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ERGONOMICS IN THE COMPUTER WORKSTATION

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ABSTRACT

Background: Awareness of effects of long term use of computer and application of ergonomics in the computer workstation is important for preventing musculoskeletal disorders, eyestrain and psychosocial effects.

Objectives: To determine the awareness of physical and psychological effects of prolonged computer usage and application of ergonomics in the workstation.

Design: One hundred and eighty one people were interviewed from tertiary educational institutions, telecommunications and media houses within Nairobi, Kenya.

Subjects: Descriptive cross sectional study.

Results: Majority (89.8%) of the respondents felt that prolonged computer use had an adverse effect on their health, with only 12.4% having received formal training on the same. Assessment of their workstations revealed the most applied ergonomic measure as feet placement on the floor: 100% (181) followed by correct monitor placement with 94.4% (171) fulfilling the requirements. The least applied ergonomic measures were non reflecting wall paint: 5% (9) and adjustable desk 9.9% (18).

Conclusion: There is awareness among computer users on the effects of prolonged computer use but there is limited application of ergonomic measures.

INTRODUCTION

Ergonomics (human factors) is the study of humans in relation to their work environment and working surroundings. It is a broad science involving application of psychological as well as physiological principles to the design of buildings, machinery, vehicles, packaging, implements (1). This is inclusive of the computer workstation.

Rapid globalisation with the need for dissemination of information has led to the increased use of computer-based technology. Nairobi is fast becoming an e-based community but with disregard to the health risks posed by computers.

Problems caused by prolonged computer use include stretch or stress of tendons, nerves and other soft tissues due to non neutral positions of joints (2) and carpal tunnel syndrome (3).

Computer vision syndrome which consists of eyestrain, tired eyes, irritation, redness blurred vision and double vision (4) has also been associated. Psychological stresses such as low job satisfaction, boredom and burnout accompany increased computer use (5).

Local data on the set up of a typical computer based workstation was not available. This information

will be used to influence evidence based policy and practice through awareness.

MATERIALS AND METHODS

This study was a descriptive cross-sectional study. A total of 181 respondents (male to female ratio 1:1) were enrolled following ethical approval from Kenyatta National Hospital Ethics and Research Committee.

Permission from the relevant authorities to interview their personnel was sought and informed consent obtained from the identified participants.

The selected population of the study was from Nairobi metropolitan city. The research participants were identified from tertiary educational institutions, telecommunication and media houses.

The sampling process was snow-balling. Pre-designed self-administered questionnaires were used to collect responses while co-authors did a checklist assessment of ergonomic measures applied within the workstation.

Data collected were coded, tabulated and analysed using SPSS version 11.5 for windows. Chi-square test was employed in analysis of correlation and p-value of <0.05 was considered significant. Results were presented in form of charts and tables.

RESULTS

Total participants were 181, 49.4% male and 50.6% female, mean age 32.3 years. The average number of years worked was 7.8 years with the maximum of 32 years and minimum of one year working experience. The participants' routine work involved use of computers with 104 (59.8%) having used computers before joining their respective professions.

Average number of hours worked per week was 41.5 hours with maximum of 140 hours and minimum four hours per week, average number of hours worked per day was eight hours and hours spent on the computer was six hours.

Only 22 (12.4%) of the respondents had received formal training on health effects of protracted computer use. Those who felt that prolonged computer use had an adverse effect on their health were 159 (89.8%) of

the total participants with most, 109 (59.9%), citing eyestrain as the major adverse effect.

Health complaints were reported among 62 (39.6%) of the respondents and this was significantly associated with long (> 4 hours) computer working hours ($p=0.046$). Those who worked on the computer for less than four hours, 151 (83%) did not report Health problems.

Due to advantages such as entertainment, reliability, accuracy and speed 166 (95.4%) enjoyed working with computers. Computer and multimedia related sources of entertainment such as computer games and internet browsing had been adopted by 50 (29.8%).

Assessment of their work stations was done to determine adherence to ergonomic recommendations and results tabulated.

