PATTERN OF COMPUTER USAGE AND VISUAL ACUITY AMONG STAFF OF THE NATIONAL OPEN UNIVERSITY OF NIGERIA (NOUN)

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Abstract
Computerized jobs are more sedentary as it requires more cognitive processing and mental attention. Besides, to put computers into operation for many tasks in tandem means that operator would necessarily sit before visual display terminal of computers screen demands that the user work within a very restricted posture range. This could have deteriorative effects on the eyes. Hence this study investigates the pattern of computer use in association with visual acuity amongstaff of National Open University of Nigeria staff.The study was a cross-sectional survey which utilized multi-stage sampling method to recruit 297 staff from selected 17 NOUN Study Centres. A self-administered and structured questionnaire was used to obtain information for the study. Snellen□s test was used to observe visual acuity among the participants.Findings from the study revealed that prolonged □daily□ computer usage is associated with less desirable visual acuity ($p<0.05$). Likewise, the longer the hours spent on daily computer use, the lesser the desirable visual acuity ($p<0.05$). It is, however, recommended that periodic eye examination and public health campaign should be adopted as preventive strategies in order to maintain vision integrity among computer users.

Key-words: Computer use, Visual Acuity, Staff, Open University.
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Introduction.
Computer has become one of the main tools in educational operation requiring prolonged daily usage. The use of computer device has increased throughout the developed countries (Ranasingh *et al.*, 2016) ranging from five minutes a day to eight hours a day depending on the type of job a person does (Akinbinu & Mashalla, 2013). The extent to which an individual experiences computer usage related symptom is largely dependent upon visual demands of the task being performed (American Optometric Association, 1997).

According to Gupta and colleagues (2014), 70-75% of computer workers have eye problems which are the most frequently related health problems. Up to 90% of computer users report visual problems and eye irritation which are associated with tasks that require repetitive motions occurring over long period of time. Various degrees of eye dysfunctions appear to suggest that it originates from prolonged

and protracted working before computer (Sauter (2001); Abida, Shahid & Akram 2011).

The human visual system is responsible for acquiring and processing the visual information. Eye conditions such as irritation, allergic conjunctivitis, blurred vision, eye aches, glaucoma and refractive errors represent a group of undesirable hazards to health that form a recognizable pattern, especially of something undesirable that have been linked to prolonged usage of computers (Amalia, Suardana, & Artini, 2010; Abida, *et al,* 2011; Akinbinu & Mashalla, 2013).

Visual acuity is the measurement of acuteness of central vision and a complex phenomenon influenced by many factors. Some of these factors are the state of the image forming mechanism of the eye, the state of the cones and stimulus factors including illumination, brightness of the stimulus, contrast between stimulus and background (Barrett, Barman, Boitano & Brooks, 2010).

Accommodation is the mechanism by which the eye changes focus from distant to near images. The degree to which the lens curvature can be increased is, of course limited and light rays from a very near object cannot be brought to focus on the retina even with the greatest effort. The near point recedes throughout life, slowly at first and then rapidly with advancing age, from approximately 90cm at age 10 to approximately 83cm at age 60 (Iheanacho & Olubiyi, 2007).

Barrett*et.al.*(2010) asserted that when a normal individual reaches age 40, the loss of accommodation is usually sufficient to make reading and close work difficult (Barret *et al.,* 2010)

Competitiveness in today□s world requires the use of computers for problem solving. At the National Open University of Nigeria (NOUN), there are no resident Staff and student on the campuses/ study centres, while the bulk of activities in NOUN are the production and provision of instructional materials to learners (students). The learning activity of the institution is predicated on effective system of communication which takes the advantage of the existence of computers and associated devices in carrying out the function of teaching.

The shift to almost 100% computer use by many companies and institutions was alluded to by Mohammed *et al.* (2009) and Ellahi *et al.* (2011) whose exploratory studies observed that somehealth complaints are often found predominantly in computer users. Investigation of these health concerns gave birth to the emergence of what has been described as Computer Vision Syndrome. These syndromes include complaints such as eye irritation, eye strain, eye ache, lacrimation, blurred vision, hypermetropia, and photophobia.

