Effect of Ophthalmic exercise on severity of Visual Acuity and Neck Disability amongst IT professionals: an Experimental study

[1]Dr. Niyatee Harshadkumar Parekh, [2]Dr. Kajal G. Chauhan

[1]Assistant Professor in Community and Rehabilitation Sharda College of Physiotherapy, Pethapur. Gujarat.

[2]Associate Professor, Department of Community Physiotherapy Maharashtra Institute of Physiotherapy, Latur

Abstract*—Background: Information Technology (IT) professionals are highly susceptible to Computer related vision problems and work-related musculoskeletal disorders due to prolonged computer use. Visual fatigue, reduced visual acuity, and neck discomfort are among the most commonly reported complaints. Ophthalmic exercises have been suggested as a simple and cost-effective intervention to reduce these symptoms. Objective: To determine the effect of ophthalmic exercises on visual acuity and neck disability among IT professionals. Methods: An experimental study was conducted among 16 IT professionals aged 25–40 years who worked on computers for at least six hours daily and had a minimum of four years of work experience. Participants underwent a four-week ophthalmic exercise program combined with ergonomic advice. The intervention included blinking exercises, palming, flexing, focusing near and far, zooming, figure-of-eight movements, the 20-20-20 rule, and scheduled visual rest periods. Visual acuity was assessed using the Snellen Eye Chart, while neck disability was measured using the Neck Disability Index (NDI). Data were analyzed using SPSS version 20.0. Since the data were not normally distributed, the Wilcoxon Signed Rank Test was applied. Results: Significant improvements were observed in Visual acuity and Neck disability following the intervention. Visual acuity improved significantly in both eyes ($p < 0.05$). Neck Disability Index scores showed a highly significant reduction after treatment ($p < 0.001$), indicating decreased neck-related functional limitations. Participants reported reduced eye strain, visual discomfort, and neck pain following the intervention. Conclusion: Ophthalmic exercises combined with ergonomic advice are effective in improving visual acuity and reducing neck disability among IT professionals. These exercises may serve as an accessible and non-invasive strategy for managing computer-related visual and musculoskeletal complaints

***Index Terms*— IT professionals, Visual acuity, Neck Disability, Ophthalmic exercise**

I. INTRODUCTION

India has emerged as major service provider in the cyber world with information technology. [1] About 85 % of computer users suffer from Visual problems and 70% of the total CVS cases are contributed by IT professionals.[2]

Visual acuity is the ability of eye to determine the precise shape and details of the objects. Mohamed mabrouk et al. Conducted study in 2009 on Effects of computer use on visual acuity among computer workers in which they showed that People who spend more than two hours on a computer everyday will experience symptoms of computer vision syndrome and it effects on visual acuity among professional computer workers [3]. According to some studies, the majority of subjects with visual defects caused by computer use complain of burning dry eyes, eyes becoming sore while using computer, difficulty in color vision and physical ailments including neck disability.

In 2017, T.M Ashwini et al. revealed that Neck disability is a common musculoskeletal complaint in computer users due to prolonged use of computer and prolonged static or awkward neck posture [4]. Pradeep kurunhikattil (2016), reported that Occulomotor deficits (poor eye- head coordination, gaze stability, and smooth pursuit eye movement control.) in those with neck disability are thought to be the cause of these visual symptoms among professional computer users [5].

Eye exercises improve the performance of muscular and motor activities of the eyes. From the statistical analysis it was found that this eye exercises is very effective in reducing eye strain and neck pain etc. These exercises help in relaxing the ocular muscles, some exercises like palming will give relaxation to all sensory nerves related with vision.

II. NEED OF THE STUDY

According to American Optometric Association, we need to focus on ophthalmic exercises to alleviate computer related vision problems among computer professionals.[6] A study was done by National Informatics Centre among 200 IT professionals to evaluate the computer related health problems and role of ergonomic factors. The result revealed that there was approximately 93% of computer related morbidity in the subjects. The visual problems were noticed in 76 % and Musculo-skeletal in 77.5 % [1].

