstations at the University of Port Harcourt confirmed poor knowledge of ergonomics in procurement of office and classroom furniture and the resultant effect is the MSDs. Apparently, the multiple regression model has confirmed the existence of cause-effect relationship.

$$y = -193.115 + 0.994\,x_1 + 0.177\,x_2 + 0.898\,x_3 + 0.916\,x_4 \quad (6)$$

To assess the contributions of each independent variable with respect to R^2, sensitivity analysis was performed and the results are presented in Table 2. From column 4 of Table 2, we observe the order of importance of the four independent variables, with x_3 in the first position, followed by x_1, x_4 and x_2, respectively. The benefit of sensitivity analysis is the ranking it brings about, thus, less contributory variables can be dropped if need be. In situation where three independent variables are needed instead of four, then x_2 is to be dropped from Equation (6). Another set of results were obtained by carrying out Kruskal-Walli's test of significance for workstation setup and four independent variables (see Equation 5 for sample/variables definition and Tables 3 and 4 for results summary).

3.3 Time versus Work Schedule

Fig. 3 shows that staff spent the largest amount of time sitting and this is followed by time on computer, reading, standing and on telephones, respectively. On the part of the students the largest amount of time is spent on receiving lectures, studying/reading, telephones and standing, respectively. For both staff and students more than fifty percent (50%) of their time is spent sitting for either computer and reading (for staff) or receiving lectures and reading (for students). The issue of poor workstation in the university and reported cases of musculoskeletal disorder, particularly waist pains, back ache, neck and shoulder aches, etc. due to prolonged sitting were established as being related with a coefficient of variance, R^2 of 0.8696. This is in agreement with literature [15].

3.4 Break Schedule

Given the staff response on break schedule, it is observed that they take break away from the office amidst prolonged computer use (see Fig. 4a). The largest number of students agreed that breaks are taken between study hours (see Fig. 4b). However, the Kendall's w-statistic for staff and students responses on break schedule indicates very low values of 8.4 and 38.9% (see Table 5). These values indicate lack of agreement amongst respondents on break schedule, which is apparent in Figs. 4a and b. The combined values of 'no' and 'undecided' seem to outweigh the 'yes' response option. This indicated a gap on level of awareness on the subject matter. The Kruskal – Walli's test of significance (see Table 3) indicates not significant. The results confirmed that the five

variables samples were of the same distribution and there is good reason to assume consistency in responses of staff and students.

3.5 Response at Simple Ergonomics Checklist

The staff and students' responses to simple ergonomics checklist are both complimentary and high positive values (the 'yes' option) across the seven questionnaire parameters (questions) are 7 out of 7 for staff and 5 out of 7 for students (see Fig. 5). The positive response indicates the respondents who answered "yes" are in the range of 64.3 – 93.9% for staff and 63.8 - 81% for students as against two other options ("no" and "undecided"). Only 2 out of 7 questionnaire parameters that a gap was observeved for which the responses on the part of students recorded 56% (that is, 'no' and 'undecided' combined).

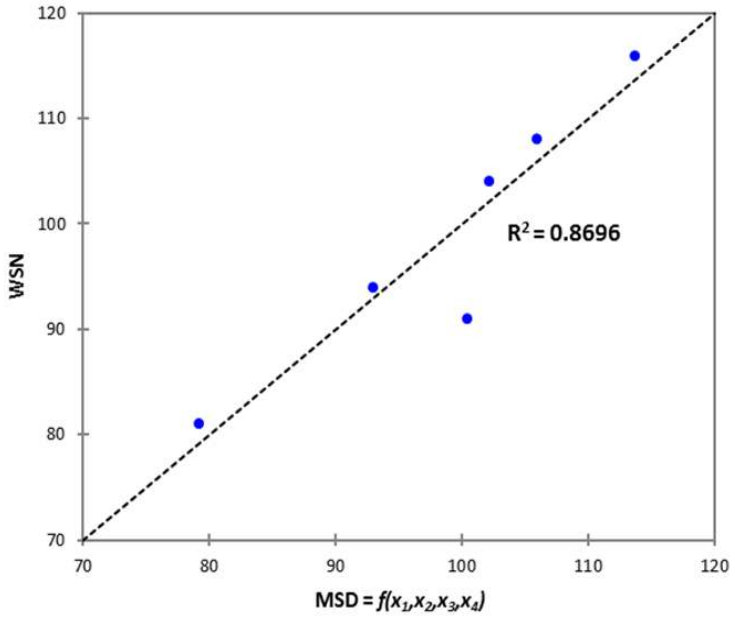


Fig. 2. A multiple regression plot for workstation (WSN) setup against musculoskeletal (MSD) disorder