In view of the boundless structure of the National Open University of Nigeria, the use of Information and Communication Technologies has greatly influenced performance of tasks of staff which requires the use of computer and keeps them on this device for prolonged hours. Hence, this study sought to determine whether pattern of computer usage could influence the visual acuity of NOUN staff.

Methodology

Research design

A cross sectional descriptive survey was used to assess the pattern of computer usage and visual acuity amongstaff of National Open University of Nigeria (NOUN).

Research setting and population of the study

The study was carried out at National Open University of Nigeria (NOUN). The National Open University of Nigeria is a Federal Open and Distance Learning (ODL) institution, the first of its kind in the West African sub-region. It is Nigeria□s largest tertiary institution in terms of student numbers and is popularly referred to as □NOUN□. The university was for years operating from its Administrative Headquarters in Victoria Island, Lagos, before moving to its permanent headquarters in Jabi, Abuja, in 2016. It has over 75 Study Centres throughout the country. It offers over 50 programmes and 750 courses. This university was chosen because the main platform for the teaching, learning, networking and collaboration is through e-learning

Sample size and sampling procedures

The study comprised of 297 staff purposively selected from the 902 staff using Fischer□s minimum sample size determination formula (Charan & Biswas, 2013). A multi stage sampling

technique was adopted to selected staff from the 76 existing study centers of NOUN. The multistage sampling technique was used to obtain a representative sample of the population.

First Stage: A random sampling technique, the □fishbowl technique□ was used. All the names of the 76 existing study centers of NOUN in Nigeria were written on slips and put in a bowl. The slips were drawn from the bowl one at a time to select the 17 study centres (systematically selected to give accurate representation of the entire NOUN staff) required for the study.

Second Stage: a stratified sampling was used to split of the population into subgroups or strata, based on the variables significant to the study, so that each component of the population fits into one and only one stratum. The participants were categorized based on three staff categories of NOUN that are actively involved in computer use, which include academic, administrative and support staff of NOUN. They were further categorized based on whether or not they use computer.

Third Stage: A purposive sampling technique was used to select staffs from the various faculties. Only participants who were devoid of any visual related problems were included in the study.

Instruments and data collection

A self-constructed questionnaire and Snellens chart were the tools used to obtain information in line with the objectives of the study. A copy of the instrument with the objectives of the study was given to two (2) other experts in the field for their inputs to improve the face and content validity of the instrument. The final copy of the instrument pre-test to establish the instrument reliability and Pearson correlation coefficient of 0.86 was obtained. The test confirmed that the instrument was suitable for the study.

Furthermore, Visual acuity was conducted with help of 4 trained Ophthalmic Nurses at near similar conditions in the various centres of investigation. Visual acuity was graded as □very desirable□, □desirable□ and □not so desirable□ acuities, as shown in Table 1.

Table 1: Visual acuity codes and interpretation from Snellen□s Chart

Visual acuity code	Interpretation
6/4 6/5	Very desirable
6/6	Desirable
6/9 6/12 6/18 6/24 6/36 6/60	Not so desirable

Source: Field SurveyTemplate, 2014 .

Ethical clearance and approval was sought from the University of Ilorin Teaching Hospital Research Ethical Committee. The informed consent was obtained from participants after explaining the nature and purpose of the research to them.

Method of data analysis:

Both descriptive and inferential statistics were used to analyze the data collected. Descriptive analyses expressed in frequencies and percentages were used to describe the pattern of computer usage among participants. Chi square was used to measure the association between computer use and visual acuity, while the patterns of computer use were further correlated with the visual acuities (right and left eye visual acuities)among computer users at 5% level of significance using Statistical Package for Social Sciences (SPSS) version 16.

Results

Descriptive analyses in frequencies and percentages were used to describe the pattern of computer usage (i.e. estimated daily duration of computer use, history and habits of computer use) among the subjects. The respondents were first divided by whether or not they use computer; hence chi square analysis was used to measure the association between computer use and visual acuity. The patterns of computer use among computer users were further correlated with their visual acuities (right and left eye visual acuities). Also, some of the results were presented based on three staff categories of NOUN which are actively involved in computer use. These are the academic, administrative and support staff (e.g. technicians, technologist etc.).

