Original Article

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Effect of Eye Exercises on Computer Vision Syndrome among Medical Students in A University in Indonesia

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Abstract

Objective: To determine the effect of eye exercises on Computer Vision Syndrome among batch 2019 medical students of the Faculty of Medicine, Universitas Sumatera Utara, Indonesia.

Methods: This study used analytical true experimental with a Pretest-Posttest Control Group Design. Sample consisted of 86 respondents divided into two groups, control and experimental (intervention) groups, was used. Each group consisted of 43 respondents who were sampled randomly using the simple random sampling technique. Data were collected using the Computer Vision Syndrome Questionnaire (CVS-Q) and analyzed statistically with a p-value of <0.05 considered significant.

Results: A decrease in the score of Computer Vision Syndrome in the experimental (intervention) group after the eye exercise was observed with a p-value of 0.001 (<0.05).

Conclusion: Eye exercise affects the Computer Vision Syndrome.

Keywords: Computer vision syndrome, eye exercise

Introduction

Computer Vision Syndrome (CVS) is defined as a complex eye discomfort condition in the form of visual impairment symptoms caused by prolonged exposure to digital displays.[1] Globally, it is estimated that around 60 million people experience this syndrome, with a million new cases identified each year.[2] The pathophysiology of this syndrome is divided into three mechanisms: ocular mechanism of dryness and redness of the eyes with a reduction in blink rate; visual mechanism that leads to blured vision, double vision and slow focus change; and extraocular mechanism associated with non-ergonomic posture in front of the computer screen that causes musculoskeletal symptoms such as headaches and shoulder pain. [3] The COVID-19 pandemic poses a risk of increasing cases of Computer Vision Syndrome due to changes in the environment for study because of the implementation of the online learning policy.[4] Garg *et al.* has reported that more than 70% of medical students of Rama University, India, spent more than 4 hours on their computers. About 40% of students know about CVS, but only 10% take CVS precautions.[5] Another study by Muma *et al*. on 348 students in Kenya, shows a prevalence of CVS of 60.4%, with a low level of knowledge about CVS (46.8%) and 40% of these students did not take preventive measures against CVS. This shows that student's prevention efforts against CVS are still relatively low.

Eye exercises can be considered as a non-pharmacological therapy to prevent and reduce symptoms of Computer Vision Syndrome. Eye exercises therapy is a series of movement performed repeatedly by the eyes to train our eye muscles and its surroundings to be elastic and strong, relax the eyes as to reduce discomfort in the eyes.[6]

A study by Intan Putri *et al*. on eye exercise effectiveness in CVS among nursing students of Riau University concluded that there was a significant difference in the decrease of CVS scores in the experimental group after

the eye exercise intervention.[7] Thus, the purpose of this study was to determine the effect of eye exercise on reducing and preventing CVS complaints among medical students of Universitas Sumatera Utara who were involved in online learning during the COVID-19 pandemic. Different types of eye exercise selected by the researcher with a consideration of feasibility of effective implementation from the time and place perspective were included. The eye exercises were carried out twice a week for one month, with a duration of approximately 10 minutes and can be done anywhere without using any tool.

Methods

This was a quantitative study with a true experimental pre-and post-test design. In this design, two group were randomly selected, Samples was divided into two groups (control and intervention). The intervention group was given eye exercises, while the control group was not given an intervention. Each group was asked to fill CVS-Q one day before doing eye exercises and one day after the last day of doing eye exercises. This study was performed from September to October 2022. Participants were selected using random sampling technique, resulting in 86 medical students of Universitas Sumatera Utara meeting the inclusion and exclusion criteria. The inclusion criteria applied were medical students with the habit of using computers at least 4 hours a day and willing to participate in the study. Participants were excluded if they did not agree to participate. The Computer Vision Syndrome score data were obtained by using the CVS-Q (Computer Vision Syndrome-Questionnaire) from Segui *et al*. which was distributed before and after eye exercises. Ethical approval for this study was granted by the Health Research Ethical Committee, Faculty of Medicine, Universitas Sumatera Utara under the ethical clearance number 797/KEPK/USU/2022.

Eye exercises in this study were carried out twice a week for one month, with a duration of exercise of approximately 10 minutes. Each eye exercise session involved the following sequential steps: blinking, palming, figure of eight, eye movement, 20-20-20 rules, and near and far focus.

In details, the instructions given for the eye exercise were as follows: (1) Sit on a chair with a straight posture and straight head position as comfortable as possible; (2) Blink 1-2 times every 10 seconds; (3) Rub palms together to warm the eyes, put them on the eyes and breathe deeply for 1 minute; (4) Then focus on an area on the floor around 8 feet away, and move the eyes in the shape of a figure 8. Trace the imaginary figure of 8 for 30 seconds, then switch direction; (5) Move the eyeball right and left, repeat 3 times; (6) Move the eyeball up and down, repeat 3 times; (7) Move the eyeball in a clockwise circle and counterclockwise, repeat 3 times; (8) Direct the eyes to look at an object 20 feet away for 20 seconds, every 20 minutes; (9) Lastly, position the fingers a few inches from the eyes, then focus the gaze on the fingers. Move the fingers away and slowly point them back closer to eyes.

