Control of Glare for VDT Operators

Evaluation of Different Lenses by Subjects***

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The widespread use of video display terminals (VDTs) in offices has been accompanied by many complaints of visual problems. A recent study by the Canadian Labour Congress on vision problems among 2,300 office workers showed that VDT operators report twice as many vision problems and require more frequent changes in lens prescription.[1] Visual complaints have stimulated research into new means of relieving the discomfort experienced by VDT operators. Murch [2] recommended low plus lenses to relax the accommodative system. Osterberg[3] found significant changes in the accommodative system after VDT work: after two hours at the terminal, the eyes became more myopic for distance and more hyperopic for near. Sivak and Woo[4] provided the scientific reason for the preference of green phosphor colour by the VDT operators, demonstrating that at the viewing distance of 50 cm. the wavelength in focus is 520 nm. (green).

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Glare is caused by excessive luminance of light sources or parts of the field of view. There are two kinds of glare:
1. Disability glare is caused by scattered light in the eye which falls on the focussed image on the retina and reduces contrast, thus impairing vision of objects.
2. Discomfort glare induces a feeling of discomfort without necessarily impairing the vision of objects.

Disability glare is not influenced by the type of light source employed, while discomfort glare seems to depend on the wavelength of the light source. DeBoer[5] has demonstrated that low-pressure sodium lamps (monochromatic yellow light) cause less discomfort glare than high-pressure mercury lamps (blue-greenish light). The fluorescent lamp is a low-pressure mercury lamp coated with phosphors, which emits some radiation in the UV range.[6]

Materials and Methods

Three groups of lenses were evaluated by the subjects in this study. The first group was the UV filter (UV-400 or Unilite). The second group was made up of various pink lenses (Pink 2, Tonelite 2, Cruxite AX) and the third group consisted of CR39 lenses. All these lenses were framed and were made available to the subjects.

Forty-five volunteers, VDT operators and/or photophobic subjects, participated in this study. Following a visual assessment, emmetropic subjects or contact lens wearers were selected. Initially, each participant was given two pairs of tinted glasses, one of the pink group and one of the UV-filter group. The subject was asked to wear these two pairs of spectacles alternatively for two weeks while working at the VDT or under fluorescent light, and then evaluate the effectiveness of these two lenses by answering the questionnaire. Subsequently the experiment was modified; a clear lens was added and the subjects were given three pairs of spectacles to evaluate. Those who had two pairs initially were given a third pair to compare. The questionnaire is based on the Likert scale.[7]

Results and Discussion

Forty-five subjects participated in this study; three withdrew, and forty-two answered the questionnaire. Thirty-four were VDT operators and sixteen had a history of

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migraine. Nineteen of the VDT operators were bothered by glare from fluorescent light (56%). Fourteen complained of eyestrain after working at the VDT terminal (41%). Twelve patients (35%) complained of migraine headaches. This percentage of migraine sufferers is higher than expected. Troost[8] indicated that migraine affects 10% of the population, and we have found[9] that 10.5% of a patient sample at an optometry clinic suffers from migraine. The high incidence of migraine in the present study could be due to the fact that migraine sufferers were more inclined to volunteer as subjects, seeking relief, or, on the other hand, there may be a higher incidence of migraine among VDT operators. The confirmation of the latter possibility requires further study of a large group of VDT operators.

Statistical analysis was done on the responses to the questionnaire, with +1 point given to the specific lens for a response of "agree" or "strongly agree." On the first question, relief of discomfort under fluorescent lights, lens A got 26 points (70%), lens B got 23 points (62%), and lens C got 6 points (16%).

In answer to the second question regarding VDTs, more subjects preferred lens A than B, and very few preferred lens C. Few responded to the third question, whether the lenses reduced the frequency of migraines, but lens A was still preferred over lenses B or C (Table 2). Logistic regression was done on these values, where the probability was calculated for lens A vs. C and lens B vs. C. The P value was more significant for lens A vs. C than for B vs. C. However, the P values were statistically significant for both A vs. C and B vs. C, especially on the first question.

These results suggest that VDT operators and photophobic subjects prefer UV filters over clear lenses and that they also prefer pink lenses over clear ones.

When VDT operator vs. non-VDT operator and photophobia vs. non-photophobia were used as variables, the P values were statistically insignificant.

These results suggest that VDT operators and photophobic subjects prefer UV filters over clear lenses and that they also prefer pink lenses over clear ones. Although more subjects preferred the UV filters, some definitely preferred the pink lenses. Thus, the best approach would be to allow the patient to choose either UV filters or pink lenses by trying both. Thus, it is recommended that optometrists enclose a UV filter or a pink tint or both in the lenses when prescribing spectacles for the VDT operators.

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Lens A/B/C provided relief from the discomfort you normally feel under fluorescent lights.	A:					
	B:					
	C:					
2. Lens A/B/C provided relief from the discomfort you normally feel while working at a VDT.	A:					
	B:					
	C:					
3. The use of lens A/B/C reduced the frequency of migraine headache experienced.	A:					
	B:					
	C:					

Lens A is the yellow lens
Lens B is the pink lens
Lens C is the clear lens

The completed questionnaires were tabulated and analyzed by a statistical consulting service. When the response was "strongly agree" or "agree", it was given a value of +1. When the response was "undecided", "disagree", or "strongly disagree," it was given a value of 0. Logistic regression was done on these values, where the three types of lenses, A (UV filter), B (pink) and C (clear) were used as variables (predictors). The probability (P) was obtained by the formula

$$\log \frac{P}{1-P} = \text{intercept} + \text{type of glasses} + \text{VDT use} + \text{photophobia},$$

where the type of glasses, VDT use, and photophobia were considered as variables.

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TABLE 1

PATIENTS PROFILE

Total number of patients 45-3 withdrew = 42

12 Males	30 Females
34 VDT Operators	8 Non VDT Users
16 Migraineurs	

TABLE 2

LENSES PREFERRED BY THE SUBJECTS

	Q_1 (Fluorescent Lights)		Q_2 (VDT)		Q_3 (Headaches)	
N	37		37		16	
	Points	% Preferred	Points	% Preferred	Points	% Preferred
Lens A	26	70%	18	53%	7	44%
Lens B	23	62%	15	44%	3	18%
Lens C	6	16%	3	9%	1	6%

TABLE 3

P values for Lens A vs C and Lens B vs C

	Q_1	Q_2	Q_3
Lens A vs. C	.0073	.0094	.0633
Lens B vs. C	.0286	.2727	.6928

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