G. Bhuvaneshwari et al. studied to assess the effectiveness of ophthalmic exercises on visual discomfort among computer workers in which they show that the computer workers had a reduction in visual discomfort score after ophthalmic exercises.[3] Ophthalmic exercise may give benefits to minimize symptoms of IT workers.

Focusing eyes at the same distance point for long periods of time causes fatigue. The human eye structurally prefers to look at objects more than six metres away, so any work performed close up puts extra demands on your eye muscles. The illuminated computer screen can also cause eye fatigue. computer users may get symptoms such as blurred vision, temporary inability to focus

on faraway objects and headaches [1]. Ophthalmic exercise may be beneficial to minimize such symptoms.

Aayunda puteri rizanti et al proved that ocular exercises reduce eye fatigue and affect convergence related binocular vision function improvement by enhancing efficiency of eye motility muscles, this exercise reduces the prevalence and incidence of eye fatigue [7].

III. AIMS AND OBJECTIVES

Aim -To see the effect of Ophthalmic exercise on severity of Visual Acuity and Neck Disability symptoms amongst people working as IT professionals.

Objectives-

3.1 To see the effect of Ophthalmic exercise on severity of Visual Acuity among people working as IT professional

3.2 To see the effect of Ophthalmic exercise on Neck Disability among people working as IT professional.

IV. REVIEW OF LITERATURE

4.1. Panel A.D.Kim et al, 2020 conducted study on "Therapeutic benefits of blinking exercises in dry eye disease". 54 participants with dry eye symptoms received instructions to perform a ten-second cycle of blinking exercises every 20 min during waking hours for four weeks. 41 participants completed the study, reporting an average of 25.6 daily blinking exercise cycles. Improvements were noted in DEQ-5 ($p < 0.001$), OSDI ($p < 0.001$), non-invasive tear film breakup time ($p < 0.04$), the proportion of incomplete blinks ($p < 0.001$),but not in tear meniscus height or tear film lipid layer thickness. Blinking exercises can modify poor blinking patterns and improve dry eye symptomology, with modest changes in objective measures of tear film quality[8].

4.2. Tommaso Bianchi et al, 2020 conducted study on "Immediate effects of eye yogic exercises on morphoscopic visual acuity". Study conducted among Twenty participants; they have been invited to perform some yoga eyes exercise for 6 min overall. Pre post visual acuity were compared, resulting in medium improvement of a visual acuity. The differences between second and first examination ranged from −22.22% to +24.44%. They have found the effects of eye yoga exercises on eyesight [9].

V. METHODOLOGY

The study was approved by the institutional ethical committee. 16 IT professionals were briefly stated about the nature of the study and informed written consent was taken before the procedure. Demographic data was collected which includes age, gender, work experience, working hours.

5.1 Criteria of selection

Those who are Willing to participate in this study, Both male and female, Persons whose age is in between 25 to 40 years, Subjects who are working minimum 6 hours in a day and minimum 4 years of work experience, Persons who have already undergone any interventional program on eye and neck exercise, Computer users with detected eye disorders such as cataract, glaucoma, trachoma, Participants who is taking medication which has direct effect on eyes, Participants who have systematic illness were excluded.

5.2 OPHTHALMIC EXERCISE Intervention [10], [3], [4], [5]

10 repetitions, 2 times in a day. 3 times in a week for 4 weeks protocol was given to subjects for 4 weeks.

5.2.1 Blinking- Closing the eyes, pausing for two seconds, then opening them again.

5.2.2 Flexing- Look up without moving your head and then look down.

5.2.3 Focusing Near and Far- This exercise can be done standing or sitting. Put your thumb in front of your face at about 10-inch distance and focus on it. Now focus on something else that is in your surrounding 10 feet away. Switch between near and far focusing repeatedly.