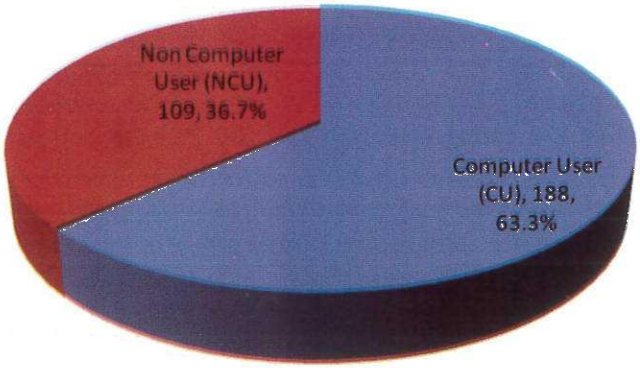


Figure 1: computer use among NOUN staff

Figure 1shows that 188(63.8%) of the NOUN staff uses computer while 109(36.7) do not.

Table 2: Demographic characteristics of subjects based on computer usage

Demographic Characteristics of Subjects		Computer Users (CU) = 188	Non Computer Users (NCU) = 109	Total = 297
Gender	Male	97 (78.2%)	27 (21.8%)	124
	Female	91 (52.6%)	82 (47.4%)	173
Age	Less than 30yrs	38 (79.2%)	10 (20.8%)	48
	31-42yrs	78 (73.6%)	28 (26.4%)	106
	43-54yrs	69 (61.1%)	44 (38.9%)	113
	55yrs and above	3 (10.0%)	27 (90.0%)	30
Years of working experience NOUN	1-3yrs	102 (89.5%)	12 (10.5%)	114
	4-6yrs	51 (58.0%)	37 (42.0%)	88
	7yrs and above	35 (36.8%)	60 (63.2%)	95
Job Description	Academic	85 (92.4%)	7 (7.6%)	92
	Administrative	64 (48.5%)	68 (51.5%)	132
	Support	39 (53.4%)	34 (46.6%)	73

The majority of the participants are males with lesser age groups, those with less than 4 years of experience and academic staff, use computers more than their other counterparts. Participants who are in their late 50s account for the majority of non computer users, as shown Table 2 shows

Table 3: Visual acuity and computer use

		N	Very desirable	Desirable	Not so desirable	X^2	P value
Right Eye	**CU**	188	7(37.0)	110 (57.0)	71(85.0)	11.990	0.002
	NCU	109	12(63.0)	84(43.0)	13(15.0)		
Lefty eye	**CU**	188	5(29.0)	112(57.0)	71(84.0)	23.429	<0.0001
	NCU	109	12(71.0)	83(43.0)	14(16.0)		

The chi square analysis showed that computer usage is significantly associated with visual acuity. Participants who do not use computer have more desirable acuities than their counterparts with P-value<0.05.

Table 4: Statistical analysis showing the relationship between pattern of computer use and visual acuity

Variables	Response	N	Eye	Very desirable	Desirable	Not so desirable	X^2	p value
Duration of computer use	1-3yrs	38	R	0 (0.0%)	24(63.2%)	14 (36.8%)	(R)-0.058	0.432
			L	0 (0.0%)	24(63.2%)	14 (36.8%)	(L)-0.076	0.301
	4-6yrs	70	R	3 (4.3%)	37(52.9%)	30 (42.9%)		
			L	2 (2.9%)	37(52.9%)	31 (44.3%)		
	7yrs above	80	R	4 (5.0%)	48(60.0%)	28 (35.0%)		
			L	3 (3.8%)	51(63.8%)	26 (32.5%)		
Daily computer use	1-4hrs	80	R	2 (2.5%)	46(57.5%)	32 (40.0%)	(R) -0.073	0.317
			L	1 (1.2%)	46(57.5%)	33(41.2%)	(L) -0.086	0.239
	5-8hrs	89	R	4 (4.5%)	50(56.2%)	35(39.3%)		
			L	4 (4.5%)	52 (58.4%)	33(37.1%)		
	Above 8hrs	19	R	1 (5.3%)	13 (68.4%)	5 (26.3%)		
			L	0(0.0%)	14(73.7%)	5 (26.3%)		
Frequency of computer use	Occasionally	28	R	3(10.7%)	17(60.7%)	8 (28.6%)	(R)0.161*	0.027
			L	4(14.3%)	16 (57.1%)	8 (28.6%)	(L)0.160*	0.028
	Weekly	46	R	2 (4.3%)	29 (63.0%)	15 (32.6%)		
			L	0 (0.0%)	30 (65.2%)	16 (34.8%)		
	Daily	114	R	2 (1.8%)	63 (55.3%)	49 (43.0%)		
			L	1 (0.9%)	66 (57.9%)	47 (41.2%)		

