Research Article

Computer Vision Syndrome among Students in Islamic Boarding School during COVID-19 Pandemic

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ABSTRACT

During the COVID-19 pandemic, computer vision syndrome (CVS) caused by the implementation of online learning was an inevitable effect. This study aimed to test the effectiveness of using the Eye Care and Eye Pro Protect Your Vision applications as a step to treat and prevent the severity of CVS. A total of 16 students who participated in virtual classroom learning (81.20% female, 87.50% laptop users with heavy duration, 93.70% experienced CVS) were included. The most frequent symptom in CVS subjects was eye pain (96.5%), while the most intense symptom was a feeling of double vision (15.9%). The use of applications can significantly reduced the duration of laptop use (p=0.025) using the Mc Nemar test. The Eye Care application reduced symptoms by 75%, while the Eye Pro was 62.5%. The Eye Care application can provide a decrease in the duration of screen time and provide rest time for better eyes. Recommendations for preventing CVS based on causal factors can be adjusted to reduce the burden of online study, increase rest time and use screen time reminder applications.

Keywords: *Computer vision syndrome, impact of COVID-19, islamic boarding school, online studies, virtual class*

INTRODUCTION

Recently, there has been a sharp rise in internet users. Five billion people will be online in 2021 (World Internet Users Statistics, 2021). The COVID-19 pandemic's rapid digital revolution raised the number of people using digital display devices globally. Numerous technological advancements have been made because of the social distancing suggestions by the World Health Organization (WHO), including online business platforms and teleconference systems (WHO, 2021). This strategy significantly impact the education system, particularly Indonesia (World Economic Forum, 2020). Virtual classrooms have supplanted almost all physical ones.

Computer vision syndrome (CVS), is a collection of issues involving ocular, visual, and musculoskeletal symptoms brought on by continuous usage of digital screen displays (Klamm &

Tarnow, 2015; Loh & Redd, 2008). The prevalence of CVS is rising, as would be expected, given the rise in daily internet tasks. Numerous studies reveal that users of digital displays, such as computer office employees and students, particularly those studying health sciences, have a high prevalence of CVS (60–90%) (Al Tawil et al., 2020; Mowatt et al., 2018; Rosenfield, 2011). The amount of time students spend studying differs among nations due to variations in educational regulations. While students from Finland, Germany, Sweden, Switzerland, and Uruguay study for fewer than 40 hours a week, Islamic boarding school students study for more than 54 hours a week (Ishizaka & Resce, 2021). When transferring to online classes, may have an impact on screen time utilization. It is interesting to note that CVS affects living quality, including sleep quality and stress levels (Akowuah et al., 2021), which lowers school productivity and performance. However, very little evidence is available about the incidence and consequences of CVS during the COVID-19 pandemic throughout Southeast Asia, including Indonesia.

There are currently few and erratic CVS-related factors available. For instance, Li et al. showed that dry eyes and itchy eyes were the most common symptoms of CVS and that female gender, refractive errors, and screen usage of more than 6 hours (as opposed to less than 2 hours) were all related to CVS (Li et al., 2022). As far as we know, no established guidelines for preventing CVS exist. Likewise, the suggestions were made in light of online learners' habits.

This study compares the effectiveness of using the Eye Care Protect Your Vision and Eye Pro applications in reducing CVS symptoms. The results can provide crucial customized health information for all future online learners. In addition, the results can be helpful in online learning management policies for schools and universities in preventing their students from CVS.

MATERIAL AND METHODS

This research was a prospective experiment. It began with the determination of subjects as research respondents with the condition that they already have Computer Vision Syndrome (CVS) symptoms. They were then divided into two groups. Group 1 was given the Eye Care Protect Your Vision application intervention, while Group 2 was given the Eye Pro software intervention. After one month of intervention, an assessment of CVS symptoms was carried out. The research involved Islamic boarding school students who used laptops/PCs in learning activities, as many as 16 students.

The Eye Care Protect Your Vision application was used to inform gadget users to rest and relax eye muscle tension with the 20-20-20 rule and stretching for the spine. Using the Eye Care Protect Your Vision Application is relatively easy because this application includes an extension from Chrome (Anggrainy, 2018). The Eye Pro Software application is helpful in reminding computer users to take regular short eye breaks, which could adjusted at their discretion and under the guidance of a reputable physician.