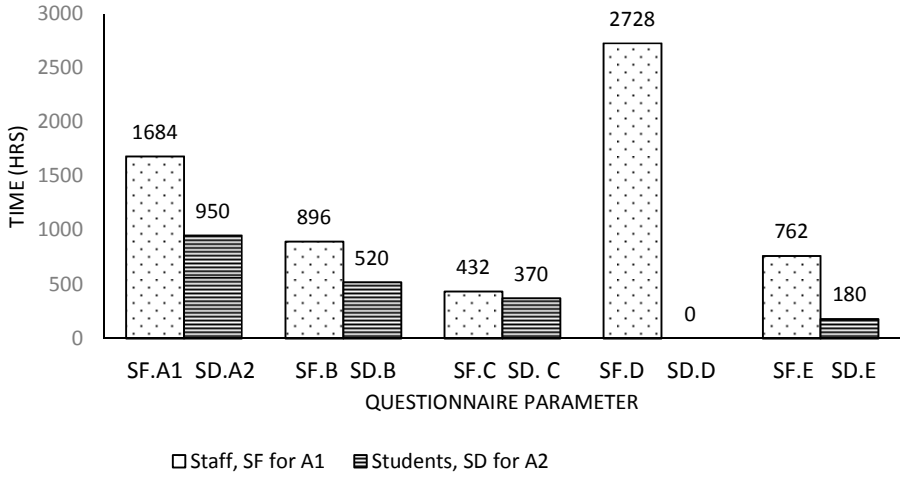


Fig. 3. Time at various work schedules in a year

A1: Time spent using computer; A2: Time spent receiving lectures; B: Time spent studying/reading; C: Time spent on the telephone; D: Time spent standing; SF = Staff and SD = Students

Table 1. Socio-demographic statistics

Gender	No. of respondents	Percentage (%)	Age bracket	No. of respondents	Percentage (%)	Sample frame	No. of respondents	Percentage (%)
			18-30	**134**	**48.2**	**Teaching staff**	**32**	**11.5**
Male	186	66.9	31-50	85	30.6	Non-Teaching staff	83	29.9
Female	92	33.1	51 and above	59	21.2	Students	163	58.6
	∑ 278	100		∑ 278	100		∑ 278	100

Table 2. Coefficients of variance (R^2) for sensitivity analysis

Model no.	Multiple regression models	Coefficient of variance, R^2 for :	
		All independent variables[±]	**Each variable, %**
1	$y = f(x_1)$	0.2994	x_1: 29.94
2	$y = f(x_1, x_2)$	0.3117	x_2: 1.23
3	$y = f(x_1, x_2, x_3)$	0.7284	x_3: 41.7
4	$y = f(x_1, x_2, x_3, x_4)$	0.8696	x_4: 14.12

[±]*All independent variables in column (2) for a given model number in column (1)*

Table 3a. Kruskal-Wallis test of significance on workstation setup and four independent variables

K (Observed value)	3.7743
K (Critical value)	11.0705
DF	5
p-value (Two-tailed)	0.5824
alpha	0.05

An approximation has been used to compute the p-value.

***Test interpretation**:*

H_0: The samples come from the same population.

As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H_0.

