Effect of Human and Technology Interaction: Computer Vision Syndrome among Administrative Staff in a Public University

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Abstract

Introduction: *Computer vision syndrome is a complex of eye and vision problems related to near work experienced during computer use. A cross-sectional study was done to determine the prevalence of computer vision syndrome, knowledge and attitude on visual ergonomics among administrative staff in Universiti Putra Malaysia (UPM).* ***Material and Methods:*** *Apre-tested, self-administered questionnaire was distributed to 216 administrative staffs in 10 randomly selected faculties in UPM.* ***Results:*** *Of 146 respondents, a total of 92 (63%) respondents had computer vision syndrome. A proportion of the respondents (35.6%) had poor level of knowledge, while 50% had poor attitude on visual ergonomics. There was significant association between gender and level of knowledge on visual ergonomics (p=0.003).* ***Conclusion****: Computer vision syndrome is prevalent among the administrative staff. Preventive strategy such as trainings on visual ergonomics should be organized by the management.*

Keywords: Computer vision syndrome, visual ergonomics, administrative staff

1. *Introduction*

Computer Vision Syndrome(CVS)is a complex eye and vision-related problem that results from prolonged computer use.[(2)] It has also been described as an eye-related repetitive strain disorder related to computer usage.[(1)]Symptoms of CVS include eyestrain, headaches, blurred vision, tired and burning eyes (dry eyes), neck and back pain and muscle spasms.[(4)]Symptoms of CVS may be caused by poor lighting, glare on the computer screen, improper viewing distances, poor seating posture, uncorrected vision problems or a combination of any of the causes.[(2)] Hence, knowing and practicing visual ergonomics influence the occurrence of CVS. Symptoms occur when the visual demands exceed the visual abilities of the individual to perform the task.[(2)] If no intervention is done, symptoms will recur and may worsen in the future.[(3)] A study conducted by the National Institute of Occupational Safety and Health (NIOSH), Malaysia reported that 70.6% of workers who used computers in their workplace complained of eyestrain while 61.4% of them suffered from lower back pain, shoulder and neck pain.[(17)] Although it has not been proven that computer work causes permanent eye damage, it may cause temporary discomfort which in turn may reduce productivity, causes lost work time and reduces job satisfaction.[(4)]

CVS occurs amongst administrative staff especially in those who work with computers for long periods.[15] CVS influences an estimated 90% of staff using computers for more than three hours every day.[1]

Malaysia is a rapidly developing country in Southeast Asia that incorporates information and communication technology (ICT) in its daily activities. Administrative and service matters are moving swiftly towards computer-based and paperless business. With the advent of useful hardware and software, more and more transactions, administrative matters and databases are done online. Hence, each personnel in most administrative offices in Malaysia are equipped with personal computers (PC). However, this increasing human-computer interface is not without any effects. Since computer vision syndrome involved not only visual perception system but other body systems as well such as musculoskeletal system,[5] it will subsequently influence staff performance at work. It is estimated that CVS can reduce performance on specific task by 40%.[1] However, limited studies have been done in Malaysia with regards to this effect of human and technology interaction and factors associated with it. Therefore, this study aimed to determine the prevalence of computer vision syndrome, its associated factors and knowledge and attitude on visual ergonomics among administrative staffs. Prevention has been reported to be the most important strategy in managing CVS.[7] Thus, our findings will be useful in planning of preventive strategies against CVS among workers at risk.

2. Materials and Methods

2.1 Study Design and Population

A cross-sectional study was carried out in 10 randomly selected faculties in University Putra Malaysia (UPM), a public university located in Selangor, which is the most developed state in Malaysia. Permanent administrative staffs that worked with computer at least 3 hours per day and did not experience acute eye problem during data collection period were included.

2.2 Research Instrument

An iterative process of questionnaire development was used and a final questionnaire was subsequently produced. The questionnaire was in the Malay and English language (bilingual). The pretested, self-administered questionnaire was distributed to the respondents and the questionnaires were collected on the same day. Section A of the questionnaire was on socio-demographic factors - age, gender, ethnic; and the work profile (working experience and daily usage of computer). Section B containsa list of symptoms of computer vision syndrome from which the respondents need to choose. Computer Vision Syndrome will be considered present if the respondent has one or more symptoms such as headache, tired eyes, blurring vision, dry eyes and neck or shoulder pain. Section C assessed on knowledge and attitude towards visual ergonomics.

