Optimizing Prevention Strategies for Computer Vision Syndrome in Malaysia's Digital Learning Environment

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ABSTRACT

This study investigates prevention strategies for Computer Vision Syndrome (CVS) among university students in Malaysia during the COVID-19 pandemic, a period of heightened digital device usage. A survey was conducted with 387 students from UiTM Kedah, UiTM Johor, and Universiti Selangor, selected via convenience sampling. Data was gathered using online questionnaires to assess CVS symptoms and the preventive measures employed by students. The findings revealed that 57.9% of students reported CVS symptoms after 5-6 hours of computer use, while 30% experienced symptoms in less than 5 hours. A significant 85% indicated that CVS negatively impacted their lifestyle and eye health. Adjusting screen brightness emerged as the most effective preventive measure (mean score 3.94), while using eye drops was the least effective (mean score 2.12). Taking breaks (mean score 3.46) and maintaining proper posture (mean score 3.35) were moderately effective and commonly practiced. This study contributes to the understanding of CVS prevention by highlighting the relative effectiveness of various strategies and underscoring the importance of institutional support in fostering a healthier digital learning environment. The findings emphasize the need for comprehensive interventions, including ergonomic adjustments and educational programs on proper technology use, to mitigate CVS symptoms. Implementing proactive interventions, such as enhancing ergonomic support and providing education on optimal technology usage, may significantly alleviate the symptoms of CVS. This study advances body of literature by demonstrating the relative efficacy of various preventive strategies and emphasizing the pivotal role of institutional support in safeguarding student well-being within an increasingly digitalized educational landscape.

Keywords: Computer vision syndrome; preventive measures; online learning; digital learning; COVID-19

INTRODUCTION

The rapid advancement of digital technology in the 21st century has profoundly reshaped educational practices, with Malaysian universities adopting computer-based learning as a central component of their academic programs. While this shift offers numerous advantages, extended use of digital devices has also introduced significant health concerns, particularly the prevalence of Computer Vision Syndrome (CVS). CVS, a condition resulting from prolonged screen exposure without adequate breaks or proper ergonomic adjustments, manifests through symptoms such as eye strain, headaches, blurred vision, and dry eyes. Research indicates that up to 90% of individuals who spend over three hours daily using computers are affected by CVS (Reddy et al., 2013). The high incidence of CVS among Malaysian university students underscores the critical need for effective prevention strategies to safeguard eye health and overall well-being. A comprehensive approach, incorporating regular screen breaks, ergonomic adjustments, and optimal lighting, has been shown to reduce the risk of CVS.

The COVID-19 pandemic has further intensified the issue, as the shift to fully online learning—implemented by the Ministry of Higher Education in Malaysia—has led to a dramatic increase in screen time for students. While online education offers benefits such as flexibility and accessibility, it has also heightened concerns over the rising prevalence of CVS symptoms, including neck and back pain, eye fatigue, and headaches (Jamaludin et al., 2023). This study aims to identify the preventive measures employed by students to alleviate or manage the symptoms of CVS, offering insights into mitigating its impact in an increasingly digital learning environment.

LITERATURE REVIEW

Theoretical Perspectives and Policy Context

Applying the Health Belief Model, the researcher considers students' perceived susceptibility (awareness of CVS risk) and perceived barriers (convenience, attitudes toward breaks and ergonomics) as determinants of behavior. The Theory of Planned Behavior further suggests that students' attitudes, subjective norms, and perceived behavioral control shape the adoption of preventive habits. Existing research often lacks integration with these theoretical perspectives and rarely frames findings in actionable policy terms. There is also limited demographic segmentation in prior studies, making it difficult to identify high-risk subgroups or targeted interventions. Past studies often report descriptive prevalence and general recommendations but less frequently examine which student-reported strategies are most adopted and perceived as effective in Malaysian Higher Education Institutions. The researchers address this by ranking preventive practices and quantifying their deviation from a neutral benchmark, providing policy-oriented guidance.

