AN ASSESSMENT OF ERGONOMIC WORKSTATIONS AND PAIN AMONG COMPUTER USERS IN A NIGERIAN UNIVERSITY COMMUNITY

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SUMMARY

Background & Objective: Computer usage is a trend in technology advancement that is common with virtually all jobs and it predisposes all users to avoidable musculoskeletal injuries. This study aimed at determining Computer Workstation (CW) ergonomics among computer users in Obafemi Awolowo University Ile-Ife, Nigeria. Also the distributions of musculoskeletal pain experienced by computers users were determined.

Methods: One hundred and fifty (150) participants were recruited using cluster sampling technique. Participants must have been users for 6 months, working 15hours per week .The participant's bio-data were recorded and CW were identified and measured for footrest, casters, keyboard height, seat height, monitor height, seat back angle and arm angle. They were asked if they were experiencing pain, its location and cause. Data were analysed using descriptive statistics.

Results: Results obtained showed that 23 (15.3%) of the CW had 5 casters, and just 3 (2%) had footrests while there were, 130 (86.7%) and 104 (69.3%) with ideal chair and keyboard heights respectively. Also, there were 130 (86.7%) and 136 (90%) with ideal monitor height and seat back angle respectively. Results showed that 105 (70%) of the participants experienced pain and mostly (52.4 % of the 70%) in the back with mean pain intensity 7 on a 10 point pain scale. Participants; (38) 25.3%, believed that CW arrangement was the cause of the pain.

Conclusion: This study concluded that majority of the CW did not meet the standard description of CW and majority of the computer had pain in the low back as at the time of study.

INTRODUCTION

Computer, a hallmark of technology advancement has ushered in a new genre of occupational health problems via improper ergonomic arrangement (Suparna, et al, 2005). The computer has been identified as a device that has a unique potential to improve the quality of health (Idowu et al, 2003). A good work ergonomic arrangement will allow any computer user to work in natural, ideal typing posture that will minimize the risk of developing any injury (Hedge, 2007). Positioning or using a computer improperly can lead to various injuries from short term discomfort or headache to potentially debilitating conditions like carpal tunnel syndrome. The posture assumed while working in an office can put a strain on the body but there are things that can be done to be more comfortable and to help prevent injuries i.e. workstation ergonomics. Literatures have shown that ideal seat height is between 38cm -53cm while keyboard height is between 65cm -81cm (Jackson, 1999). Also, monitor height, seat back and arm angles are observed to be normal when they are 90cm -115cm, 90 degrees and 90 degrees respectively, (Jackson, 1999). Studies showed that levels of ergonomic knowledge and the priority given to ergonomic computer use were low irrespective of location (Sawyer, 2004).

According to Rudakwetch et al, (2001), ergonomic intervention reduces the prevalence of musculoskeletal symptoms by an average of 40%. Interventions aimed at reducing musculoskeletal disorders due to computer workstation should be directed at either physical or ergonomic factors. Good posture is the basis of good workstation ergonomic and the evaluations of postures

and postural re-education as formed part of physiotherapy education and practice since its earliest days (Jones and Bakers, 1996). The postures a man adopts should involve little expenditure of energy, minimal stress and strain which should be conducive for maximum efficiency of the body (Jones and Bakers, 1996).

There is an upsurge in computer usage of recent with a consequent increase prevalence of musculoskeletal disorders in the neck, upper extremities and low back (Kryger et al, 2003; Adedoyin et al, 2004). Back pain and other musculoskeletal pain have been observed to be common among computer users (Adedoyin et al, 2004). The increase prevalence has been link to factors like poor workstation design, duration of daily keyboard and mouse usage, assumed posture during computer work, (Palmer et al, 2001; Kryger et al, 2003; Sillanpaa et al, 2003). There has been an extensive study of these disorders in the developed nations of the world but they are appeared to be few available studies in this environment. Similarly, there is scarcity of studies that evaluated computer workstation among computer users. This study was therefore aimed at determining computer workstation among computer users in Obafemi Awolowo University, Ile Ife, Nigeria. Musculoskeletal pain intensity, distribution and cause, and was also determined

METHODOLOGY
Materials
Subjects: The study involved 150 male and female participants. They were computer users who had used a computer for a minimum of 6 months and constituently working for 3 hours per day or 5 hours per week as described by (Supama et al, 2005). They were recruited from 6 faculties in Obafemi Awolowo University (OAU), Ile Ife, and Osun State, Nigeria.