2.3 Data Entry and Analysis

Data entry and analysis was done using SPSS version 20.0. Median scores were used as cut-off points for good and poor knowledge and attitude on visual ergonomics. Chi-square test was used to determine association of age group, gender and ethnicity with computer vision syndrome. Mann-Whitney-U test was used to assess the association of work experience and daily usage of computer with computer vision syndrome. Level of significance was set at 0.05.

2.4 Ethics

Ethics approval was obtained from the Medical Research Ethics Committee of Faculty of Medicine and Health Sciences, UPM. Permission to conduct the study was given by the deans of all selected faculties. Informed written consent was obtained from all respondents.

3. Results

3.1 Socio-Demographic Characteristics

One hundred and forty six respondents participated (response rate 88%), majority (49.3%) of whom were 20-29 years old, where 50(34.2%) were male and 96(65.8%) were female; majority (93.2%) were of Malay ethnic. Mean (SD) working experience was 9.7 (7.4) years and the mean (SD) daily usage of computer was 8.6 (2.6) hours per day (Table 1).

3.2 Prevalence

Prevalence of Computer Vision Syndrome was 63.0% (92 respondents) (Table 2). Majority (64.4%) respondents had good knowledge on visual ergonomics while 35.6% did not have good knowledge. Equal proportions (50%) of respondents had good and poor attitude on visual ergonomics (Table 3).

3.3 Associated Factors of CVS, Knowledge and Attitude

Age, gender, ethnicity, work experience and daily computer usage duration were not associated with CVS (p>0.05) (Table 4,5). There was a significant association between gender and level of knowledge on visual ergonomics (χ^2=8.901, df=1, p=0.003) where,52% male staff had poor knowledge on visual ergonomics as compared to females (27.1%). However, age and ethnicity were not significantly associated (p>0.05) with knowledge on visual ergonomics (Table 6). Knowledge and attitude on visual ergonomics were not associated with occurrence of CVS among the administrative staff (p=0.527, p=0.493 respectively) (Table 7).

4. Discussion

Of 146 respondents who participated, a major proportion (65.8%) of the respondents in this study was females and 49.3% were of younger age group (20-29 years old). It is common that most computer based administrative work is dominated by females and younger generation.[16] In this study, our respondents generally had almost ten years of working experiences with the computer (mean = 9.7 years) indicating that they have mastered the basic computer use skills. Since most office task are online and computer-based, the respondents worked with the computer about eight hours per day (mean = 8.6 hours). This is in concordant with the normal office hours in Malaysia. Similarly, study by Stella et al. in Nigeria described that majority of their respondents also spent more than eight hours daily with computers at work.[13] Our finding revealed that 63.0% of the 146 respondents had computer vision syndrome. This result is slightly lower than finding by Zairina & Suhaila who reported that the prevalence was 68.1% among academic and administrative staff in a public university in Malaysia.[16] According to a study by Madhan in 2009, it was estimated that 75% of the respondents suffered from this syndrome.[8] The prevalence was even higher in United States, where it was estimated that 90.0% of the 70 million workers reported to have some form of computer vision syndrome symptoms.[9] Higher prevalence in earlier studies could be due to factors of the computer technology. It was reported that people who frequently work with computers are susceptible to CVS because of some factors, one of which is the computer screen itself.[15] Over the years, the computer monitor has evolved from the cathode ray tube (CRT) in those days which is now obsolete, to the better quality liquid crystal display (LCD) and subsequently the light-emitting diode (LED) monitor in recent years, which has much better resolution and viewing angles thus provides better eye comfort. This development could be one of the reasons for the difference in prevalence of CVS.

