

TO STUDY THE ROLE OF ERGONOMICS IN THE MANAGEMENT OF COMPUTER VISION SYNDROME

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ABSTRACT

INTRODUCTION

Ergonomics is the science of designing the job equipment and workplace to fit the worker by obtaining a correct match between the human body, work related tasks and work tools. By applying the science of ergonomics we can reduce the difficulties faced by computer users.

OBJECTIVES

To evaluate the efficacy of tear substitutes and the role of ergonomics in the management of Computer Vision Syndrome. Development of counseling plan, initial treatment plan, prevent complications and educate the subjects about the disease process and to enhance public awareness.

MATERIALS AND METHODS

A minimum of 100 subjects were selected randomly irrespective of gender, place and nature of computer work & ethnic differences. The subjects were between age group of 10-60 years who had been using the computer for a minimum of 2 hours/day for atleast 5-6 days a week.

The subjects underwent tests like Schirmer's, Test film breakup time (TBUT), Inter Blink Interval and Ocular surface staining. A Computer Vision score was taken out based on 5 symptoms each of which was given a score of 2. The symptoms included foreign body sensation, redness, eyestrain, blurring of vision and frequent change in refraction. The score of more than 6 was treated as Computer Vision syndrome and the subjects underwent synoptophore tests and refraction.

RESULT

In the present study where we had divided 100 subjects into 2 groups of 50 each and given tear substitutes only in one group and ergonomics was considered with tear substitutes in the other. We saw that there was more improvement after 4 weeks and 8 weeks in the group taking lubricants and ergonomics into consideration than lubricants alone. More improvement was seen in eyestrain and blurring ($P < 0.05$) of vision than redness ($P > 0.05$).

CONCLUSION

Advanced training in proper computer usage can decrease discomfort.

KEYWORDS

Computer Vision Syndrome, Dry Eye, Lubricants.

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INTRODUCTION: The American Optometry Association defines computer vision syndrome as a "Complex of eye and vision problems related to near work which are experienced during or related to computer use."^{1,2}

This condition most commonly occurs when the viewing demand of the task exceeds the visual abilities of the Video Display Terminal (VDT) user.

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The VDT is an input/output device that contains a screen, a keyboard and a mouse. Spending more than 2 hours a day on the computer may lead to symptoms of Computer Vision Syndrome. (Sen A, Richardson S).³

The following strategies have been reported by the researchers to prevent/ reduce the symptoms of Computer Vision Syndrome (Grant A.H).^{4,5}

Keeping the computer screen at a distance of 35-40 inches away may allow the eyes to relax and may reduce eye strain.

Keep pixel size as low as possible and the flicker rate as high as possible in the computer.

Adjusting the computer monitor to a viewing angle of 15 degrees lower than horizontal level may reduce the musculoskeletal discomfort (neck pain and back pain) and visual discomfort.

Taking regular small breaks may relax accommodation process of the eyes, thereby preventing eye strain.

It is easier to practice the small breaks in between the work by following the rule of 20/20/20 after 20 minutes of computer use, one should look at something 20 feet away for 20 seconds.

Maintaining good sitting posture to avoid neck pain and back pain.

Correction of visual problems by wearing spectacles or contact lenses is important to avoid eye strain.

The screen lighting, contrast and brightness should be adjusted to the optimum before starting the work on the computer. The luminance of the room should not exceed three times than the mean luminance on the screen.

Artificial tears, polysorbate 0.5%-optizen and tetrahydrozoline 0.05%-visine25, povidone 2% preservative-free eye drops have been prescribed to alleviate the symptoms related to CVS. These eye drops rewet the ocular surface, contribute to tear volume; and thus decrease symptoms of ocular tiredness, dryness and difficulty in focus, thus improve dynamic visual acuity.

MATERIALS AND METHODS: The Case Control study was conducted in the Department of Ophthalmology, Santosh Medical College & Hospital Ghaziabad from January 2014 to December 2014 in patient of either sex and age between 10-60 years of age, using the computer for a minimum of 2 hours/day for at least 5-6 days/week.

Inclusion Criteria: The subjects were between age group of 10-60 years who had been using the computer for a minimum of 2 hours/day for atleast 5-6 days a week.

Exclusion Criteria:

- Below 10 years of age and above 60 years of age.
- Any other known cause of headache.
- Recent ongoing ocular diseases of Lids, Lashes, Conjunctiva, Cornea.
- Ocular Motility disorders.
- Any other known causes of Dry Eye like Kerato conjunctivitis sicca, Hypovitaminosis A, Chemical burn Trachoma, Stevens-Johnson syndrome, corneal ulcers.
- Disorders of blinking.
- Regular use of topical medications, especially longer than two weeks.
- Intake of systemic drug known to cause dry eye viz. antipsychotics, antidepressants, anticholinergics, anxiolytics, antihistamines, antiparkinsonians, diuretics and hormones.