The assessment instrument for measuring the success of using software is a standard questionnaire from the CVS-Q (Computer Vision Syndrome Questionnaire) (Seguí et al., 2015), with a sensitivity and specificity level of more than 70%. In addition, there is a questionnaire containing the characteristics of the respondents prepared by the researcher.

The study results were analyzed by an independent sample T-test. The use of this test is based on the data scale used for the CVS in the form of a ratio and aims to test differences between samples that are not correlated (independent). The first sample was tested after the Eye Care Protect Your Vision application intervention, while the second was tested after the Eye Pro software intervention.

RESULTS AND DISCUSSION

Respondent Characteristics and Usage Behaviour

Respondents are Islamic boarding school students who attend formal education. The existence of a pandemic has had an impact on them regarding the implementation of learning. The special condition of the transmission of the Covid19 virus requires students to study online. This will undoubtedly increase the behaviour of using a laptop much longer than when learning is done offline.

Table 1 shows the majority of respondents are female (81.2%). According to previous literature, the gender factor also determines the likelihood of CVS occurring. Research (Altalhi et al., 2020) states that female health students experience more CVS symptoms (p = 0.002). The same condition is also experienced by computer users at the Songkla University Faculty of Medicine (Sornboot et al., 2009), which states that most CVS sufferers are female students. This can happen because the duration of using laptops/gadgets is longer for women. They stated if they were not studying, the laptop was used to watch entertainment such as film series and others. As a result, the duration of using the laptop will increase.

Based on the level of the duration of use of laptops/gadgets, it is divided into three types, namely mild (0 to 2 hours), moderate (2.1 to 4 hours), and heavy (more than 4 hours). Table 1 showed that almost 90% (14 respondents) of students/ respondents are classified as heavy regarding laptop/gadget use. Computer Vision Syndrome (CVS) status was measured using the CVS-Q standardized questionnaire (Computer Vision Syndrome- Questionnaire) which was validated by (Seguí et al., 2015) with the Non-CVS category obtained when the frequency of symptoms multiplied by the intensity, a score of 0 to 5. While including suffering from CVS if the score obtained is more than equal to 6. Based on table 1 it seen that almost all students suffer from CVS (93.7%).

Table 1. Gender Distribution, Duration of Laptop/Gadget Use, Application Intervention and Computer Vision Syndrome Status Before and After Intervention

Variable	Category	Total	Percentage (%)
Sex	Male	3	18.8
	Female	13	81.2
Laptop Usage Duration	Light (< 2 hours)	0	0.0
	Medium (2-4 hours)	2	12.5
	Heavy (> 4 hours)	14	87.5
Application Intervention	Eye Care	8	50.0
	Eye Pro	8	50.0
Pre-intervention Status	CVS negative (Score < 6)	1	6.3
	CVS positive (Score > 6)	15	93.7

CVS status before and after intervention

Table 2. CVS Status Before and After Eye Care Application Intervention

CVS Status Pre-Test	Frequency (n)	Percentage (%)	CVS Status Post-Test	Frequency (n)	Percentage (%)
Non-CVS	0	0	Non-CVS	3	37.5
CVS	8	100	CVS	5	62.5
Total	8	100	Total	8	100

Table 2 shows a decrease in the number of CVS statuses before and after being given the Eye Care Protect Your Vision intervention. Initially, 100% of students had CVS, and only 62.5% had CVS after the intervention. This shows that there is a decrease in symptoms after giving the Eye Care intervention application for one month, so it is advisable to continue using the rest reminder application regularly to reduce CVS status in students.

From the results of the Mc Nemar statistical test, it was found that there was no difference in CVS status before and after the intervention was given ($p = 0.25$). This could be due to other factors such as the duration of laptop use (Alabdulkader, 2021; Zayed et al., 2021), the level of compliance of students in implementing applications, the lack of time for interventions, and other factors. However, the average CVS symptom score showed a decrease in CVS symptoms of 4.13. This is also evidenced by the decrease in the number of CVS sufferers in Table 2 of 37.5%.

