

Title: Computer ergonomic practices and musculoskeletal complaints among computer users in a Nigerian University community

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Abstract

Background: Over the past few decades, computer-based technology has become indispensable in most offices and has become part of the day-to-day operations in our Universities. With the increased proliferation of computer technology, there are concerns about its safe and comfortable use since many scientific studies have found various associations between computer use and musculoskeletal discomfort.

Objective: This study was designed to document the computer ergonomic practices of secretarial staff within the university. Their expressed musculoskeletal complaints were also documented.

Method: The study was descriptive and cross-sectional in design. A purposive sampling technique was used to select 240 members of the secretarial staff who participated in the study. A random sampling technique was used to select thirty secretaries who were observed at their workstations and 50 heads of department who were interviewed. Data was analyzed using descriptive and chi-square statistics.

Results: The study revealed poor computer ergonomics practice, lack of training of computer users and non-availability of policies on computer ergonomics within the university. The majority (70%) had experienced musculoskeletal symptoms in the neck, shoulder, back and wrist during the 12 months preceding the study, which were attributed to computer use.

Conclusion: Computer ergonomic practices of secretarial staff within the university are poor. Computer ergonomic training should be organized for computer users within the university.

Keywords: Computer use, Ergonomics, Musculoskeletal Discomfort, Secretarial Staff, Training

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 five years computers have gone from being scarce in Nigerian universities to being a standard part of the day-to-day running of academic and non-academic programs. Much funding has gone towards obtaining computers for secretarial staff within Nigerian universities, without corresponding infrastructure support and training for the users.

Ergonomics is often defined as “fitting the job to the person” (OFSWA, 2003). Poor ergonomics while using the computer can lead to musculoskeletal symptoms that include fatigue, muscle discomfort, burning sensation, stiffness, aches and pains, soreness, weakness of muscles or numbness and tingling (Ortiz-Hernandez et al, 2003). University of Ibadan has been making new developments in the Information Technology (IT) sector. This is reflected in the emergence of cybercafés, computer centers and use of computers by all departments in the university. The number of computer users in the university is therefore on the rise, and this is expected to increase further in the coming years. In most departments, secretaries carry out secretarial jobs, which most times have to do with use of the computer (Aboyade, 1999). The increased use of computers by secretaries in various departments in the university is seen to pose a major health risk to them in terms of development of musculoskeletal symptoms. Secretaries constitute a particularly vulnerable group because most of the furniture they use is not designed or suited to their anthropometric dimensions, and most furniture is not even adjustable and when they are adjustable, they often are not adjusted (Bennett, 2001).

As more workers spend more time working at the computers without due consideration and knowledge of computer ergonomics, they are putting themselves at risk for musculoskeletal disorders and other conditions that can result from overuse. Several previous reviews have indicated a possible causal relationship between computer work and musculoskeletal complaints in various parts of the human body (Hush, Mayer, and Refshauge., 2005; Woods, 2005; Janwantanakul et al., 2008; Klusmann et al., 2008). Back pain and other musculoskeletal pain have been observed to be common among computer users in Nigeria (Adedoyin et al, 2004). The increase prevalence has been linked to factors such as poor workstation design, duration of daily keyboard and mouse usage, and assumed posture during computer work (Palmer et al, 2001; Kryger et al, 2003). This study aimed at documenting the computer ergonomic practice of secretarial staff within the University of Ibadan in Nigeria.

Methods

The study was descriptive and cross sectional in design. A purposive sampling technique was used to select the secretarial staff that completed a semi-structured, pretested questionnaire. Random sampling was used to select those that participated in the observational study and the heads of departments who were interviewed.

Participants

The study involved 240 members of the secretarial staff of the University of Ibadan who were available and willing to participate in the study. 50 heads of departments were also interviewed in this study. They were recruited from the 13 faculties in the University of Ibadan, Oyo State, Nigeria.

Data were collected by the use of both qualitative and quantitative methods. A semi-structured, pre-tested questionnaire was used to obtain information about socio-demographics characteristics of respondents, knowledge of computer ergonomics and experience of musculoskeletal health

symptoms. Pre-testing of the questionnaire was carried out among the secretarial staff of the Polytechnic Ibadan, Oyo State, Nigeria. An observational method was used to observe the workstation of thirty secretaries who were randomly selected from the University of Ibadan. A checklist was used to systematically record observations. In-depth interviews were also carried out with fifty heads of departments who were also randomly selected from the 13 faculties in the university.