Computer Vision Syndrome Score: Complaint of soreness, heaviness and burning sensation in eye: Since the subjects have asthenopic symptoms all complaints like headache, eye pain, eye strain and eye fatigue after a

minimum of 2 hours of computer usage in a day were categorized under this and given a score of 2.

Complaint of Foreign Body Sensation, Grittiness: All subjects with complaints like burning and irritation in their eyes stinging sensation continuous itching in the eyes after atleast 2 hours/day of computer usage were categorized under this and a score of 2 was given to them. Complaint of intermittent blurring of vision and difficulty in focusing: Subjects complaining of having to repeatedly strain to focus or complaining that characters become hazy on the screen after sometime, blurred vision or having to continuously blink to clear the view after atleast 2 hours/day of computer usage were categorized under this and a score of 2 was given to them. Change in refraction (glasses) more than twice in 6 months: Since our corrected vision affects our computer vision a lot thus the refraction plays an important role in computer vision syndrome. Glasses and computer vision are interrelated so if the subject visits the ophthalmologists for glasses correction more than 2 times in six months, proper evaluation was done and a score of 2 was given to them.

On examination, Interpalpebral and lower palpebral conjunctival congestion: Since redness is an important symptom and the sign to be evaluated for this is congestion so it should be examined and subjects having interpalpebral and lower palpebral congestion were all given a score of 2. Each of the above was given a score of 2 thus making a total score of 10. More than 6 out of 10 was considered abnormal.

OBSERVATIONS:

Computer Vision Syndrome score	No. of subjects	%
Computer Vision Syndrome score >6	76	76%
Computer Vision Syndrome score <6	24	24%

Table 1: Showing incidence of computer vision syndrome

Sample Size-100

Thus we see that out of 100 subjects, 76 subjects had a computer vision syndrome score of more than 6 and the rest 24 had a score of less than 6. So, 76% of the subjects were considered to be suffering from computer vision syndrome.

Age group (years)	No. of subjects	Percentage (%)
10-20	4	5%
21-30	42	55%
31-40	26	34%
>40	4	5%

Table 2: Showing age wise distribution in computer vision syndrome

Thus we infer that computer vision syndrome is seen maximum in 21-30 years of age since out of 76 subjects 42 (55%) belong to the age group of 21 to 30 years.

Sex	No. of Subjects	Percentage (%)
Females	19	25%
Males	57	75%

Table 3: Showing gender based distribution in computer vision syndrome

Thus we infer that out of 76 subjects suffering from computer vision syndrome 75% (57 subjects) are males and rest 25% (19 subjects) are females. So it is more common in males.

Symptoms	At presentation		4 weeks		8 weeks	
	Mean Schirmer	Mean B.U.T	Mean Schirmer	Mean B.U.T	Mean Schirmer	Mean B.U.T
Redness & grittiness	20	16	21	18	22	18
Eyestrain	18	18	20	18	20	18
Blurring & difficulty in focussing	20	16	20	18	20	18
Contact lens discomfort	17	16	17	16	19	16
Frequent change in glasses	20	18	20	18	20	18

Table 4: Showing mean value of Schirmer and B.U.T tests in the subjects studied on presentation and follow up

It was observed that there was no derangement in Schirmer test values and BUT values in subjects of computer vision syndrome.

	Eye strain	Redness	Blurring
Baseline values			
Group A	14	8	11
Group B	14	7	8
At 4 weeks			
Group A	10	6	8
Group B	10	4	5
At 8 weeks			
Group A	5	5	5
Group B	2	3	2

Table 5: Efficacy of tear film substitutes and the role of ergonomics in computer vision syndrome

	Eyestrain	Redness	Blurring of vision
Baseline	<0.05	>0.05	<0.05
At 4 weeks	<0.05	>0.05	<0.05
At 8 weeks	<0.05	>0.05	<0.05

Table 6: Relationship between symptoms and p value of group A vs. group B

Thus we see that Group B when compared to Group A showed a significant improvement in symptoms of Computer vision syndrome symptoms of eyestrain (p value <0.05) at 4 weeks and 8 weeks whereas for the symptoms of redness at 4 weeks and 8 weeks both the groups showed compatible results. (p value >0.05).