Instruments:
Bathroom weighing scale, height meter, to measure heights and weights respectively and visual analogue scale to rate pain, tape measure to measure lengths and goniometer to quantify angles.

Research Design & Sampling Technique:
The research design for this study was the cross sectional survey design. The cluster sampling technique was used to randomly select the faculties that were used.

Procedure
An ethical clearance for the research was sought and obtained from the research committee of the Obafemi Awolowo University Teaching Hospital Complex. The computer workstation was assessed for ergonomics safety measures available and these included foot rest, casters, and elbow rest. Participants' physical characteristics (body weights, and heights) and the pain intensities were measured.

Computer Workstation: These following variables were measured

❖ Seat height: This was measured as distance from the floor to the top seat surface using the tape measure. Ideal seat height is between 38cm-53cm. (Jackson, 1999).

❖ Keyboard height: This was measured as distance from the floor to the keyboard tray using the tape measure. Ideal keyboard height is between 65cm-81cm (Jackson, 1999).

❖ Monitor height: This was measured as distance from the floor to the edge of the monitor using the tape measure. Ideal monitor height is between 90cm-115cm (Jackson, 1999).

❖ Seat back angle: This was measured as the angle between the horizontal and vertical bars of the chair using the goniometer. Ideal seat back angle is 90 degrees (Jackson, 1999).

❖ Arm angle: This was measured as the angle of the elbow joint while working on the computer using the goniometer. Ideal arm angle is 90 degrees. (Jackson, 1999).

Computer work station chairs were also assessed for five casters and foot rest (Jackson, 1999). Participants were assessed on; pain severity and location(s) during the use of computer, and the cause(s) of pain.

Data Analysis
Data were analyzed using descriptive statistics of mean, standard deviation, frequencies and percentages.

RESULTS
Physical characteristics of the participants
One hundred and fifty male and female computer users recruited from six randomly selected faculties of the Obafemi Awolowo University Ile Ife participated in the study. The physical parameters of the participants are presented in Table 1. The mean, age weight, and height were 42.2± 7.7, 68.8 ±9.8 and 1.60± 0.1 respectively.

Table 1: Physical Characteristics of the Participants

	Range	Mean	±SD
Age (n=150)	28 – 59	42.4	±7.7
Height (N=150)	1.50 – 1.86	1.4	±0.1
weight (N=150)	25 – 101	68.8	±9.8

Key- N= Number of subjects, SD = Standard Deviation the visual analogue pain rating scale of 10 (Table 5).

The period of computer usage in years among the computer users were arranged in the range of 1-5yrs, 6-10yrs, 11-15yrs and 16-20yrs. Seventy five (50%), 68(45.3%), 6(4.0%), and 1(0.1%) fell within the grouped years respectively. Also, the length of computer usage in hours were arranged into the range of 1-5yrs and 6-10yrs with the frequency

and percentage of 120(80%), 30(20%) respectively (Table 2). Also, the results showed that 105 participants representing 70% of the whole group experienced pain at work while using the computer but only 45 (30%) were without pain.

The locations of pain among 105 computer users who claimed to have pain are presented in Table 3. The locations were; the eyes, neck, back, back and neck and wrist. Results showed that 55(52.4%) complained of pain mostly in the back. Twenty seven (25.7%) subjects could not explain the source of the pain, while the same number claimed that the computer workstation arrangement must have been responsible for the pain. Also, 24(22.9%) participants opined that having musculoskeletal pain was due to the long length hours of work. The results also showed that 30 (28.6%) rated their pain as 3, 37 (35.2%) as 4 , 25 (24.8%) as 5 and only 1 (1%) of the participants experienced pain level of 7 on the visual analogue pain rating scale of 10 (Table 3).