Table 3. CVS Status Before and After Eye Pro Application Intervention

CVS Status Pre-Test	Frequency (n)	Percentage (%)	CVS Status Post-Test	Frequency (n)	Percentage (%)
Non-CVS	1	12,5	Non-CVS	2	25,0
CVS	7	87,5	CVS	6	75,0
Total	8	100	Total	8	100

Table 3 shows a decrease in the number of CVS statuses between before and after the Eye Pro intervention. As many as 87.5% of students suffered from CVS before the intervention, which decreased to 75%, suffered from CVS after being given the intervention. This shows an improvement in the decrease in symptoms after being given the Eye Pro intervention application. This application is an independent programso that its operation does not depend on other applications.

The results of the Mc Nemar statistical testshowed no difference in CVS status before and after being given the Eye Pro intervention ($p = 1.00$). This could be due to other factors such as the duration of laptop use, the level of compliance of students in applying the application, the lack of time for the intervention, and other factors. However, the results of the average CVS symptom score showed that there was a decrease in CVS symptoms of 1.38.

Table 4. Level of Symptom Reduction before and after Intervention with Eye Care and Eye Pro Applications

Eye Care Application	Frequency (n)	Percentage (%)	Eye Pro Application	Frequency (n)	Percentage (%)

No reduction in symptoms	2	25	No reduction in symptoms	3	37.5
Reduction in symptoms	6	75	Reduction in symptoms	5	62.5
Total	8	100	Total	8	100

Filling in the questionnaire (Seguí et al., 2015) can describe the condition of the respondent's CVS, both in the form of an increase or decrease if the measurement is carried out twice with the same respondent. Regarding CVS status testing using the Mann-Whitney statistical test, there was no difference in symptom reduction before and after the Eye Care and Eye Pro interventions were given (p = 0.602). This can be due to the decrease in symptom scores between the two applications, the range is not too far apart, and in terms of the number of application users who experience CVS between the two applications, the number does not differ significantly from the number of CVS sufferers in Eye Care users (75%) and Eye Pro (62,5%).

However, from the total CVS symptom score, there was a decrease in CVS symptoms before and after the application intervention. Based on Table 4, between the two applications, Eye Care can reduce symptoms by 75% while Eye Pro is 62.5%. This is supported by the symptom reduction score for Eye Care Application users (4.13), which is higher than Eye Pro (1.38). Therefore, the percentage reduction in the number of CVS sufferers was more significant for students who were intervened with the Eye Care application. This proves that students use browsers more during face-to-face meetings with laptop or gadget screens. Eye Care itself is an easy and lightweight application and integrated with a web browser in its operation. Therefore, it can have a better impact than the Eye Pro application.

Using a laptop with CVS status after intervention

Table 5. The Relationship between Laptop Use Duration and CVS Status after Intervention

Laptop/Gadget Usage Duration Level	Computer Vision Syndrome (CVS) Status				Total		Contingency Coefficient Relationship Test Results	Information
	Non-CVS		CVS					
	n	%	n	%	n	%	Sig 0,025 < 0,05	There is a relationship between the level of duration of laptop use and CVS status.
Light (0-2 hours)	0	0	0	0,0	0	0,0		
Medium (>2-4 hours)	2	100	0	0,0	2	100,0		
Heavy (> 4 hours)	3	21,4	11	78,6	14	100,0		
Total	5	31,3	11	68,7	16	100,0		

Table 5 shows a relationship between the duration of laptop use and the incidence of CVS. The higher the duration level, the CVS event rate also increases. Therefore, apart from the effectiveness and compliance of students in applying the Eye Care/Eye Pro application, the duration of laptop use is also one of the reasons for the high frequency of CVS sufferers. This is because almost all CVS sufferers are classified as users with a heavy duration, of more than 4 hours.

CONCLUSION AND SUGGESTION

During the COVID-19 pandemic, social distancing is mandatory; thus, online learning cannot be avoided. As screen time increases, the prevalence of CVS increases among Islamic boarding school students. Using the Eye Pro and Eye Care applications could significantly reduce the duration of laptop use. The Eye Care application could reduce CVS symptoms better than Eye Pro. For online learning, students are advised to use optimal screen brightness, adjust the screen/environment brightness to reduce reflections/glare, and use the eye pro or eye care application as a reminder of screen time duration. If the symptoms do not go away, it is advisable to see a doctor. In addition, learning providers should arrange adequate rest periods between learning sessions and inform students of these recommendations to prevent CVS during learning. Finally, supporting policies should create to help reduce the burden on virtual classes.

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CONFLICT OF INTEREST

There are no conflicts of interest in this research.

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