Procedure

Participants were consented using an institution-approved document that thoroughly explained the study purpose. Those who did not want to participate had the right to decline being interviewed. Confidentiality and anonymity were maintained during the conduct of the study by using serial numbers only and not names.

Data analysis

The data obtained were entered into a computer and analyzed with SPSS version 11.0 and were presented in frequencies, tables and appropriate graphs. Chi-square test was used to test associations involving discrete data. The level of significance was set at $p < 0.05$.

Results

Socio-demographic characteristics of respondents

A total of 240 computer users comprised of typists and secretaries selected from the 13 faculties in the university participated in the study. The mean age of respondents was 40 ± 7 years. 156 (65%) of the respondents were females while 84 (35%) were males. The average years of working experience was 12 years, with a range from 2-33 years spent in service.

Knowledge and experience of health symptoms

Respondents listed problems that may arise as a result of use of the computer without proper ergonomics as back pain (75.8%), neck pain (70%), eye problem (71.3%), leg pain (17.9%), hand and wrist pain (47.5%), and shoulder pain (16.7%) (Table 1).

Table 1: Respondents' Knowledge of Problems That May Arise As A Result of Poor Computer Ergonomics

Problems	Frequency	Percent
Back Pain	182	75.8
Neck Pain	168	70.0
Eyes Problem	171	71.3
Leg Pain	43	17.9
Hand & Wrist problem	114	47.5
Shoulder Pain	40	16.7
Headache	57	23.8

A high proportion of respondents (68.3%) reported that they had experienced musculoskeletal pain or discomfort in some part of their body in the last 12 month prior to the study (Table 2). Gender was significantly correlated to their experience of pain, with males (84.7%) having a higher incidence of pain than females (61.9%) ($p = 0.03$).

Table 2: Respondents' report of parts of the body in which they had experienced pain

Part of the body	Frequency	Percent
Head	51	21.3
Neck	78	32.5
Upper Back	52	21.7
Elbow	24	10
Hip	12	5
Hand	44	18.3
Ankle/feet	26	10.8
Knee	23	9.6
Thigh	35	14.6
Wrist	68	28.3
Lower back	76	31.7
Shoulder	62	25.8
Eyes	89	37.1

Computer ergonomic practice

Respondents were observed while working at their workstation. Each observation took an average of thirty minutes. Most of the respondents observed were not at an arm's distance (between 18-24 inches) away from their computers. They were either too close or too far. All secretaries observed did not have a document holder and nearly all (96.9%) had their document at the same level as the work surface. The entire mouse was seen to respond easily during use and many (62.5%) of the monitor screens were at or slightly below eye level. Half of the computers observed had a glare on them.

The majority (87.5%) of subjects had their elbow joint not angled at the recommended angle (90^0), while three-quarter of secretaries observed had their wrists not straight while keyboarding. None of them had a wrist rest. Most (81.3%) secretaries had their lower back unsupported in the chair and three-quarter actually sat at the edge of the chair without using the back support of the chair. Most (87.5%) seats were cushioned, and there was adequate room for leg clearance among most (71.9%) of respondents while almost all (96.9%) had their thighs well positioned without having contact with the underside of the desk. The majority (78.1%) of the respondents' chairs were not adjustable (Table 3).

Training on computer ergonomics

The in-depth interview conducted with the heads of departments revealed that almost all staff within the various departments had access to a computer, and it was even documented that most academic staff had laptops while other non-academics make use of the computers within the department. Some departments also have cybercafés where students, lecturers and others come to use the Internet. Of all the departments visited, only one head of department organized personal training on computer ergonomics for his office workers after he received training on ergonomics from abroad. All heads except one who did not respond to the question were certain that there was no policy within the university on computer ergonomics. Most heads considered cost, comfort and convenience, quality and durability, and beauty in selecting office furniture.

