Title: Effectiveness of self-instructional information on knowledge of office ergonomics among computer users in educational institutions in North-Eastern Nigeria

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Abstract

Background: The use of computers has increased among adolescents, as have musculoskeletal symptoms. There is evidence that these symptoms can be reduced through ergonomic approaches via education

Objectives: The purpose of this study was to assess the effectiveness of self-instructional information on knowledge regarding office ergonomics among computer users.

Methods: 170 computer users among the staffs of selected higher educational institutions in Nigeria participated in this study. The occupational Safety and Health Administration (OSHA) workstation checklist was used to assess the level of knowledge of office ergonomics. The work Safely with Visual Display Terminal (WSVDT) booklet was used to provide instructional information on office ergonomics. Both the OSHA checklist and WSVDT booklet were administered and collected by hand. Paired *t*-test and Kendall's correlation coefficients were used for data analysis. Statistical significance was set at an alpha level of 0.05

Results: The pre-information and post-information knowledge scores of office ergonomic were 22.78±6.61 and 31.05±2.82 respectively. Paired *t* test showed a significant difference in the pre information and post -information knowledge scores of the participants ($t = 20.495$, P value = 0.000). Kendall's correlation coefficient value (r) of the association between changes in the level of knowledge of office computer ergonomic and age, level of education of computer users, levels of computer use; i.e., daily computer use, weekly computer use and total period of computer use, were -0.28, 0.34, 0.59, 0.24 and 0.07, respectively. Age did not show a statistically significant correlation with changes in the knowledge of office ergonomic ($P > 0.05$) whereas the level of educational qualifications and all levels of duration of computer use did show significant correlation ($P < 0.05$).

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Conclusion: Findings from this study showed that instructional information on computer office ergonomics increased the level of knowledge of office ergonomics among computer users in selected institutions of learning in Nigeria. It also showed that the level of education and duration of computer use increased with an increase in the changes in the level of knowledge of computer office ergonomics among computer users.

Key Words: Computers, Office-ergonomics, Training

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Introduction

Computers provide many benefits to organizations as they allow the processing, storage, generation and communication of vast amounts of data quickly and accurately, resulting in increased efficiency and productivity (Bergvist et al, 1997). During the past several years computers have gone from being scarce in various institutions of learning to being a standard part of the day-to-day running of academic and non-academic programmmes. Much funding has gone towards obtaining computers for staff within Nigerian universities and institutions of learning, without corresponding infrastructural support and training for the users**.** Ergonomics is the science of fitting jobs to workers by taking into account the requirements of the job and peoples' physical and mental capacities (Computer Work Station Ergonomics 2008). It is the science of ergonomics that is used to design an appropriate computer workstation. When workstations are not designed appropriately, when non-ergonomically designed computer equipment is used and when jobs and tasks are not well organized, a number of computer related health problems can arise (Computer Work Station Ergonomics 2008). Whether browsing the Web or intensively entering and editing text in a document, arms, wrists, and fingers are at work on the keyboard, mouse, and desktop. These continuous movements cause Repetitive Strain Injury. Reports of studies have suggested clearly the likelihood of suffering health problems linked to computer use is related to the amount of time spent using computers as well as the lack of knowledge related to computer ergonomics (Janwantanakul et al., 2008). There is evidence that computer related musculoskeletal symptoms can be reduced through an ergonomics approach and through education (Computer work station ergonomics 2008). The question is whether the alleged planned teaching programme on ergonomics for computer use will be effective on the level of knowledge of computer users.

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Methods

Ethical approval

Permission to carry out this study was obtained from the Research and Ethics Committee of University of Maiduguri Teaching Hospital. Detailed information about the study was provided and informed consent was obtained from the participants prior to participating in the study.

Questions on demographic variables such as age, sex, level of education and duration of computer usage were collected via a well-structured questionnaire known as the Occupational Safety and Health Administration (OSHA) checklist. OSHA is used specifically for identifying risk factors for work-related MSDs associated with workstation postures and devices (Computer Workstation Ergonomics 2008) The OSHA workstation questionnaire revealed specific risks for work-related MSDs related to positioning of the head, neck, shoulders, and trunk, as well as seating issues. The questionnaire also identified risks associated with keyboard and mouse position, monitor position, and lack of document holder, wrist rests, and telephone hands-free headset. It has been shown to have good internal consistency (α=.89) and good test-retest reliability (r=.88) and is correlated with measures of pain (r=.41) and upper-extremity symptoms (r=.33) [Bergvist et al., 1997].