Prevalence and Impact of Computer Vision Syndrome (CVS)

The advent of digital learning has revolutionized the way we receive education. It has made it easier for students to access educational resources from anywhere in the world, breaking down geographical barriers and expanding academic opportunities. With this new mode of learning comes a new set of challenges, especially when it comes to prolonged screen time. Computer Vision Syndrome (CVS), also known as digital eye strain, is a condition that results from prolonged use of digital devices such as computers, smartphones or tablets (Basar et al., 2021). To help prevent these issues from arising or worsening over time while studying online, taking proactive measures becomes crucial (Basar et al., 2021). The prevalence of Computer Vision Syndrome (CVS) in Malaysian university students is a major concern that demands immediate attention. According to Peiris et al. (2020), the COVID-19 pandemic has only exacerbated this issue, with an alarming 90.98% of undergraduate students at Melaka Manipal Medical College reporting symptoms of CVS. Moreover, those who spent more than four additional hours per day on digital devices were found to be significantly more likely to experience these symptoms compared to those who spent less than two additional hours. It is clear that computer and display screen use for prolonged periods can cause vision-related discomfort and negatively impact productivity among university students in Malaysia. The prevalence of computer vision syndrome (CVS) is a growing concern among Malaysian university students, as the extended use of computers has become an essential part of their daily lives. Implementation of preventative measures such as taking regular breaks from computer use, proper lighting, and ergonomic adjustments have been identified as effective methods for reducing the incidence of CVS (Hadi et al., 2020). As Hadi et al. (2020) describe it, "CVS is the general term used to describe a variety of vision related symptoms that may be aggravated by regular use of a computer or any display screen device." It follows that implementing strategies designed specifically for reducing exposure time would help alleviate some eye strain caused by excessive usage. Moreover, it's not just about preventing eye strain but also improving visual comfort during extended use through proper lighting conditions.

Behavioral and Preventive Strategies

More than 70% of children engaged in online learning were reported to have CVS, with associated risk Over 70% of children who engaged in online learning were reported to have computer vision syndrome (CVS) according to a recent study by Seresirikachorn et al. (2022). The associated factors, including hours of digital device usage, hours of online learning, ergonomics and refractive errors should be adjusted to decrease the risk

of acquiring this condition. This finding emphasizes the necessity for preventive measures against CVS among students who engage in virtual classrooms. Eye strain and dry eyes are other symptoms that might result from prolonged exposure to digital devices during online classes. These figures are alarming because they indicate an increased number of individuals suffering from visual discomfort due to extended screen time related activities. However, despite these challenges posed by technology use, there exist several simple yet effective preventive measures that can help minimize the effects on one's vision when engaging in online learning activities.

METHODOLOGY

The research study's sampling frame was sourced from the academic affairs unit of each university. The intended population consists of currently active students who have been affected by COVID-19. To ensure generalizability, students from UiTM Kedah, UiTM Johor, and Universiti Selangor were selected by the researchers with a population size of 22,870 students. Convenience sampling was used to obtain the sample for this study. Determination of sample size adhered to Krejcie and Morgan's sample size table which provides scientific criteria guidelines for making sample size decisions. For a population of 20,000 people the recommended sample size is 377; thus, an analysis was conducted on a total of 387 university students who were still active but impacted by COVID-19. The individual student served as the unit of analysis for this study. Data collection took place online where participants were asked to respond entirely to all questions with answers recorded automatically via electronic means upon submission. Following completion, exported data files underwent thorough analytical processing as detailed in the results section.

RESULTS

CVS Experience

The findings (Table 1) show Computer Vision Syndrome (CVS) experience are staggering, with a whopping 57.9% of participants reporting symptoms after a mere 5-6 hours of computer use or less. Shockingly, 30% of respondents experienced symptoms after less than 5 hours of use. These results highlight the urgent need for further investigation into the potential health risks associated with prolonged computer use. In line with Tika and Fitria (2023), there was a significant association between computer usage exceeding four hours per day and an increased risk of CVS, with a relative risk of 4.75 compared to students who used computers for less than four hours per day. The findings of this study indicate a pervasive prevalence of computer vision syndrome among Malaysian university students who are actively participating in online learning amidst the ongoing pandemic. A staggering 85% of the participants, comprising 329 out of 387 respondents, reported that their lifestyle and eye health are adversely impacted by computer usage. In contrast, a mere 15% of the respondents, accounting for 58 out of 387 individuals, did not acknowledge any such effects. The findings indicate that a significant proportion of participants possess knowledge regarding the potential ramifications of computer usage in their well-being and eye health.