Group A	Eyestrain	Redness	Blurring of Vision
Baseline	14	8	11
4 weeks	10	6	8
8 weeks	5	5	5

Table 7: Showing improvement in major subjective symptoms in group A

Group B	Eyestrain	Redness	Blurring of vision
Baseline	14	7	8
4 weeks	10	4	5
8 weeks	2	3	2

Table 8: Showing the improvement in major subjective symptoms in group B

DISCUSSION: The present study has shown the incidence of computer vision syndrome in 76% (Table 1). More in males (75%) than in females (25%). Age group being affected to the maximum is 21-30 years ($\chi^2=8.0$, $p<0.05$). As the exposure time increases so does the frequency of computer vision syndrome. In less than 4 hours' day, 5.3% subjects are affected, 4-8 hours/day of exposure 26.3% subjects show symptoms and a large number i.e. 68.4% of subjects having exposure more than 8 hours/day show more symptoms and had computer vision syndrome score >6.

According to the study conducted by A.K. Sharma in March 2006⁶ mean age group in symptomatic subjects was 21-30 years, males outnumbered females in the ratio 7:3. Magnitude of computer related problems is 93% visual problems increased as the duration of working hours increased being 26% in 3-5 hours of usage, 21% in 5-7 hours and 42% in 7-9 hours and 45% in more than 9 hours. Dinesh J. Bhandari in 2008⁷ concluded that among computer users, 46% males and 47% females showed symptoms of asthenopia, 36.4% subjects working less 20 hours/week showed asthenopia whereas 50% of subjects working for more than 20 hours/week showed asthenopia.

Richa Talwar, 2009⁸ conducted another study on computer professionals in Delhi and NCR. It was deduced from this study that mean age of subjects showing symptoms was 28.23 years, male female ratio being 5:3, the presence of visual problems was 76, 5%. 30% spent 3 hours on the computer. 44% spent 6-9 hours and 26% spent more than 9 hours.

In the present study where we had divided 100 subjects into 2 groups of 50 each and given tear substitutes only in one group and ergonomics was considered with tear substitutes in the other. We saw that there was more improvement after 4 weeks and 8 weeks in the group taking lubricants and ergonomics into consideration than lubricants alone. More improvement was seen in eyestrain and blurring ($P<0.05$) of vision than redness ($P>0.05$). Thus advanced training in proper computer usage can decrease discomfort (Kirke. E, 2010).⁹

CONCLUSION: In the present study, the results suggest that: The incidence of computer vision syndrome is 76%, more in males (84%) than in females (16%). The age group being affected most commonly is 21-30 years i.e the working

age group since it is an occupational hazard. As the duration of hours spent on the computer increases so does the probability of this syndrome.

Ergonomics means making the job fit for the worker and following points should be considered for that: Computer screen should be lowered so that the centre of the screen is below your eye level and at a viewing distance of 20-28". Glare filters should be used to minimize glare and harsh reflection. Drought should be directed away from the eyes. Concentrate on blinking, whenever you begin to sense symptoms of dry or irritated eye. Take frequent breaks. Follow the 20-20-20 rule. This simply means every 20 minutes look away beyond 20 feet and blink 20 times. Replacement of old style monitor (Called Cathode Ray Tube) with a flat panel LCD (Liquid Crystal Display) which is easier on the eye and usually have an anti-reflective surface minimizing eye strain and fatigue. Use of appropriate glasses and correction of any visual problems like near sightedness, far sightedness and astigmatism. Use artificial tears in eye drop or gel form to keep eyes well lubricated. This is an upcoming problem of the modern times but subject can be managed well with lubricants and proper workplace designing.

REFERENCES:

1. American optometry association the relationship of computer vision syndrome to musculoskeletal disorders. *Ergonomics* 1997;5.
2. American optometry association. Guide to the clinical aspects of computer vision syndrome. *Ergonomics* 1995;1.
3. Sen A, Richardson S. A study of computer related upper limb discomfort and computer vision syndrome. *J Human Ergol* 2007;36:45-50.
4. Grant AH. Factors affecting hand eye synchronicity in computer users *Optom Vis. Sci* Sept 1992;69(9):739-744.
5. Grant AH. The computer user syndrome. *J Am Optom Assoc* 1987;58(11):892-901.
6. Sharma AK, Khera S, Khandekar J. Computer related health problems among IT professionals in Delhi. *Indian J Community Med* 2006;31(1):36-8.
7. Bhandari JD, Choudhary S, Doshi VG. A community-based study of asthenopia in computer operators. *Community eye care* 2008;56(1):51-55.
8. Talwar R, Kapoor R, Puri K. A study of visual and musculoskeletal health disorders among computer professionals in NCR Delhi. *Indian J of Community Med* 2009;34(4):326-328.
9. Kirke E, Strong J. Management of eWork health issues a new perspective on an old problem. *Work* 2010;35(2):173-81.