Participants

Participants were computer users and staff of the University of Maiduguri (UNIMAID), University of Maiduguri Teaching Hospital (UMTH), Ramat Polytechnic and Kashim Ibrahim College of Education Maiduguri. Eligible participants were those who used desk top and/or laptop computers and were able to read, write and understand the English language. Computer users who met these criteria but have undergone any studies involving knowledge of office ergonomics in the past were excluded

Assessment of level of knowledge of office ergonomics

The OSHA workstation checklist was used to assess the level of knowledge of office ergonomics prior to and after administration of instructional information. The OSHA workstation checklist is used specifically for identifying risk factors for work-related MSDs associated with workstation postures and devices. The OSHA workstation checklist revealed specific risks for work-related (MSDs) related to positioning of the head, neck, shoulders, and trunk, as well as seating issues. The workstation checklist also identifies risks associated with keyboard and mouse position, monitor position, and lack of document holder, wrist rests, and telephone hands-free headset. The OSHA workstation checklist is made up of 34 different statements where participants will be required to respond to each of the statement by indicating Yes or No. A score of 1 was assigned to a correct response and 0 to an incorrect response. The checklist has been shown to have good internal consistency (α=.89) and good test-retest reliability (r=.88) and is correlated with measures of pain (r=.41) and upper-extremity symptoms (r=.33) [Bergvist et al., 1997].

Instructional information materials on office ergonomics

The Work Safely with Visual Display Terminal (WSVDT) booklet was used to provide instructional information on office ergonomics. It is a self-instructional information booklet on office ergonomic problems and their management**:** This booklet examines the potential hazards and interventions employers can use to prevent or reduce the potential harmful effects of working with visual display terminals (VDTs). The information in this brochure comes from standard office practice guidelines for tasks requiring long periods of concentrations and repetitive motions among computer users. These suggestions will help users to avoid fatigue and discomfort and tell them how to best use the computer to make tasks easier and more enjoyable (Computer Workstation Ergonomics 2008).

Procedure

Prior to administering the instructional information material on office ergonomics, the OSHA workstation checklist was administered to all the participants who were then requested to complete and return it immediately. Following this, an instructional information material on office ergonomics, the WSVDT booklet was given to all the participants who were then requested to study it within 24hrs (1 day). Upon returning the WSVDT booklet, the OSHA workstation check list was then re-administered to the participants for immediate completion. Administration and collection of questionnaires and instructional information material was done by hand.

Data analysis

Paired *t*-test was used to analyse the differences between pre-information and post-information level of knowledge scores. Kendall's Correlation Coefficient was used to determine the association between changes in the level of knowledge and each of the demographic variables e.g. age, level of educational qualification and duration of computer use. The level of significance was set at alpha = 0.05

Results

One hundred and seventy (170) copies of the (OSHA) VDT workstation checklist questionnaire were distributed. One hundred and seventy were returned (a response rate of 100%). All the returned questionnaires were included in the analysis process.

Table 1 shows the socio-demographic variables of the participants: age, gender, level of education and period of computer usage. A total of 170 participants from the age of 15years and above met the inclusion criteria and were recruited into the study, they were grouped into four groups according to their age (i.e., 15 – 24 years, 25 – 34 years, 35 – 44 years, and

45years and over). There were 123 participants between the ages of 15-44 (72.4%), and 47 participants from 45 years of age and above, (27.6%).

Table 1: Participants' Age, Gender, Level of Education and Period of computer usage

Variables	Frequency	Percentage (%)
Age, years		
15-24 s	10	5.9
25-34	60	35.3
35-44	53	31.2
≥ 45	47	27.6
Gender, n		
Male	112	65.9
Female	58	34.1
Level of Education, n		
Primary/Elementary	3	1.8
Secondary/High School	64	37.6
Bachelor Degree	41	24.1
Master Degree	34	20.0
Doctorate Degree	28	16.5
Daily Computer Use, n		
< 1 hr	10	5.9
1-2hrs	52	30.6
3-4hrs	66	38.8
≥ 5 hrs	42	24.7
Weekly Computer Use, n		
Once weekly	4	2.4
Twice weekly	13	7.6
Thrice weekly	15	8.8
Four times weekly	13	7.6
≥ Five times weekly	125	73.5
Total Period of Computer Use, n		
< 1year	5	2.9
2-3years	16	9.4
≥ 4-5years	25	14.7

The majority of participants were male 112 (65.9%), and 58 (34.1%) were female. There were 67(39.4%) participants with primary/elementary school to secondary/high school qualifications and 103 (60.6%) participants with bachelor degree qualification and above. One hundred and twenty eight (75.3%) participants used a computer between less than one to four hours daily, and 42 (24.7%) participants used a computer five hours or more a day. Forty five (26.4%) of the participants used a computer within one to four times weekly and 125 (73.5%) used a computer five times or more a week. In terms of the participants' total

period of computer use, 21 (12.3%) of the participants had used computer for less than three years and participants 25 (14.7%) had used a computer between four to five years.

Table 2: Pre information and post information knowledge scores

Variables	Mean± SD	t-value	p-value
Pre-IK	22.78±6.61	20. 495	<0.0001
Post-IK	31.05±2.82		

Key: Pre-IK = pre-information knowledge score; Post-IK = post-information knowledge

Table 2 shows the pre-information and post-information knowledge scores of the participants. The pre-information scores have a mean and standard deviation value of 22.78±6.61while the post-information knowledge scores were 31.05±2.82. Paired *t*-test showed a significant difference between pre-information and post-information knowledge scores of the participants (t =20.495, P value = 0.000).