5.2.4 Palming- Place your two hands over your eyes. The palm of hands should cover the eyes, the fingers on the forehead.

5.2.5 Zooming- Raising your thumb in the hitchhikers position. Focus on the thumb and now draw it in until the thumb is three inches away from the face. Keep your focus on the thumb. Then slowly move the thumb and forearm back to the starting position.

5.2.6 Figure of Eight- Staring at a blank wall, imagine a large figure 8 tilted on its side 10 feet away from you. Now trace this path of the figure 8 with your eyes without moving your head. Do this one way for a minute.

5.2.7 20-20-20 Rule- Scheduling regular breaks can help to alleviate some of this strain. The 20-20-20 rule is easy to remember. For every 20 minutes of near work, look at a target 20 feet away for 20 seconds.

5.2.8 Rest- Rest your eyes for 10 mins away from the screen for every 1 hour of work.

5.2.9 Ergonomics for vision care : Size of characters on computer should not be too small to avoid strain, Sit 3 feet away from window, Monitor brightness should be equal to the area directly behind it, Lower the total light levels whenever possible to reduce glare on computer screen (remove or turn off some overhead lighting), Avoid placing monitor directly under cabinet task light, Close shades, curtains or blinds on window which producing unwanted lights, Clean computer screen periodically to maximize clarity, Place computer screen at the appropriate reading distance from your eyes.

VI. OUTCOME MEASURES

6.1 SNELLEN EYE CHART (VISUAL ACUITY CHART) [11]

The eye chart is used to measure visual acuity. It's part of a general assessment of overall eye health. The Snellen chart usually shows the rows of capital letters. The first line has one very large letter. Each row after that has increasing numbers of letters that are smaller in size. In procedure, Place the chart on a wall or easel 20 feet away. Cover one eye with your hand, a large spoon or some other item that completely blocks the vision of the covered eye. Identify a line on the chart you can comfortably read. Read the letters on that line aloud. Stop you when a person fails to correctly identify at least 50 percent of the letters on a line. Switch to the other eye and repeat.
Record visual acuity for each eye by noting the line for which you correctly identified either:
a) More than half the letters on that line, but not all of them.
b) All letters on that line, plus a few letters (less than half) on the next line.
Visual acuity will be expressed as a fraction. Fractions are shown to the left of each row and identify how well person can see. Reliability: Reliability of snellen eye chart is 0.87.

6.2 NECK DISABILITY INDEX [12], [13]

This questionnaire has been designed to give information to how neck pain has affected the ability to manage in everyday life. The NDI can be scored as a raw score or doubled and expressed as a percent. Each section is scored on a 0 to 5 rating scale, in which zero means 'No pain' and 5 means 'Worst imaginable pain'. Points summed to a total score. The test can be interpreted as a raw score, with a maximum score of 50, or as a percentage. 0 points or 0% means: no activity limitations. 50 points or 100% means complete activity limitation. A higher score indicates more patient-rated disability with a sensitivity of 0.78 and a specificity of 0.80. Mean duration of the test: 3 to 7.8 minutes. Interpretation of scoring: 0-4 points (0-8%) no disability, 5-14 points (10– 28%) Mild disability, 15-24 points (30-48%) Moderate disability, 25-34 points (50- 64%) severe disability, 35-50 points (70-100%) complete disability. The reliability of the questionnaire is 0.81 to 0.89 and is valid in assessment of neck disability**.**

VII. RESULTS

Data was analysed by Statistical Package of Social Science (SPSS) version 20.0 was used and before applying statistical test normality of the data was checked by the Shapiro wilk test, p value is < 0.05 so, data is not normally distributed. As the data is not normally distributed non - parametric test is used for analysis. In this study power was kept at 80% and level of significance was kept at 95%. Group (n=16) received ophthalmic exercise with ergonomic advice. Baseline assessment was taken on 1st day and after 4 weeks.