Figure 1

Self reported health effects associated with prolonged computer use

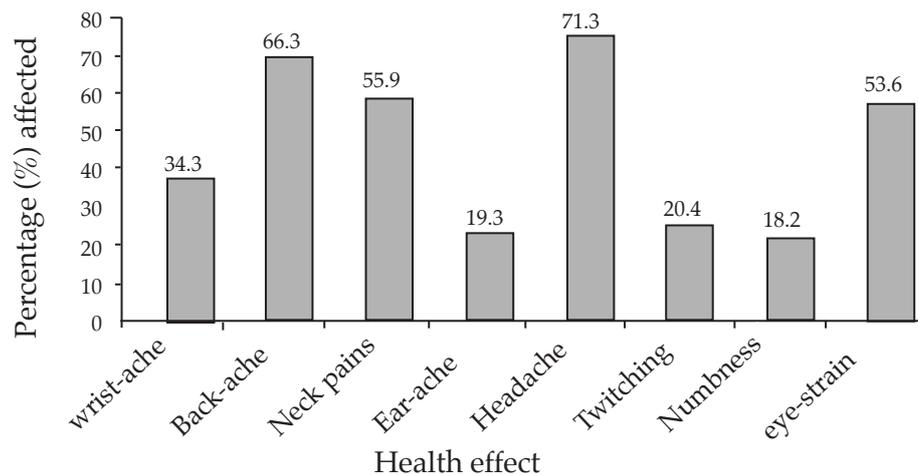


Table 1

Results of checklist assessment of the workstation

Item of ergonomic concern (Computer workstation Ergonomics CDC)	Percentage of workstations the fulfilled the requirement
<i>Desk</i> ; Adjustable desk height	9.9
<i>Chair</i> : Adjustable	34.8
Armrest present	34.8
<i>Footrest</i> : present	0
<i>Monitor</i> : 18-30 inches from user	94.4
Screen at/just below eye level	94.4
Anti glare present	24.9
<i>Keyboard</i> : slope correctly adjusted	0
<i>Lighting</i> ; Supplementary desk light	0

Continuation of Table 1

Reflection of light 90° across monitor	64.4
Illumination from glossy wall paint	5.0
Document holder: adjacent to and convenient distance from workstation.	24.9
Neutral position: Wrist position parallel to floor	69.6
Feet on floor	100
Thighs parallel to floor	69.6
Adequate leg space	39.8

DISCUSSION

The findings regarding the duration of computer use are important because long duration has been significantly associated with eyestrain, neck or upper extremity pain, back pain and psychological distress (6). This was comparable to our sample population who reported knowledge of the health effects as well as actual side effects of prolonged computer use.

Working continuously for more than four hours per day has been considered to be long in other studies (7). Despite awareness of the risks (89.8%), there is lack of formal training on safety measures and the computer users are not aware of ergonomic preventive measures. Continuing education has been reported to be protective against the ill effects of poorly applied computer ergonomics (8).

Work satisfaction contributes significantly as a protective ergonomic factor (8) most of the participants found satisfaction in their jobs which had also influenced their lifestyles. From our survey of 181 workstations, our finding is that ergonomics has not been applied to alleviate workplace constraints. A suitable workstation should suit the capabilities of the human body as is the main intent of ergonomics. Environmental variability at the work place has a significant impact on the quality of life and physical symptoms (9).

In conclusion, despite the high level of awareness on health effects of prolonged computer use, there is limited training on ergonomic practices as well as application of the same in workstations.

RECOMMENDATIONS

The Ministry of Health via the Directorate of Occupational Health and Safety Services should ensure adequate implementation of computer workstation ergonomics through education programmes and workplace assessment.

A proactive approach consisting of a comprehensive programme with management support and employee involvement should be used in the application of ergonomic principles at the work place.

Creation of manuals for implementation of ergonomics, training and education of workers and continuous evaluation should be included in these programmes.

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REFERENCES

1. Oxford Press- University of Oxford: Oxford concise medical dictionary 7th edition 2007 pg 238.
2. Thibodeau, P.L. and Melamut, S. J. Ergonomics in the electronic library. *Bull. Med. LibrS. Assoc.* 1995; **83**: 322-329 .
3. Rempel, D.M., Keir, P.J. and Bach, J. M. Effect of wrist posture on carpal tunnel pressure while typing. *J Orthop Res* 2008; **26**: 1269-1273.
4. Blehm, C., Vishnu, S., Khattack, A., *et al.* Computer vision syndrome; a review, *Surv ophthalmol.* 2005; **50**: 253-262.
5. Smith, M.J., Conway, F.F. and Karsh, B. T. Occupational stress in human computer interaction. *Industrial hlth.* 1999; **37**: 157-173.
6. Yez, Abe, Y., Kusano, Y., Takamura, N., *et al.* Influence of VDT use on physical and mental use of administrative staff in Japan. *J. Physiol. Anthropol.* 2007; **26**: 69-73.
7. Shikdar, A. A. and Al-Kindi, M.A. Office ergonomics: deficiencies in computer workstation design. *Int. J. Saf. Ergon.* 2007; **13**: 215-223.
8. Rocha, L.E. and Debert- Ribeiro, M. Working conditions, visual fatigue and mental health among systems analysts in Sao Paulo Brazil. *Occupatn. Viron. Med.* 2004; **61**: 24-32.
9. Naves, J.R., Sheedy, J. E., Stelmack and Heaney, C.A. Computer use, symptoms and quality of life. *Opto. Vis. Sci.* 2007; **84**: 738-794.
10. National Institute for occupational health and safety: Computer workstation ergonomics URL: <http://www.cdc.gov/niosh>.