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Asthenopia and Use of Glasses among Visual Display Terminal (VDT) Users

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Abstract: This study was designed to determine the prevalence of various asthenopic symptoms among VDT researchers who wear glasses for correction of refractive errors in University of Benin community. About 136 regular computer users in cyber cafes in University of Benin and environs filled questionnaires which were designed specifically to determine the ocular, visual and related non visual symptoms found with prolonged use of computers. Of this 32 people who routinely wear glasses for various refractive errors had their questionnaires analyzed to see the prevalence of asthenopia among them. Most glasses wearers 22 (68.8%) were aged 18-34 years. About 15 of them (46.9%) were males while 17 (53.1%) were females. Comparing this sex prevalence with the general population (of 136 VDT users); 15 out of 97 males (15.5%) and 17 out 39 females (43.6%) wore glasses. About 20 (62.6%) had not had a refraction in the last 2-3 years. Blurring of distant vision was a major complaint in 19 (59.4%) subjects, 16 (50.0%) had blurred vision when using the VDT. Eye strain occurred in 18 (56.3%); $p = 0.0002$, while headache was found in 20 (62.5%); $p = 0.0541$. Other ocular complaints were ocular fatigue (62.5%); $p = 0.0047$, watering of eyes (56.8%); $p = 0.0007$, red eyes (40.6%); $p = 0.1503$, itching (59.4%); $p<0.0001$, burning (28.1%); $p = 0.0526$ and double vision (31.3%); $p<0.0001$ when these were contrasted with 104 controls who did not use glasses. Adequate correction of refractive errors and improvement in the research station environment of visual display terminal users are likely to reduce ocular symptoms and related discomfort in VDT users.

Key words: Ocular symptoms, asthenopia, video display terminal users, refractive errors, glasses wearers, prevalence

INTRODUCTION

A revolution in Information Technology (IT) has occurred rapidly in the last 20 years. Computers were previously understood by very few before then. Now, many researchers obtain a large amount of information from Visual Display Terminals/Units (VDTs or VDUs) during general and specific duties. Even in private life, an increasingly long duration of computer use is being found among every generation. Much concern has been raised about the psychological and physiological health of VDT researchres (Council of Scientific Affairs, 1987).

A study at Benin earlier showed that single youths spend a lot of time on the internet and the main activities being performed were e-mail (100%), games (84.78%) and browsing (61.41%) (Egbokhare and Akwukwuma, 2005). The commonest age group found in the cyber cafe was 20-25 years. Majority (43.48%) of them spent 3-4 h daily on internet (Egbokhare and Akwukwuma, 2005). Many individuals who stay long on the computer experience eye related discomfort and/or visual problems (WHO, 1986). Although, studies claim these changes are not permanent, yet these individuals may be among the many patients that the ophthalmologist for symptoms of asthenopia (Cole *et al*., 1996).

The most common symptoms are itching, redness, burning and tearing of eyes. There may also be headache, double vision, eye strain, blurred vision and neck or shoulder pain (Salibello and Nilsen, 1995; Rey and Maer, 2007). These symptoms are related to fatigue of accommodative function in the eye (Rey and Maer, 2007).

Some researchers have however, reported that VDT operators may experience continued impaired or reduced visual abilities such as blurred distance vision, even after research (Rosner and Belkin, 1989). Such problems continue to recur and even worsen with more VDT use. Visual demand of VDT work is different from viewing a typewritten or printed page. Letters on a VDT screen may not be as precise and sharply defined. The level of contrast to the background is reduced and the presence of glare and reflections may make viewing more difficult (Murch, 1982). If short sighted people wear their

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distance spectacles or contact lenses for the VDT, they will experience ocular fatigue often a while because of the effort of focusing on the near screen. It is better therefore for them to view the VDT as a distant object or to view the screen without their distance correction (Salibello and Nilsen, 1995). Computer extension leads and other devices such as cordless mice/keyboards may be used to take away the effort to see the screen up close (1992). All refractive states (myopia, hyperopia and presbyopia) should place the VDT screen at the maximum distance at which the printed matter on the VDT screen can be seen with the eye relaxed (Sheedy, 1992). Some have suggested the use of specific occupational lenses prescribed to meet the unique demands of computer work (Rosner and Belkin, 1989). We carried out a study to assess, the frequency of asthenopia and related complaints among VDT users in Benin City.

MATERIALS AND METHODS

A specially designed self administered questionnaire was used as the instrument of data collection in this study. The research instrument was pre-tested on some students of Computer Science Department, University of Benin, to ensure its validity, following which corrections were made. One hundred and fifty questionnaires were randomly distributed to VDT users in cyber cafes in and around the University with the aid of four research assistants (Computer Science students). One hundred and thirty six of these were completed and returned. Of these, thirty two were using prescribed glasses, these are the subjects of this study.

The other one hundred and four who did not wear glasses were used as controls. Information was gathered on their demographic data, number of hours of use of VDT per day, number of days per week and number of years of use.