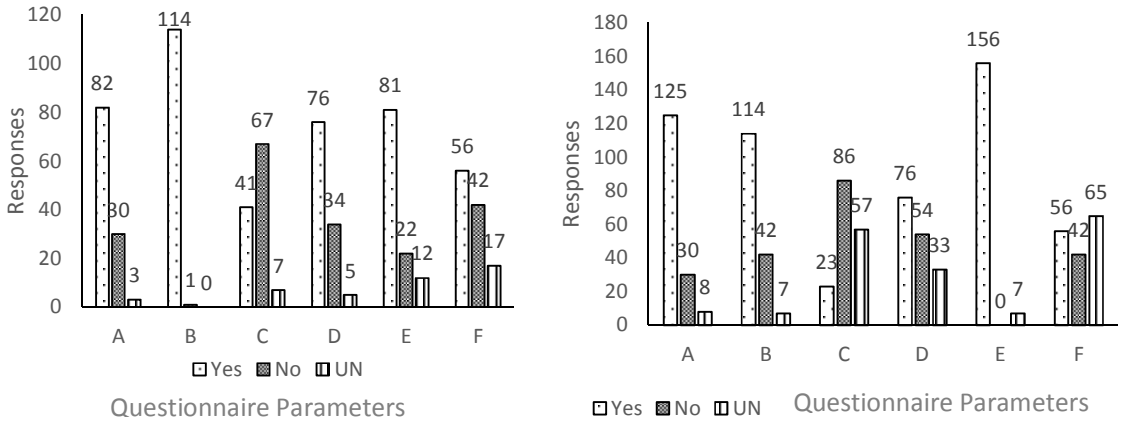
The risk to reject the null hypothesis H_0 while it is true is 58.24%. Ties have been detected in the data and the appropriate corrections have been applied

Table 3b. Significant differences

	WSN	LBA	HA	NUBA	NSA	BS
WSN =y_1		No	No	No	No	No
LBA = x_1	No		No	No	No	No
HA = x_2	No	No		No	No	No
NUBA = x_3	No	No	No		No	No
NSA = x_4	No	No	No	No		No
BS	No	No	No	No	No	
p-values:						
	WSN	LBA	HA	NUBA	NSA	BS
WSN =y_1	**1**	0.9400	1.0000	0.8674	0.9782	0.9929
LBA = x_1	0.9400	**1**	0.9098	0.4745	0.9979	0.9956
HA = x_2	1.0000	0.9098	**1**	0.9965	0.9361	0.9992
NUBA = x_3	0.8674	0.4745	0.9965	**1**	0.5220	0.9982
NSA = x_4	0.9782	0.9979	0.9361	0.5220	**1**	0.9992
BS	0.9929	0.9956	0.9992	0.9982	0.9992	**1**

Table 4. Results of kendall's w-statistic and Kruskal-Walli's test of Significance for workstation setup and four independent variables

Questionnaire Grouping	Kendall's w-statistic (%)		Kruskal-Walli's Test Results for Staff and Students for:
	Staff	Students	Combined Variables, (y, x_1, x_2, x_3, and x_4) for average values between staff and students
Ergonomic workstation checklist	16.0	10.0	Results indicates not significant
Lower Back ache	32.4	47.0	
Headaches & Eye Strain	3.0	0.9	
Neck and upper Back ache	20.3	20.8	
Neck and Shoulder ache	8.4	1.0	
Daily Break Schedule Per Hour	8.4	38.9	



(a) Staff **(b) Students**

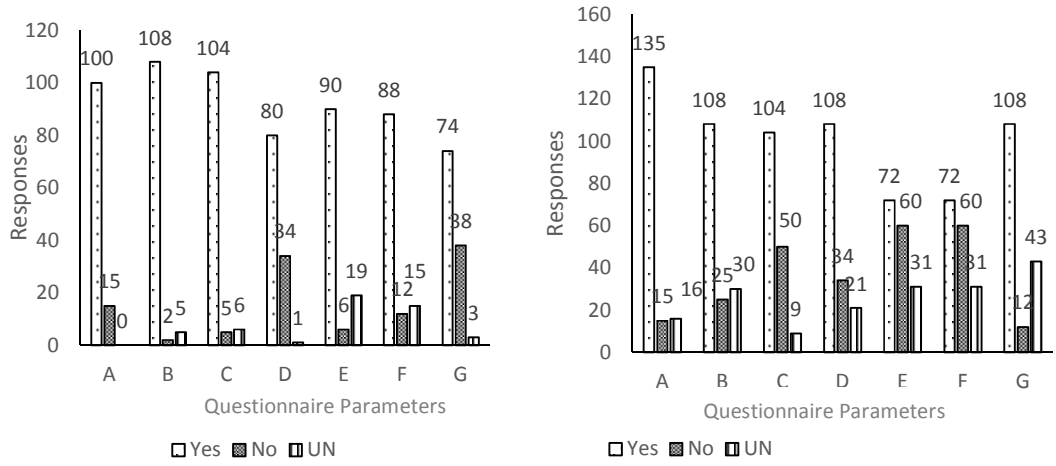
Fig. 4. Break schedule

A: Breaks taken during office hours (for staff) or after each class (for students); B: Breaks taken after prolonged computer use (staff) or between prolong lecture hours (for students); C1: Time taken to strectch after sitting for long; C2: Breaks are sufficient between lectures;D: Are breaks sufficent?; E: No breaks; F1: Is annual leave always taken?; F2: Sufficient break is given before and after examination