***significant correlation p<0.05**

Table 5: Correlation analysis showing the relationship between pattern of computer use and visual acuity

Spearman's rho		Right eye	Left eye
How long have you been using computer?	Correlation Coefficient	-.060	-.038
	Sig. (2-tailed)	.413	.604
	N	188	188
How often do you stay to work on computer daily?	Correlation Coefficient	-.023	.006
	Sig. (2-tailed)	.757	.937
	N	188	188
Frequency of comp use	Correlation Coefficient	.173	.145
	Sig. (2-tailed)	.041	.05
	N	188	188

***significant correlation p<0.05**

Frequency of computer use (occasionally, weekly and daily) significantly correlates with visual acuity of the participants. The scatter plots below showed that less desirable acuity is significantly associated with daily computer use (**Figure 2**).

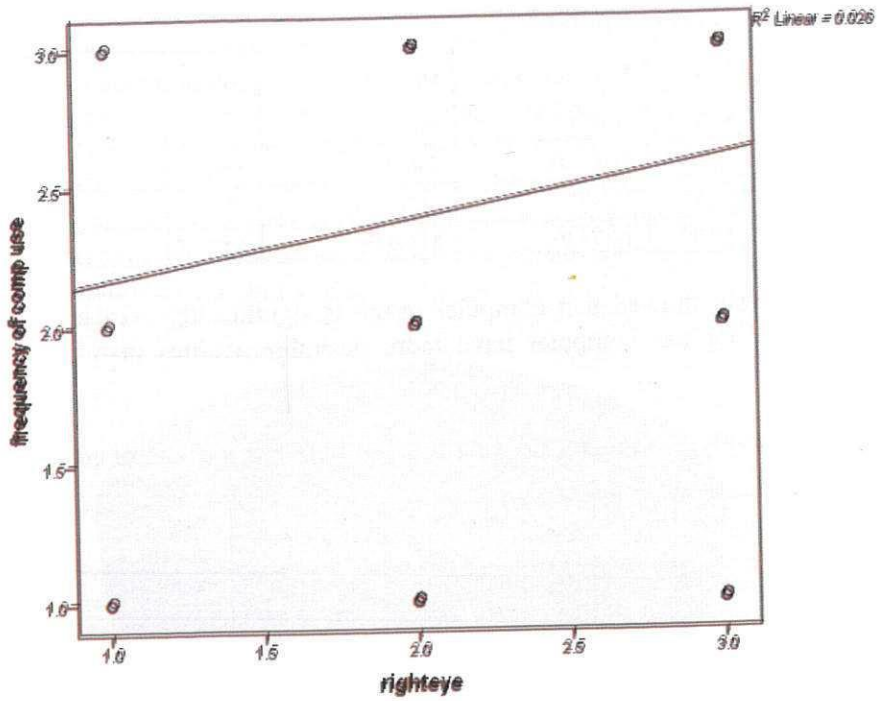


Figure 2: Correlation between frequency of computer use and the right eye visual acuity