Table 3: Kendall's Correlation Coefficient table

	Age	LEDU	DCU	WCU	TPCU
Corr. Coeff. (r)	-0.28	0.34	0.59	0.24	0.07
p values	0.646	0.047	0.033	0.004	0.001

Post IK minus Pre IK (X± SD) = 8.10±0.05

Key: LEDU = Level of education; DCU = Daily computer use; WCU = Weekly computer use; TPCU=Total period of computer use.

Table 3 shows Kendall's Correlation Coefficient on the association between age, level of education, daily computer use, weekly computer use, total period of computer use and changes in the level of knowledge of office ergonomics (post-information knowledge scores minus pre-information knowledge scores) of the participants. The coefficient value (r) between changes in the level of knowledge and age, level of education, daily computer use, weekly computer use and total period of computer use were -0.28, -0.34, 0.59, 0.24 and 0.07 respectively. Age did not show a statistically significant correlation with changes in the knowledge of office ergonomics (P >0.05) while the level of educational qualifications and duration of computer did show a significant correlation (P < 0.05).

One hundred and seventy copies of the (OSHA) Workstation Checklist questionnaire were distributed. One hundred and seventy were returned, giving a response rate of 100%. All the returned questionnaires were included in the analysis process.

Discussion

Findings from this study establish that the information module on office ergonomics increased the participants' level of knowledge on office ergonomics among computer users in the selected institutions of higher learning. This is very important to note as previous studies have revealed lack of knowledge of office ergonomics as one of the risk factors for developing computer related MSDs. Omokhodion and Sanya, (2003) carried out a study on ergonomic practices and musculoskeletal complaints among office computer users. The study revealed poor computer ergonomics practice, lack of training of computer users and non-availability of policies on computer ergonomics. The findings from this present study has shown that instructional information on office ergonomics could be a means of empowering computer users on computer ergonomic principles, so as to prevent the occurrence of work-related MSDs that could arise from improper use of computers.

The outcome of the present study showed a negative correlation between age of computer users and changes in the level of knowledge of office ergonomics as a result of the information provided. This could mean that the younger computer users demonstrated more understanding of the information provided than the older computer users. Conversely, levels of education and duration of computer use showed positive correlations to the changes in the level of knowledge of office ergonomics as a result of the information modules provided. This perhaps could imply that computer users who spend more time using a computer and those who are more educationally qualified demonstrated more understanding of the information provided on office ergonomics. The association between age and level of knowledge did not show a statistical significance which was shown for the level of education

and duration of computer use (P <0.05). It appears that studies on the association between age and level of education of computer users with information on office ergonomics are scarce, thus limiting a comparison of the findings from this study with previous ones. However, reports of some previous reviews have indicated a possible causal relationship between computer work and musculoskeletal complaints in various parts of the human body (Woods, 2005; Janwantanakul et al., 2008; Klussmann et al., 2008). In these studies, the increased prevalence has been linked to factors such as duration of daily keyboard and mouse usage, poor workstation design, and assumed posture during computer work (Palmer et al, 2001; Kryger et al, 2003). Bart (2008) has reported the association between prolonged computer uses and poor postures at workstations as the main cause of MSDs. Hakala (2002) suggested that prolonged self-reported computer usage is the most consistently reported risk factor for computing-related MSDs across study populations.

The observed increase in the level of knowledge of office ergonomics could be due to the facts that the majority of the participants who also are regular computer users lacked the knowledge of basic office ergonomics prior to reading the information pamphlet. It could also mean that the majority of the computer users in the present study became aware of the consequences of assuming poor posture while using the computer as they looked at illustrations and read about the correct and incorrect postures and consequences of adopting incorrect postures via the information provided in the information module used in the present study. Ming and Zaproudina, (2003) and Wahlstrom, (2005) in their studies indicated the various parts of the body including neck, shoulder, back, and leg where computer users could have musculoskeletal complaints as a result of poor computer ergonomics. Thus, it could be that the instructional information material used in the present study, which contained information on the deleterious effects of adopting poor working posture and also diagrams (pictorial illustrations) showing right and wrong postures in different part of the body have

been very useful to enhance the understanding of the participants on office ergonomics. However, there will be a need for randomised controlled trials involving larger numbers of subjects and in which the effects of instructional information modules on the incidence, intensity and /or frequency of work related MSDs among computer users may be investigated to validate the perceived benefits of the instructional information.

Conclusion

This study concluded that information module on computer office ergonomics increased the level of knowledge of office ergonomics among computer users in selected institutions of learning in Nigeria. It also showed that the level of education and duration of computer use increased with changes in the level of knowledge of computer office ergonomics.

Conflict of interest: None declared

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