Table 5. Summary of kendell's statistic (w)± for staff and students responses on break schedule

Parameter	Staff			Students		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
Q1	309	348	1521	314	492	31684
Q2	344	348	16	351	492	19881
Q3	264	348	7056	311	492	32761
Q4	301	348	2209	329	492	26569
Q5	299	348	2401	294	492	39204
Q6	269	348	6241	317	492	30625
Total			∑19444			∑180724
W	= 0.084014 (8.4%)			= 0.388689 (38.86%)		

±*The same procedure is employed for the analyses of the other questionnaire responses by applying Equations (2) – (4) to determine the degree of agreement amongst respondents (see Table 4)*



a) Staff **b) Students**

Fig. 5. Staff/ students response to simple ergonomics checklist

A: No working clearance between leg, knee and desk; B: No standing alternative with sitting & working; C: You don't work within normal reach of arms/legs; D: There is not enough room for a tall staff; E: No comfortable space between edge of seat and back of knees; F: Keyboard is at a height which places the forearms approximately parallel with the floor; and G: Arm rest is not used or adjusted to support or suit arms movement

The Kendall's w-statistic for staff and students questionnaire responses ('yes' option) yielded 16.0 and 10.0%, respectivlely (see Table 4); indicating low level of agreement. However, analysis of variance (Kruskal-Walli's test of significance) carried out on staff and students'responses indicates "not significant'(see Table 4). Apparently, there is consistency in both responses (indicating that the samples were of the same distribution).

In addition, Fig. 5a shows teaching and non-teaching staff workstations in the University of Port Harcourt are likely to cause MSDs challenge of muscle and joint ache. Apparently, the level of Safety education on Ergonomics workstation setup was found to be very low. Also, Fig. 5b shows a good number of students that are likely to experience musculoskeletal aches / pains due to poor ergonomic set up at their lecture halls and study areas. Also, this highlights the level of Safety education on Ergonomics and workstation setup for which there is a gap.

3.6 Response on Experience of Lower Back Aches

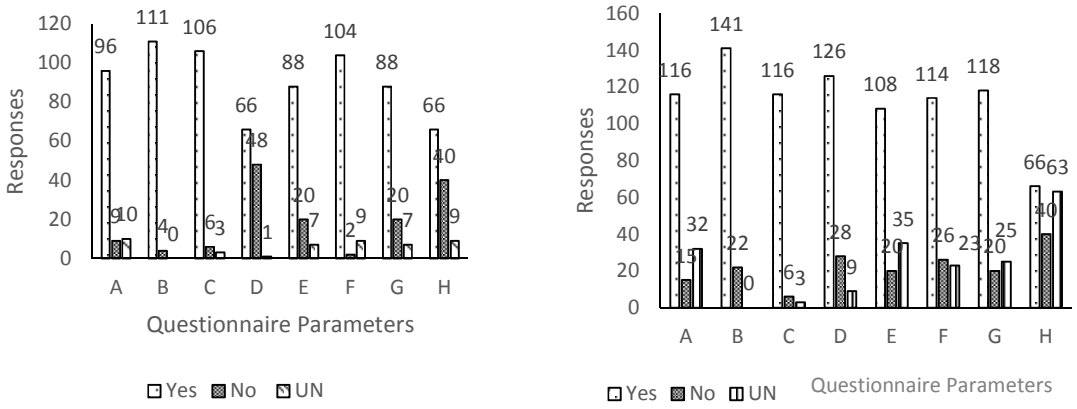
The number of staff and students that answered 'yes' option to all the questions are by far higher than those with 'no' and 'undecided' options with the exception of questions D & H for staff (see Fig. 6a) and question H for students (Fig. 6b).

The range of the positive responses of the questions is 7 out of 8 for both staff and students. The Kendall's w-statistic for staff and students on the experience of back aches are 32.4 and 47.0%, respectively. This implies that the level of agreement amongst the respondents on the issue of lower backaches is moderately low for both staff and students. The level of agreement may be blamed on the level of awareness of the respondents on effects of poor workstation setup.