Our results showed that there was no significant association between age, gender, ethnic, working experience and daily computer usage duration with computer vision syndrome (p>0.05). Since our study population was only administrative staffs who were mostly female Malays, no significant difference could be established due to the homogeneity of the sampling population. However, a study by Stella et al. on various frequent computer users showed that the longer a person works with the computer, the more visual discomfort complaints were received.[13] We have found that 35.6% of all administrative staffs did not have good knowledge on CVS and 50% of male staff had poor knowledge on visual ergonomics. A randomized controlled study has discovered that ergonomics education was helpful in reducing discomfort during computer work which, in turn could also be effective in alleviating the symptoms of CVS.[6] Therefore, intervention needs to be done to this group of staff as a preventive strategy against CVS symptoms. From our findings, half (50%) of the participants did not have the right attitude on visual ergonomics in their own respective workstation. Other studies had stated that the knowledge and attitude on ergonomics can prevent the onset and progress of musculoskeletal and ocular injuries.[14] In addition, the application of knowledge on workplace ergonomics among computer users could directly fulfil two goals which are health and productivity.[10] Thus, increasing the knowledge followed by improving the attitude on visual ergonomics among the administrative staffs may reduce the prevalence of CVS. Our findings did not show any significant association between socio-demographic factors and attitude on visual ergonomics. Similarly, study by Sam et al. concluded that gender was not a factor that will affect attitude towards computer use.[11] However, Sara & Joseph reported that attitude towards computer are modifiable regardless of age and gender.[12] Therefore, although majority of our respondents were young female, intervention as a result of this study may be applied to administrative staffs of all age and gender.

5. Conclusion/Recommendations

Prevalence of computer vision syndrome among administrative staff is high and a substantial proportion of staffs do not have good knowledge and attitude on visual ergonomics. We would like to recommend that preventive strategies such as awareness campaigns and trainings on visual ergonomics should be organized by the management so as to reduce the prevalence of CVS and among administrative staffs.

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References

Aaras, A., Horgen, G., & Ro O. (2000). Work with visual display unit: Health consequences. International Journal of Human Computer Interaction 12, 107-134.

American Optometric Association.(2007). Computer Vision Syndrome.Retrieved January, 2012 from http://www.aoa.org/x5253.xml.

Bergquist U.O., Knave B.G. (1994). Eye discomfort and work with visual display terminals. Scand J Work Environ Health, 20(1): 27-33.

Charpe N.A. and Kaushik V. (2009). Computer Vision Syndrome (CVS): Recognition and Control in Software Professionals. J Hum Ecol, 28(1): 67-69.

Griffiths, K.L., Mackey, M.G. & Adamson, B.J. (2007). The impact of a computerized work environment on professional occupational groups and behavioural and physiological risk factors for musculoskeletal symptoms: a literature review. J OccupRehabil. 2007; 17(4):743-65.

Ketola, R., Toivonen, R., Hakkanen, M., Luukkonen, R.,Takala, E.P., Viikari-Juntura, E. & the Expert Group of Ergonomics (2002). Effects of ergonomic intervention in work with video display units.Scand J Work Environ Health 28(1):18-24.

Loh K. Y. & Reddy S.C. (2008).Understanding and preventing Computer Vision Syndrome. Malaysian Family Physician, 3(3): 128-130.

Madhan, M.R. (2009). Computer Vision Syndrome. The Nursing Journal of India, 10: 236 – 237.

Nilsen, R. (2005). Computer eye syndrome. Retrieved January, 2012 from: http://www.naturaleyecare.com/diseases

Rakhshaan, K.R.R., Ambreen, S., & Umar, A. (2012) Knowledge and practices of ergonomics in computer users. JPMA 62: 213; 2012.

Sam,H. K., Othman, A. E. A., &Nordin, Z. S. (2005). Computer Self-Efficacy, Computer Anxiety, and Attitudes toward the Internet: A Study among Undergraduates in Unimas. Educational Technology & Society, 8 (4), 205-219.

Sara,J.C. & Joseph, S. (1998). Age differences in attitudes Towards Computers. Journal of Gerontology: Psychological Science. 53B,No. 5, P329 - P340.

Stella, C.I., Allen, E.A. &Olajire, B.A. (2007). Evaluation of Vision-Related Problems amongst Computer Users: A Case Study of University of Benin, Nigeria. Proceedings of the World Congress on Engineering 2007, Vol I. WCE 2007, July 2 – 4, 2007, London, U.K.

Wahlstro, M.J., Svensson, J., Hagberg, M, & Johnson PW.(2000). Differences between work methods and gender in computer mouse use.Scand J Work Environ Health; 26: 390-7.

Yan Z., Hu L., Chen H. & Lu F. (2008). Computer Vision Syndrome: A widely spreading but largely unknown epidemic among computer users. Computers in Human Behavior, 24, 2026-2042.