The history of glasses use and reason for its use and regularity of change of prescription were elicited. Symptoms of asthenopia such as blurred vision, eye strain, headache, burning, itching and ocular fatigue were also requested. Results were analyzed with Graphpad Instat^{tm} 2.05a statistical software to find percentages and p-values using Fisher's exact t-test or Chi square test.

RESULTS AND DISCUSSION

One hundred and thirty six questionnaires were completed. Of these 32 were wearing glasses (subjects of the study). Most glasses wearers 22 (68.8%) were aged 18-34 years. Fifteen of the respondents (46.9%) were males, while 17 of them 53.1% were females. Comparing this sex prevalence with the general population (of 136 VDT users) Fifteen out of the 97 males 15.5% and 17 out of the 39 females 43.6% wore glasses (Table 1).

Table 1: Age/sex distribution

Age (years)	Male	Percentage	Female	Percentage	Total	Percentage
18-24	5	15.63	6	18.75	11	34.38
25-34	3	9.38	8	25.00	11	34.38
35-45	4	12.50	1	3.13	5	15.63
>45	3	9.38	2	6.25	5	15.63
Total	15	46.88	17	53.13	32	100.02

General population = 136; M = 97, F = 39; Glasses wearers 32; M = 15, F = 39; Percentage of glasses wearer (sex): M = 15/97 (15.50%), F = 17/39 (43.6%)

Thirty (93.7%) of the 32 subjects were in tertiary institutions or had tertiary education. About 62.5% of these were students, while others were civil servants 18.8%, information communication technologist 12.5% and self employed (6.3%).

There were 14 unmarried females 43.8% and 3 (9.8%) married females. Married men were 7 (21.9%) while unmarried men were 8 (25.0%). Twenty people (62.6%) had not had a prescription change in the last 2-3 years while 9 (28.1%) had changed their prescription in the last one year. Others had stable prescription. About 17 out of 32 (53.1%) VDT users (who wore glasses) use computer for a minimum of 4 h daily. Twenty five (78.1%) of these use the VDT at least 3 days a week and 23 (71.9%) have been using the computer (VDT) for at least 4 years.

Blurring of distant vision was a major complaint in 19 (59.4%) subjects, while 16 (50.0%) had blurred vision when using the VDT. Eye strain when using VDT occurred in 18 (56.3%) and headache was found in 20 (62.5%) subjects.

The number of glasses wearers with eye strain associated with VDT use was statistically significant compared with the non glasses wearers ($p = 0.0002$), while a similar comparison was not quite significant ($p = 0.0541$) in cases with headache (Table 2).

Other ocular complaints among them include ocular fatigue (62.5%), watering of eyes (56.8%), red eyes (40.6%) itching (59.4%), burning (28.1%) and double vision (31.3%). In contrast, one hundred and four controls who did not use glasses had the following statistics, ocular fatigue (36.5%), watering of eyes (26.0%), redness of eye (28.9%), itching (20.2%), burning (12.50%) and double vision 0.96% (Table 3), p-values for these comparisons are shown in Table 4-9. In the majority of surveys on VDT use and visual discomfort, women report more eye discomfort than men (Sheedy, 1992). This was the finding in this study where women

Table 2: Visual/associated complaints

Complaint	No. % (32 = 100%)
Blurred vision	
With reading	1 (34.38)
With distance	19 (59.38)
With computer	16 (50.00)
All3	15 (46.86)
Eye strain	
Reading text	6 (18.75)
Using VDT	3 (9.37)
Both	18 (56.25)
None	5 (15.63)
Headache	
Forehead	10 (31.25)
Unilateral	8 (25.00)
Occipital	2 (6.25)
None	12 (37.80)

Table 3: Non visual ocular complaints

	Glasses wearers		Non glasses wearers	
Symptoms	No. (32)	Percentage	No. (104)	Percentage
Tired eyes	20	62.50	38	36.54
Watering	18	56.25	27	25.46
Red eyes	13	40.63	30	28.85
Itching	19	59.38	21	20.19
Burning	9	28.13	13	12.50
Double vision	10	31.25	1	0.96

Table 4: Statistical analysis of tired eyes

Tired eyes	Glass wearer	Non-glass wearer	Total
Yes	20	38	58
No	12	66	78
Total	32	104	136

Chi square = 6.743, df = 1, p = 0.0047 (significant); Odd ratio = 2.895, 95% confidence interval 1.275-6.570

Table 5: Statistical analysis of watering eyes

Watering eyes	Glass wearer	Non-glass wearer	Total
Yes	18	27	45
No	14	77	91
Total	32	104	136

Chi square = 10.140, df = 1, p = 0.0007; Odd ratio = 3.667, 95% confidence interval 1.607-8.365

Table 6: Stayistical analysis of red eyes

Red eyes	Glass wearer	Non-glass wearer	Total
Yes	13	30	43
No	19	74	93
Total	32	104	136

Fisher's exact test, p = 0.1503; Odd ratio = 1.688, 95% c; confidence interval 0.7408-3.845