Table 3: Observational Checklist

Observational checklist	Yes	No
Head, eyes, neck & shoulders		
Is monitor an arm's distance away from user?	21.9	78.1
Is top of monitor screen at or slightly below eye level?	62.5	37.5
Is there a glare on the screen?	50.0	50.0
Is the document off the flat work surface?	3.1	96.9
Is user aligned straight in front of the monitor & keyboard?	78.1	21.9
Are input documents positioned to minimize head movement?	9.4	90.6
Arms, elbow, wrist & hands		
Are elbows approximately angled from 90 ⁰ to 110 ⁰ ?	12.5	87.5
Is mouse/input device at same level and close to keyboard?	53.1	46.9
Are wrists straight while keyboarding or using the mouse (not angled or drooping)?	25.0	75.0
Does mouse respond easily when in use?	100.0	----
Are hard, sharp, or cold edges contacting arms, wrists, or elbows?	594	40.6
Is there a wrist rest?	----	100.0
Back, legs, & feet		
Is curve of the lower back supported in chair?	18.8	81.3
Do feet rest firmly on floor or footrest?	43.8	56.3
Are hips and knees at comfortable angles when seated back in chair?	21.9	78.1
Is there a fist distance of space between front of chair and back of knees when seated back fully?	12.5	87.5
Is the chair adjustable?	21.9	78.1
Does user perch towards front of chair?	75.0	25.0
Is seat pan cushioned?	87.5	12.5
Is there leg clearance under desk to stretch legs while seated?	71.9	28.1
Do thighs come in close contact with underside of desk or keyboard tray?	3.1	96.9

Discussion

Respondents in this study were fully aware of the consequences of assuming poor posture while using the computer as they listed neck, back, shoulder, hand and wrist pain as problems that may arise as a result of poor computer ergonomics. This is in agreement with the works of Tittiranonda, Burastero, and Rempel et (1999), Ming & Zaproudina, (2003), Wahlstrom, (2005), and Gerr, Monteilh, and Marcus (2006) in which various parts of the body, which included neck, shoulder, back, and leg pain, were documented as where respondents could have musculoskeletal complaints as a result of poor computer ergonomics. A high proportion reported that they had experienced musculoskeletal pain in various parts of their bodies in the last 12 months preceding the study, which was attributed to computer use. This might be because many of them assumed bad posture when working on the computer as evidenced by the result of the observational study carried out. Increased in the incidence of musculoskeletal complaints among computer user was found by Gyekye (2006) to be as a result of maintaining an unnatural or unhealthy posture while using the computer, inadequate lower back support, static load placed on the body by sitting in the same position for an extended period of time and an ergonomically poor workstation design. More men than women reported having musculoskeletal symptoms in this study. This result is in contrast with previous cross-sectional studies that showed a greater female predisposition to musculoskeletal pain. (Mikkelsen et al, 1997; Palmer et al, 2000; Hoogendoorn et al. 2000; Hakala et al 2002). The observational methods revealed poor practice of computer ergonomics among secretaries as most (78%) of the monitors were either too close or too far from the user. Sheedy (1991) concluded in his study of computer users and ergonomics that inappropriately placed computer monitors

places the user at a high risk of developing eye-related problems later in life. The absence of a document holder on the desk of all secretaries observed for documents that needed to be typed showed a poor practice of ergonomics. This implies that documents will most likely be placed on the flat work surface and shows a poor knowledge of computer ergonomics. Document holders have been demonstrated to prevent neck strain from looking up and down between the monitor and documents, and reducing eye fatigue from excessive refocusing between different distances (Atencio, 1996).

A wrist rest is an important component of an ergonomically designed computer work station (Geoffrey, 2006). None of the secretaries observed had a wrist rest. Most computer users had their wrist on the hard table surface, and this may increase pressure on tendons and nerves, leading to being at risk of having musculoskeletal pains in the wrist and hand. The majority (78.1%) of sampled secretaries used chairs that are not adjustable, and 75% of them sat at the edge of the chair while 81% of them did not have their lower back supported by the chair. Research has documented the correlation between poor posture and back pain especially while using the computer (Guo, 2002; Omokhodion and Sanya, 2003). Grieco et al (1998) also concluded that poor posture at work is a major cause of back pain, workplace stress, and repetitive strain injury, resulting in lost time, reduced productivity, poor employee health, low morale, and higher costs.

The in-depth interview conducted with the heads of departments revealed the absence of any documented policy on health and safety issues associated with computer use. It also showed that cost and quality were of more importance when decisions on purchase of office furniture are to be taken. There is a need for university management to also be ergonomically conscious when purchasing office furniture for use by secretaries and even other members of staff. In addition, secretarial staff have to take responsibility for looking after their own well-being as providing ergonomically designed furniture on its own alone is not sufficient to prevent musculoskeletal complaints. There is the need for secretaries to have an in-depth understanding of the issues and an ergonomically conscious work culture, created and supported by the university authority.

Conclusion

This study concluded that computer ergonomics practice among secretarial staff within the University of Ibadan is very poor. Effort should be made to empower computer users within the university on computer ergonomic principles, so as to prevent the occurrence of work-related musculoskeletal complaints that can arise from improper use of computers. Computer ergonomic training is recommended for secretarial staff within the university.

Conflict of interest: None declared.

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