Zairina, A.R. &Suhaila, S. (2011). Computer User: Demographic and Computer Related Factors that Predispose to Get Computer Vision Syndrome. International Journal of Business, Humanities and Technology, 1(2): 84-91.

Bernama (2006). 10,000 Malaysians injured annually thanks to computer use Kuala Lumpur: [Online] Available from http://www.lowyat.net/v2/latest/10-000-malaysians-injured-annually-thanks-to-computer-use.html (January, 2012)

Table 1: Socio-demographic and Work Factors of 146 Administrative Staff in UPM

Factors	Frequency (%)	Mean (SD)	Median (IQR)
Age (years)			
20-29	72 (49.3)		
30-39	42 (28.2)		
40-49	22 (15.1)		
50-59	10 (6.8)		
Gender			
Female	96 (65.8)		
Male	50 (34.2)		
Ethnic			
Malay	136 (93.2)		
Chinese	6 (4.1)		
Indian	3 (2.1)		
Others	1 (0.7)		
Working experience (years)		9.7 (7.4)	8.0 (9.0)
Usage duration (hours per day)		8.6 (2.6)	8.0 (3.0)

Table 2: Prevalence of Computer Vision Syndrome among Administrative Staff in UPM (N=146)

Computer Vision Syndrome	Frequency	Percentage (%)
Present	92	63.0
Absent	54	37.0

Computer vision syndrome - headache, tired eyes, blurring vision, dry eyes and neck or shoulder pain

Table 3: Knowledge and Attitude on Visual Ergonomics

Variable	Frequency (%)	Mean (SD)	Median (IQR)
Knowledge		3.0 (1.5)	3.0 (2.0)
Good	94 (64.4)		
Poor	52 (35.6)		
Attitude		50.9 (7.9)	51.0 (10.0)
Good	73 (50.0)		
Poor	73 (50.0)		

Median cut-off points were used to categorize as `good' and `poor' knowledge and attitude

Table 4: Association between Socio-demographic Factors and Computer Vision Syndrome

Socio-demographic	CVS Positive, N(%)	CVS Negative,N(%)	χ^2 value	df	*p*-value
Age (years)			1.357	3	0.716
20-29	47(46.8)	25(53.2)			
30-39	25(59.5)	17(40.5)			
40-49	15(68.2)	7(31.9)			
50-59	5(50.0)	5(50.0)			
Gender			1.605	1	0.205
Male	28(56.0)	22(44.0)			
Female	64(66.7)	32(33.3)			
Ethnic			2.440	1	0.118
Malay	88(35.3)	48(64.7)			
Others	4(60.0)	6 (40.0)			

Table 5: Association between Work Factors and Computer Vision Syndrome

	Computer Vision Syndrome				
	Present		Absent		
	N (%)	Median (IQR)	N(%)	Median (IQR)	*p*-value
Working Experience (years)	92 (63.0)	8 (9)	54 (37.0)	8 (9)	0.664
Usage duration (hours per day)	92 (63.0)	8 (3)	54 (37.0)	8 (3)	0.48

Mann-Whitney test: Level of significance $p < 0.05$

Table 6: Association between Socio-demographic Factors and Knowledge on Visual Ergonomics

Socio-demographic	Good Knowledge, N(%)	Poor Knowledge, N(%)	χ^2- value	df	*p*-value
Age			4.540	3	0.209
20-29	47(65.3)	25(34.7)			
30-39	31(73.8)	11(26.2)			
40-49	11(50.0)	11(50.0)			
50-59	5(50.0)	5(50.0)			
Gender			8.901	1	**0.003***
Male	24(48.0)	26(52.0)			
Female	70(72.9)	26(27.1)			
Ethnic			3.801	3	0.284
Malay	90(66.2)	46(33.8)			
Others	4 (40.0)	6(60.0)			

*χ^2-test: level of significance $p<0.005$

Table 7: Association between Knowledge and Attitude on Visual Ergonomics and Computer Vision Syndrome

	CVS Present, N(%)	CVS Absent, N(%)	X^2 value	df	p-value
Knowledge			0.400	1	0.527
Good	61 (64.9)	33(35.1)			
Poor	31 (59.6)	21 (40.4)			
Attitude			0.470	1	0.493
Good	48 (65.8)	25 (34.2)			
Poor	44 (60.3)	29 (39.7)			

χ^2-test: level of significance $p<0.05$