The high positive responses of staff (see Appendixes A2) and students on the experience of lower back ache show to a large extent that the teaching and non-teaching staff as well as students workstations in the University of Port Harcourt are prone to cause MSDs of disc and spine, leading to back ache. In effect continuous neglect of proper ergonomics in the workstation set up of offices, may result into temporary injuries in a short term or permanaent injuries in a long term. In turn this would lead to poor performance, decreased efficiency and loss of time. The students' responses also highlighted the fact that most seats used in their lecture rooms have no back rest. Hence, it is likely that continuously neglect of proper ergonomics in the workstation set up of class rooms, may result to injuries which would in turn lead to poor performance, decreased efficiency and loss of time.

3.7 Response on Experience of Neck and Shoulder Aches

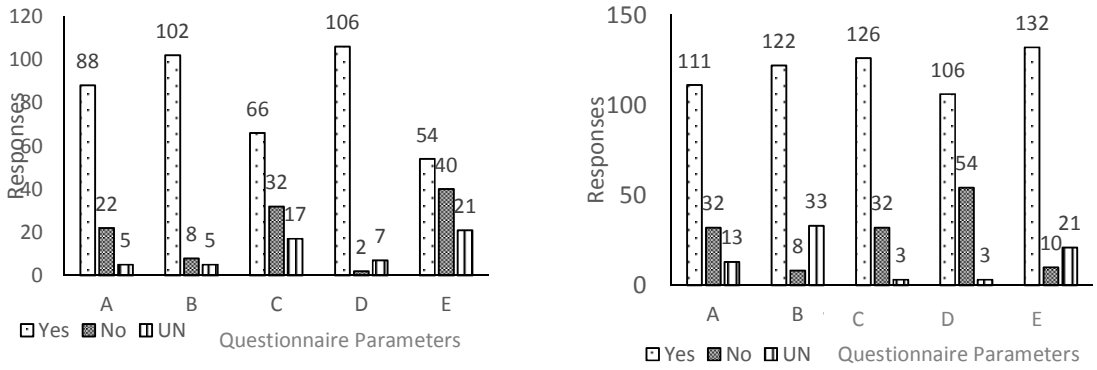
The positive (or yes) response level of 57.4 – 92.2% for staff and 68.1 – 81.0% for students on the issue of neck and shoulder aches are supportive of poor ergonomics workstation setup at the University of Port Harcourt. On the responses to the questions, a total of 4 out of 5 and 5 out of 5 were recorded for staff and students with high positive values, respectively. As evident in Fig. 7a, poor workstations and ergonomic practice make a number of the University staff prone to neck and shoulder aches/pain which could lead to development of MSDs. Better ergonomics awareness and proper workstation design can curb this menace. To a great extent the students' workstations in the University of Port Harcourt are likely to cause neck and shoulder aches (see Fig. 7b) which may result to MSDs. Physical observation / inspection of the existing workstations in University of Port Harcourt indicates that there are no real ergonomic considerations in the procurement of classroom furniture as some seats or desks are either too high or too low. Thus, continuous neglect of proper ergonomics in the workstation set up of class rooms, may result to discomfort which apparently leads to poor performance on the part of students.



a) Staff **b) Students**

Fig. 6. Staff and Students responses on experience of lower back aches

A: You bend over to use monitor, keyboard, input device or while making notes?; B: Backrest that provides support in the lower back is absent; C: Your feet touch the floor when sitted
D: Your feet do not touch the floor when sitted; E: Absence of comfortable space between the edge of the seat and the back of the knees; F: You lean forward to read blurry text; G: You lift loads away from the body, thereby increasing load on the lower back that results in reaching and bending; and H: You stand for several hours



a) Staff **b) Students**

Fig. 7. Staff and Students responses on neck and shoulder aches

A: Long reaches to frequently used input devices; B: When hunching the shoulders due to high work surface; C: When placing work above the shoulder; D: There is no arm rest; and E: The seat is too low or desk too high