Table 7.1: Age distribution

	MALES	FEMALES
MEAN AGE (YEARS)	27.32 (1.22)	28.01 (0.96)

Table 7.2: Gender distribution

Gender	Group
Male	9
Female	7
Total	16

Table 7.3: Work experience of Participants

YEARS	N	%
0-5 YRS	14	87%
6-10 YRS	2	13%
>10 YRS	-	-
TOTAL	16	100%

Table 7.4: Working hours in Group

Working Hours	Group
Mean (Hours)	7.43
SD	0.81

Table 7.5 Tests to Compare Outcomes

Outcome Measures	Test
Visual acuity (Snellen chart)	Wilcoxon Signed Rank Test
Neck Disability (NDI)	Wilcoxon Signed Rank Test

Table 7.6: Comparison of Pre and Post treatment score of visual acuity within Group

Visual acuity	Pre-Test		Post-Test			
	Mean	Sd	Mean	Sd	Wilcoxon Test	P Value
Right side	0.08	0.04	0.04	0.05	2.65	0.008
Left side	0.11	0.09	0.07	0.09	2.27	0.023

Data was not normally distributed, wilcoxon signed rank test was used to comparison of pre and post treatment score of Right-side Visual Acuity within Group. For Group: P value of Visual Acuity Rt Side is 0.008 and Left side is 0.023. Significant difference was found.

Table 7.7: Comparison of Pre and Post Treatment Score of Neck Disability Index (NDI) Within Group

Neck Disability Index	Pre Test		Post Test			
	Mean	Sd	Mean	Sd	Wilcoxon Test	P Value
	8.75	3.30	6.69	3.07	3.55	<0.001

Data was not normally distributed, wilcoxon signed rank test was used to comparison of pre and post treatment score of NDI within Group. For Group: P value of NDI is < 0.001, considered highly significance difference.

VIII. DISCUSSION

In present study, Participants (n=16) received Ophthalmic exercise with ergonomic advice. Baseline assessment of Visual equity (Snellen chart) and Neck Disability (Neck Disability Index) were taken on 1st day and after 4 weeks. Both outcomes were significantly reduced. Few previous studies that reported that effect of Ophthalmic exercise significantly decreased Vision problems score of participants working in a software company. The study which was done by Mujahid k sheikh et al, (2020) reported that Eye fatigue was significantly reduced in the post- Ophthalmic exercise session followed by the ergonomic advice as compared to the pre-exercise session in school-aged children attending online classes and significant decline was found in the eye fatigue in them [14].

Result concluded that there is a is significant effect on visual acuity (right side > left side) in intervention. These results correlated with a study done by Naresh kumar et al, conducted a study and the result of the study revealed that right eye of male shows significant difference in single experimental group after the application of four weeks of yogic eye exercises [15].

Eye exercises improve the performance of muscular and motor activities of the eyes. From the statistical analysis it was found that this eye exercises are very effective in reducing eye strain and neck pain etc. These exercises help in relaxing the ocular muscles, some exercises like palming will give relaxation to all sensory nerves related with vision.

Rathod Vandana J. et al. (2011) studied the effect of eye exercises on Myopia and concluded that visual training improves Near point of convergence (NPC) which could be due to an improved accommodation power as a result of eye exercises, which in turn improves the NPC [16].

These similar results show in another study which was done by Aayunda puteri rizanti et al, ocular exercises reduce eye fatigue and affect convergence related binocular vision function improvement by enhancing efficiency of eye motility muscles, this exercise reduces the prevalence and incidence of eye fatigue [17].

Neck disability also gets reduced with Ophthalmic exercises because the neck, shoulders and head are all very closely situated anatomically which means that if ailment be falls one it is most likely to negatively impact on the closest areas first. Muscle tension in the upper back, neck and shoulders can lead to headaches or eye strain because the flow of blood to the eyes is restricted. With eye exercises, blood flow is increased so symptoms were reduced and positive effect on muscle lead to reduce neck disability.