The CVS score were then analyzed using the Wilcoxon test, with a p-value of <0.05 considered significant. Age and gender were used as the secondary data for individual characteristics of the subject.

Results

Data on subject characteristics were obtained from the 86 respondents in terms of gender and age as seen in Table 1. Most respondents were women and 21 years old, which was probably due to the fact that most students in that age were working on their mini-thesis, increasing their computer use.

Table 2 and Fig. 1 demonstrate that there are three symptoms that were frequently experienced before and after intervention, i.e., headache, tearing, and itching.

As described in Table 3, the intervention group experienced a significant decrease in the CVS score after the eye exercise, with a p-value of 0.001 while the control group did not show a decrease in the CVS score (p-value=0.802). Two respondents in the intervention group showed increased CVS scores after intervention, while 17 respondents experienced an increase in the CVS score in the control group.

Table 1 Subject Characteristics

Variable	n=86
Age (years)	
20	27 (31.4)
21	53 (61.6)
22	6 (7)
Sex	
Female	66 (76.7)
Male	20 (23.3)

Table 2 Computer Vision Syndrome Symptoms Before and After Intervention

Symptom	Before intervention	After intervention
	n=86	n=86
Burning	25 (29)	20 (23.2)
Itching	74 (86.1)	61 (70.9)
Feeling of a foreign body	67 (77.9)	43 (50)
Tearing	75 (87.2)	64 (74.4)
Excessive blinking	34 (39.6)	29 (33.7)
Eye redness	57 (66.3)	43 (50)
Eye pain	60 (69.8)	48 (55.9)
Heavy eyelids	47 (54.6)	40 (46.6)
Dryness	54 (62.8)	52 (60.5)
Blurred vision	60 (69.8)	48 (55.9)
Double vision	27 (31.4)	21 (24.4)
Difficulty focusing for near vision	32 (37.2)	19 (22.1)
Increase sensitivity to light	47 (54.7)	36 (41.9)
Colored halos around objects	21 (24.5)	14 (16.3)
Feeling that sight is worsening	43 (50)	32 (37.2)
Headache	77 (89.5)	67 (77.9)

Table 3 Wilcoxon Test Analysis Results of Control and Intervention Groups

Ranks	Group	
	Control	Experimental
	(n=43)	(n=43)
Negative ranks[a]	17	2
Positive ranks[b]	25	37
Ties[c]	1	4
p Value	0.802	0.001

Note: * a. (score (pre) < (score (post); b. (score (pre)> (score (post); c. (score (pre)= (score (post)

Discussion

Computer and VDT(Visual Display Terminal) have become an essential part of modern lifestyle; thus the term of "Computer Vision Syndrome" is then coined to describe a group of symptoms experienced after a prolonged use of VDT. Therefore, by doing eye exercises could help to prevent and reduce the occurrence of Computer Vision Syndrome

Before the intervention, symptoms that were mostly mentioned by the participants were headache, tearing, and itching. However, after the intervention, the number and the percentage of the symptoms declined. This

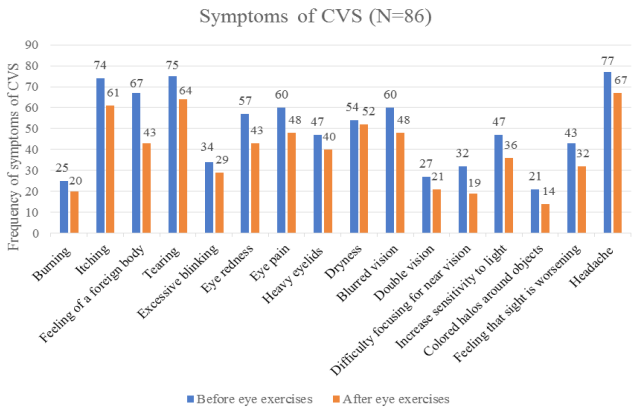

Fig 1. Symptoms of CVS

result supported the study by Ranasinghe and Altalhi that stated headache as the most common symptom mentioned.[8,9,10] Excessive tear production is not directly linked to the duration of VDT use, but to an increased reflex in the eye to increase tear production [11].

Analysis using the Wilcoxon test in the intervention group produced a p-value of 0.001 ($p<0.05$), showing that the eye exercises affect the reduction of the CVS score in this group. This is in line with the findings of previous studies stating a significant decrease in CVS score after eye exercises[7,12]. A significant reduction of CVS in this study may also be linked to the fact that the respondents complied to do the eye exercise properly and routinely twice a week for a month.

Eye exercises are proven to improve the vision and performance of the eyes muscular and motor activities. Palming helps to relax the ocular muscles and all sensory nerves related to vision. Eye movements and figure of eight help the eyes muscle to control the back and movement of the eye's lens, to achieve sights at multiple distances[13]. Blinking replenishes the tear film by redistributing tears from the lacrimal glands and lipids from the meibomian glands on the surface of eye[14]. Thus, eye exercises are shown to positively affect the Computer Vision Syndrome. However, this study also has limitations, such as the small sample size and short period of eye exercises, leading to less data variation. Therefore, a future study should have more respondents and extended period of eye exercises. Other types of eye exercises may also be applied in order to get more representative results.

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