It is interesting to note that the major findings from this study which includes poor awareness of ergonomic workstation, the resultant effects of poor ergonomic (pains in lower and upper backs, necks) in staff and students are in agreement with the findings of Nwaogazie et al. [15], where most office – based civil servants in Rivers State, Nigeria suffer from pains in their lower back. Also, with reference to the finding on poor workstation for staff and ergonomical compliance furnitures for lecture hall/classrooms, this agrees with the affirmation of Devereux et al. [17] that the ergonomical compliance of the office and workstation environment is a major contributing factor to musculoskeletal disorder.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Based on the results of this study, the following conclusion can be made:

i) The awareness of ergonomics workstation is low at the University of Port Harcourt;
ii) Most respondents experience pain in lower and upper backs, and necks;
iii) Most respondents maintain awkward postures at work or in the classroom as they frequently lean forward, bend their necks or sit in classrooms or offices that do not allow enough leg room or knee clearance;
iv) Most of the staff respondents spend reasonable part of their time using computer (26%) and standing while teaching (42%);
v) Most of the students respondents spend their reasonable time sitting in class receiving lectures (47%) and studying/reading (18.3%), respectively;
vi) A handful of students (9%) stand for most of the time receiving lectures due to limited number of seats;
vii) Some seats and desks are too high, while some are too low leading to hunching of shoulders or slouching resulting in shoulder and back pain; and
viii) Due consideration is not given to ergonomics in the procurement of furniture.

4.2 Recommendation

From this study, Musculoskeletal Disorder (MSD) amongst staff and students from the University of Port Harcourt can be reduced to its barest minimum by the following actions:

i) The workstations for staff and students within the University of Port Harcourt should be upgraded and ergonomically compliant;
ii) The University management should frequently organize safety seminar on ergonomic workstation setup for students and staff of the institution;
iii) The University should carry out frequent ergonomic audit of all its workstations including the students lecture hall; and
iv) There should be sufficient breaks between lectures for students of the institution.

CONSENT AND ETHICAL APPROVAL

Ethical certificate was obtained from the University Ethics committee for the study. Also, informed written consents were obtained from staff and students who participated in the study.

COMPETING INTRESTS

Authors have declared that no competing interests exists.

REFERENCES

1. Boo S, Winkel J, Shahnavaz H. Prevalence of musculoskeletal disorders at workplaces in the people's republic of China. International Journal of Occupational Safety and Ergonomics. 2000;6(4):557–574.
2. Patron DD. Classroom ergonomics implications for health, safety and academic performance [webpage on the Internet] Huntington Valley, PA. The Free Library; 2009.
   Available:http://www.thefreelibrary.com/Classroom+Ergonomics+Implications+for+Health,+Safety+%26+Academic...-a01073984348
   [Accessed November 11, 2013]
3. Centre for Disease Control and Prevention (CDC). National Institute for Occupational Safety and Health (NIOSH). US Department of Health and Human Services; 1997.
4. Triano JJ, Selby NC. Manual material handling to prevent back injury. Spin-Health Trusted Information of Pain Relief; 2006.
   Available:http//www.spine-health.com/wellness/ergonomics/manual-material-handling-prevent-back-injury
5. Mfon E. Essential occupational health and safety. Dorand Publishers. 2009;38-55.
6. Karakolis T, Callaghan JP. The impact of sit-stand office workstations on workers discomfort and productivity: A review. Applied Ergonomics. 2014;45:799–806.
7. WISHA service Division. Office ergonomics – practical solutions for a safer workplace. Washington State Department of Labour and Industries. 2002;F417-133-000.
8. Choobineh A, Lahmi M, Shahavaz H, Jazani RK, Hosseini M. Musculoskeletal symptoms as related to ergonomic factors in Iranian hand-woven carpet industry and general guidelines for workstation design. International Journal of Occupational Safety and Ergonomics (JOSE). 2004;10 (2):157–168.
9. Omokhodion FO, Osungbade OO. Health problems of automobile mechanics in Nigeria. Journal of Borno Medical. 2002; 26:102-104.
10. Oyewole O, Adeniyi EA, Olajitan AA, Oritogun KS. Work-related musculoskeletal disorders and ergonomic stressors among direct and nondirect contact health care workers from a Nigerian tertiary health facility. African Journal of Medical and Health Science. 2016;15(1):7–13.
11. Ajayi OO, Joseph JO, Okanlawon SA, Odunjo OO. Assessment of the impact of musculoskeletal disorders on Nigerian construction workers. International Journal of Civil Engineering, Construction and Estate Management. 2015;3(3):69-84.
12. Momodu BAI, Edosomwan JHE, Edosomwan TO. Evaluation of ergonomics deficiencies in Nigerian computer workstations. Journal of Ergonomics. 2014; S4: 008.
    DOI: 10.4172/2165-7556.S4-008
13. Ikonne CN. Influence of workstation and work posture ergonomics on job satisfaction of librarians in the Federal and State University Libraries in Southern Nigeria. IOSR Journal of Humanities and Social Science (IOSR-JHSS). 2014;19(9): 78–84.
14. Maduagwu MS, Maijindadi RDW, Duniya KI, Oyeyemi AA, Saidu IA. Prevalence and Patterns of work-related musculoskeletal disorders among bankers in Maiduguri, Northeast Nigeria. Occup Med Health Aff. 2014;2:169.
    DOI: 10.4172/2329-6879.1000169
15. Nwaogazie IL, Omuruka TC, Adaramola SS. Work-related musculoskeletal disorders: A case of office-based civil servants in Rivers State, Nigeria. International Journal of Tropical Disease & health. 2016;18(1):1-13.
16. Nwaogazie Ify L. Probability and statistics for science and engineering practice, University of Port Harcourt Press (2nd Edition, 2006). De-Adriot Publishers, Enugu. Nigeria 3rd Edition; 2011.
17. Devereux IG, Vlachonikolis BPW. Potential interaction between physical and psychological risk factors in the work place associated with musculoskeletal disorders. Journal of Occupational and Environmental Medicine. 2000;59(4):269-270.