IX. CONCLUSION

Ophthalmic exercise and ergonomics can be considered as effective intervention to manage Visual equity and Neck disability among IT professionals.

X. LIMITATIONS

Study population taken was less. Not checked all type of refractive errors. Inadequate time for the study.

XI. FUTURE RECOMMENDATIONS

- Other intervention program can be included for future studies.
- This project can be further taken up for the studies so that we can properly assess the subjects with objective outcome measures.

REFERENCES

[1] Sudharshini, S., Anantha Raman, V. V., & Mathew Arumai, M. (2018). Computer Professionals and their Health issues and Managements. *Public Health Review- International Journal of Public Health Research*, *5*(3),117-122

[2] Bhuvaneshwari, G., & Bernard, C. A study to assess the effectiveness of ophthalmic exercises on visual discomfort among computer workers in selected company, Chennai.

[3] Abdelaziz, M. M., Fahim, S. A., Mousa, D. B., & Gaya, B. I. (2009). Effects of computer use on visual acuity and colour vision among computer workers in Zaria. *Eur J Sci Res*, *35*(1), 99-105.

[4] Ashwini, T. M., Karvannan, H., & Prem, V. (2018). Effects of movement impairment based treatment in the management of mechanical neck pain. *Journal of bodywork and movement therapies*, *22*(2), 534-539.

[5] Kurunhikattil, P. K. (2016). Role of eye exercises in improving performance of professionals working with computers. *Journal of Indian System of Medicine*, *4*(3), 145

[6] American Optometric Association (2019) Computer vision syndrome.

[7] Wang Q, Xu H, Gong R, Cai J (2015) Investigation of visual fatigue under LED lighting based on reading task. Optik 126(15-16): 1433-1438

[8] Kim, A. D., Muntz, A., Lee, J., Wang, M. T. M., & Craig, J. P. (2021). Therapeutic benefits of blinking exercises in dry eye disease. *Contact Lens and Anterior Eye*, *44*(3), 101329.

[9] Bianchi, T., & Bellen, R. (2020). Immediate effects of eye yogic exercises on morphoscopic visual acuity. *Yoga Mimamsa*, *52*(1), 5.

[10] Petrisia, J. (2011). A study to assess effectiveness of ophthalmic exercises on visual discomfort among computer workers in selected company, Bangalore (Doctoral dissertation, Annai JKK Sampoorani Ammal College of Nursing, Komarapalayam).

[11] American Optometric Association (2019) snellen eye chart

[12] MacDermid, J. C., Walton, D. M., Avery, S., Blanchard, A., Etruw, E., Mcalpine, C., & Goldsmith, C. H. (2009). Measurement properties of the neck disability index: a systematic review. *Journal of orthopaedic & sports physical therapy*, *39*(5), 400-417.

[13] Vernon, H., & Mior, S. (1991). The Neck Disability Index: a study of reliability and validity. *Journal of manipulative and physiological therapeutics*.

[14] Charpe NA, Kaushik V (2009) Computer vision syndrome (CVS): Recognition and control in software professionals. Journal of Human Ecology 28(1): 67-69.

[15] Pandey, R., Bihari, R., & Pandey, A. (2017). Effect of Eye Exercise on Myopia in Children Aged Between 10-15 Years-A Randomized Clinical Trial. *International Journal for Advance Research and Development*, *2*(1).

[16] Desai, V. J. R. D. P., & Alagesan, J.(2011) Effect of Eye Exercises on Myopia- Randomized Controlled Study. *Journal of Pharmaceutical and Biomedical Sciences (JPBMS)*, *10*(10).

[17] Rizanti, A. P. (2021). Yoga Ocular Exercises to Maintain Eye Health During Work and Distance Learning in the New Normal Era. *Jurnal Berita Ilmu Keperawatan*, *14*(1), 1-9.