Table 7: Statistical analysis of itching eyes

Itching eyes	Glass wearer	Non-glass wearer	Total
Yes	19	21	40
No	13	83	96
Total	32	104	136

Chi square = 16.258, df = 1, p<0.0001; Odd ratio = 5.777, 95% confidence interval 2.462-13.553

population (i.e., glasses wearers) was 53.1 and men 46.9%. Edema and Okojie (1997) had described such even among non-VDU users. They mentioned that some girls and ladies considered wearing of glasses a mark of sophistication. The tendency to have more females

Table 8: Statistical analysis of burning eyes

Burning eyes	Glass wearer	Non-glass wearer	Total
Yes	9	13	22
No	23	91	104
Total	32	104	136

Fisher's exact test, p = 0.0526; Odd ratio = 2.739, 95% confidence interval 1.043-7.193

Table 9: Statistical analysis of double vision

Double vision	Glass wearer	Non-glass wearer	Total
Yes	10	1	11
No	22	103	125
Total	32	104	136

Fisher's exact test, p<0.0001 (significant); Odd ratio = 46.818, 95% confidence interval 5.693-385.03

interested in wearing glasses is further reflected in considering that the male to female ratio of those wearing glasses among the entire population of (136) respondents was 15:97 (15.5%):17:39 (43.6%).

Assessment of exposure to long term VDT stress is very difficult as there is no established method of quantitative measurement. Computer stress is influenced by complex factors, which include the continuous duration of use (Sheedy, 1992) the working environment and the equipment (Rosner and Belkin, 1989).

Egbokhare and Akwukwuma (2005) found that 71.20% of their study population (students/youths) used the computer continuously for at least 3 h daily and these were said to be exposed to the risk of internet addiction. In this study 17 (53.15%) of those studied use the VDT for at least 4 h daily. Using the standard of the above researchers, it can be said that more than half of the respondents are at risk of computer stress.

These are mainly students (62.5%), civil servants (18.8%), computer operators (12.5%) and self employed people (6.25%). The computer work they participate in is therefore different from other uses of the eye on a daily/weekly basis. For example, students are engaged with a lot of reading daily. About (71.9%) claimed they had had this routine for at least 4 years. It has been reported that in general, about half of all VDT operators display some kind of eye deficiency and most of these use prescriptive lenses of one type or another (Yeow and Taylor, 1991).

Presbyopes are expected to have the highest frequency of visual complaints because of changes in accommodation occurring rapidly, especially when these are between 40 and 50 years old (Rosner and Belkin, 1989). Of note in considering the possible influence of VDT use on presbyopia, it is observed that there were 10 out of 17 (58.7%) in the age groups 35-45 years (that is 10 glasses wearers vs 17 in general population of 136) were using glasses. The closer the VDT is to the eyes, the harder the eyes have to work to accommodate. As such, VDT use as a near work has a positive correlation with short sightedness occurring (Murch, 1982).

Researchers have shown that poor correction is one of the reasons for asthenopia among VDU operators (Rosner and Belkin, 1989). A study among Italian VDU operators reported that about 46% had normal vision, while 38% were myopic (Rey and Maer, 2007). This is consistent with the report by Swiss and French VDT operators in which 32% of 275 VDT operators examined by some ophthalmologists had improved vision by refractive error correction (Rey and Maer, 2007).

In this study, 20 respondents (62.6%) had not had a refraction in the last 2-3 years or more. Some of these could possibly need a change in their correction. Partially corrected refractive error is a common cause of asthenopia (Rey and Maer, 2007; Gur and Ron, 1992; Murch, 1982; Yeow and Taylor, 1991).

About 62.5% of the respondents (glasses wearers) complained of frequent headache, majority had frontal headaches. Frontal headache is known to be common in VDT asthenopia (Cole *et al*., 1996; Salibello and Nilsen, 1995). Other symptoms elicited in the subjects were burning eyes, double vision, red eyes, watering, itching and ocular tiredness/fatigue. Each of these was present in higher ratios among glasses users than with the controls.

Such ratio had significant p-values for ocular fatigue (tired eyes), double vision, itching and watering of the eyes. There was no statistical significant difference for redness and burning eyes. Itching could also be a manifestation of allergic conjunctivitis, other symptoms of which include redness and burning of the eyes. All three symptoms had been described by Rey and Maer (2007) who found more cases of conjunctivitis in VDT operators than in controls.

Sheedy (1992) and Wan (1992) suggested that there should be the use of task specific computer glasses not just the usual myopic or hypermetropic correction.

CONCLUSION

Asthenopia among VDU Operators is a temporary phenomenon, though some believe the strain of accommodation may worsen from day to day. It is essential that all VDT users who have asthenopic symptoms with or without glasses regularly correct their refractive errors. It is noteworthy however to know that spectacle may not be all the patient needs.

Reduction of psychological stress, correct placement (distance) of the VDT from the operator and the design of workplace environment go a long way to make the user comfortable with long hours of VDT use. Researchers should be advised to take some break off the VDT task they are doing because more hours spent continuously before the VDT unit per day may worsen the complaints.

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