APPENDIX A

Sample of questionnaire response frequency tables for staff

Table A1. Ergonomic workstation checklist

S/N	Items	Yes	No	Un
1	No working clearance between the leg, knee and the desk;	100	15	Nil
2	No standing alternative with sitting and working;	108	2	5
3	You don't work within normal reach of arms/legs;	104	5	6
4	There is not enough room for a tall staff;	80	34	1
5	No comfortable amount of space between the edge of the seat and the back of the knees;	90	6	19
6	The keyboard is at a height which places the forearms approximately parallel with the floor;	88	12	15
7	Arm rest is not used or adjusted to support or suit arms movement.	74	38	3

Table A2. Lower back ache

S/N	Items	Yes	No	Un
	Do you experience lower backache when:			
8	You bend over to use monitor, keyboard, input device or while making notes;	96	9	10
9	Back rest that provides support in the lower back is absent?	111	4	0
10	Your feet touch the floor when sitted	106	6	3
11	Your feet do not touch the floor when sitted;	66	48	1
12	Absence of comfortable amount of space between the edge of the seat and the back of the knees;	88	20	7
13	You lean forward to read blurry text;	104	2	9
14	You lift loads away from the body, thereby increasing load on the lower back that results in reaching and bending;	88	20	7
15	You stand for several hours.	66	40	9

Table A3. Head ache & eye strain

S/N	Items	Yes	No	Un
	Do you strain your eye or have headaches when:			
16	Focusing on the displayed text on your monitor's screen, which often results twisting and leaning when trying to find a glare-free angle to view from	82	24	9
17	You experience difficulty in adjusting to the differences in light levels, with respect to your eyes sensitivity	102	6	7
18	Reflected overhead lights may cause white spots on screen, often resulting in twisting and leaning when trying to find a glare-free angle to view	106	6	3
19	Low lighting and shadows make it difficult to see hard copy	92	16	7
20	The glare reflecting from work surfaces shine into your eyes and are more difficult to avoid,	74	36	5

Table A4. Neck and upper back ache

S/N	Items	Yes	No	Un
	Do you experience neck and upper back ache when:			
21	Documents that are laid flat on the desk surface result in leaning forward and tilting the head downward;	73	38	4
22	You frequently lift items located between knee and shoulder height;	54	38	23
23	Loads are regularly lifted/carried with two hands below 50 lbs for men and below 44 lbs for women ;	75	22	18
24	You bend forward to view text or images on your computer screen;	86	16	13

Table A5. Neck and shoulder ache

S/N	Items	Yes	No	Un
	Does your neck and shoulder ache when:			
25	Long reaches to frequently used input devices;	88	22	5
26	When hunching the shoulders due to high work surface;	102	8	5
27	When placing load/work above the shoulder;	66	32	17
28	There is no arm rest;	106	2	7
29	The seat is too low or desk too high.	54	40	21

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