Table 2: Physical Characteristics of the Subject

N= 150	Range	F	%
Length of computer use in years	1-5	75	50
	6-10	68	45.3
	11-15	6	4
Length of computer use in Hours per day	16-20	1	0.7
	1-5	105	70
	6-10	45	30

KEY- N= Number of subjects, SD = Standard Deviation

Table 3:Frequency showing the Location of Pain, Cause of Pain and the rating of Pain usuing VAS

N= 150	Range	F	%
Location of Pain	Eyes	4	3.8
	Neck	15	14.3
	Back	55	52.4
	Back and Eyes	8	7.6
	Back and Neck	15	14.3
	Wrist and Back	8	7.6
Pain rating using VAS	2	3	2.9
	3	30	28.6
	4	37	35.2
	5	26	24.8
	6	8	7.6
	7	1	1
Causes of Pain	Don't Know	27	25.7
	Furniture	27	25.7
	Body Weight	8	7.6
	Sitting Posture	4	3.8
	Sitting for Long	13	12.4
	Long Length of Hours at work	24	2.9
	Monitor	2	1.9

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One hundred and twenty one (80.7%) participants were aware of the need for a proper table and chair for the computer workstation while 29(19.3%) were not. Six (50.7%) departments involved in the study were not aware of the proper table and chair for computer workstation while 74(49.3%) were aware. Twenty three (15.3%) out of the 150 computer chairs have five casters the ideal for a proper ergonomic workstation (Jackson, 1999). One hundred and twenty seven (84.7%) computer workstations did not have 5 casters, while 147 (98%) did not have foot rests (Table 4).

The ideal measurement of computer furniture was compared with the computer furniture measurement at the different workstation involved in the study. One hundred and thirty (86.7%) had the ideal seat height while 20 (13.3%) did not. One hundred and four (69.3%) had the ideal keyboard height while 20(13.3%) had the ideal monitor height/ 136 (90%) had seat back angle, while 15(10%) did not. 114 (76%) had ideal arm angles while 36(24.5%) did not.

Table 4: Frequency and Percentage Table of Five Casters and Foot Rest

N= 150	Range	F	%
Five Casters	Yes	23	15.3
	No	127	84.7
Foot Rest	Yes	3	2
	No	147	98

KEY- N= Number of subjects, F = Frequency, %= percentage

DISCUSSION

Result obtained showed that (105) 70% of the subjects involved in the study had pain while using the computer. This might be because a lot of them probably assumed bad postures when working on the computer as evidenced by the poor common computer working environment observed in this study. Even though most of the computer workstations observed in this study had chairs and tables with proper heights and angles, they were still not up to standard in literature because most o f the stations had less than five casters and no footrest, which are basic part of proper computer chairs and tables. Sawyer (2004) opined that levels of ergonomic knowledge and the priority given to ergonomic computer use were low irrespective of location. Good posture according to Hedge (1993) is one, which most naturally suits the body, and it is the basis of good workstation ergonomics and the best way to avoid a computer-related injury. . Thirty eight (25.3%) out of the participants who claimed to have pain believed their furniture arrangement was the cause of the pain. Only few chairs had 5 casters, the standard for a proper ergonomic workstation and very few of the whole 150 computer workstation had a foot rest. According to Caple (2007), a foot rest is useful to address lower back fatigue when sitting for long periods. Pushing the feet into the footrest helps to push the back into the angled backrest of the chair. Idowu et al, (2005) also opined that a computer chair should have a 5-leg base (casters) for stability

This study found that computer users in the University experienced pain in the eyes, neck, wrist but majority experienced pain in the back. The mean pain intensity observed in this study on a 10 point pain scale was 7. This value appears to be high, suggesting that pain experienced by computer users in this study was high. Adedoyin et al (2004) found out that the most common complaints by computer users were low-back pain (78%), finger pain (69%) and neck pain (67%). All these were identified with poor ergonomic inappropriate furniture as the cause of pain among the participants studied. Kryger et al (2003) similarly observed that there is an upsurge in computer usage with a consequent increase prevalence of musculoskeletal disorders in the neck, upper extremities and low back.

CONCLUSION

It was concluded that only few of the computers had standard 5 casters and foot rests. The computer stations however met expected standard for seat and keyboard heights, monitor and seat back angles. Computer users experienced pain mostly in the back, and mostly between 3 and 5 on a ten point scale.

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