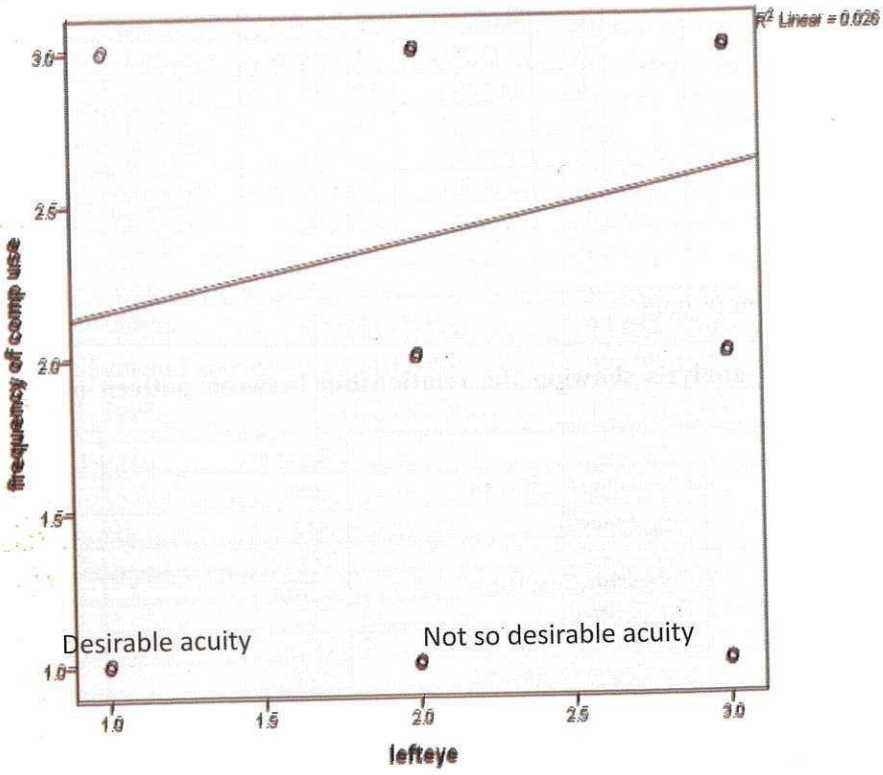


Figure 3: Correlation between frequency of computer use and the left eye visual acuity

Discussion

The findings of this study revealed that less desired visual acuity exist more among the Academics (89%), the group whose roles make the highest demand on the use of computers. Strongly implicated is the prolonged use of computer as a risk factor for visual dysfunctions However, some environmental and genetic factors may be contributing to this as observed by Sanchez *et al.* (2010) and Tatemichi*et al.* (2004)

The findings on the investigation of pattern of computer usage further established the association between computer usage and visual acuity; less desirable acuity were found among staff who are daily computer users compared to their counterparts with weekly and occasional use. The length of time spent daily was also identified to be a contributing factor to not so desirable acuity. Staff who spent more than 8 hours on daily computer use had less desirable acuity than their counterparts who spent less

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The findings showed a continuous increase in the percentage of Staff with visual dysfunctions as daily duration of exposure to computer increases. This corroborates the previous study by Mohammed *et al.* (2009) that duration of computer usage may have effect on visual acuity. Since near point recedes throughout life starts slowly at first and then rapidly as an individual advances in age from approximately 90cm at age 10 to about 83cm at age 60. This recession has been attributed primarily to increasing hardness of the lens consequently leading to loss of accommodation precipitated by steady decrease in the degree to which the curvature of the lens has been increased.

Hong-xin *et al.* (2003) reported that concentrating on the screen for long period could reduce the blink rate and allow the tear film on the surface of the eye to dry which can result into dry and sore eyes. Suzuki (2006) in a study conducted by the Department of Human Factor Engineering, University of Occupational and Environmental Health, Japan, revealed that visual strain occurred after merely 60 minutes of video terminal work, which further resulted in lower productivity. All these reports supported the findings of this study.

This study also revealed that the majority of the participants are males with lesser age groups. This is in line with Seybert (2007) who examined the differences in the regular use of ICT among women and men in the different members States European Union. In nearly all European countries and in all age groups, however, men are more regular users of both computers and the internet than women and many more men than women are employed in computing jobs throughout the European Union (EU). Furthermore, Tomte and Hatlevik (2011) also noted that the overall picture of the situation relating to gender and ICT has so far been that men have been dominant and left the women behind.

The continuous steady decrease in the percentage of computer users with normal visual acuity as the number of years of computer usage increases, testifies to the fact that years of usage is a risk factor to visual acuity of computer users

Conclusion

This study has attempted to investigate the pattern of computer usage and visual acuity among computer users at the National Open University of Nigeria. This study therefore concludes that prolonged computer usage over a long period of time without interfacemay lead to the propagation of poor vision and lower productivity. Hence, it is suggested that that periodic eye examination and public health campaign should be adopted as preventive strategies in order to maintain vision integrity among computer users. Sensitization of staff on the effective use of computer with necessary precautions to limit the dangers of job hazards should be frequently organized for staff in the institution.

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