Table 1: CVS Experience

Items	**n**	**Percentage (%)**
After how many hours of computer use you experience CVS symptoms?		
< 5 hours	116	30.0
5-6 hours	108	27.9
7-8 hours	68	17.6
8-9 hours	38	9.8
9-10 hours	30	7.8
> 10 hours	27	7.0

Do you think CVS affects your lifestyle and eye health?		
Yes	329	85.0
No	58	15.0

Preventive Measures Scale

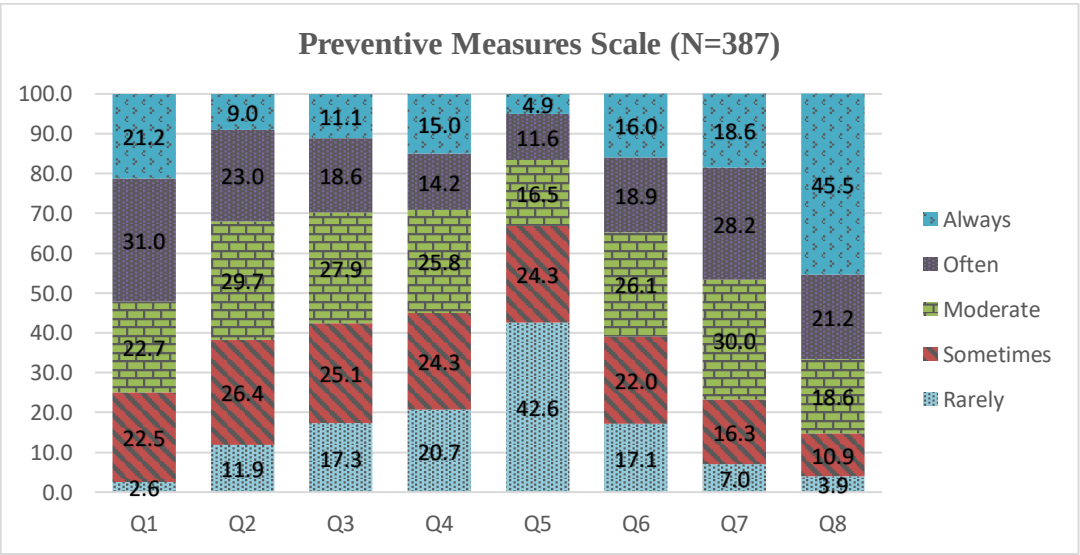
Utilizing preventive measures scale derived from Reddy et al. (2013), an investigation into the efficacy of preventive measures against Computer Vision Syndrome (CVS) among university students was undertaken. The findings of this inquiry, based on eight questions rated on a 5-point category scale, are detailed in Table 2. The findings reveal varying levels of adoption and perceived effectiveness of preventive measures against CVS among university students. Adjusting screen brightness (Q8) emerged as the most widely practiced and highly effective measure, with a mean score of 3.94 and relatively low standard deviation of 1.19, suggesting strong consensus among respondents. Conversely, the use of eye drops (Q5) received the lowest mean score of 2.12, indicating lower adoption and perceived effectiveness.

Table 2: Preventive Measures Scale

Questions	**Item**	**Mean**	**SD**
Q1	Taking breaks in between computer use	3.46	1.13
Q2	Looking at far objects in between computer use	2.91	1.15
Q3	Massage of eyes	2.81	1.24
Q4	Use of radiation filter on the screen	2.79	1.33
Q5	Use of eye drops	2.12	1.22
Q6	Adjust computer monitors to a viewing angle of around 15 degree lower than the horizontal level	2.95	1.32
Q7	Good sitting position	3.35	1.16
Q8	Adjusting computer brightness	3.94	1.19
N= 387			

Figure 1 below presents the responses on the preventive measure scale (N=387), derived from the eight questions outlined in Table 2. Given the paper's emphasis on preventive approaches, the researcher extensively elaborated on each aspect in detail.

Figure 1: Preventive Measures Scale Responses



Taking Breaks In Between Computer Use

Breaks are a crucial aspect between classes for university students, and our study reveals that a staggering 52.2% of respondents prioritize taking breaks often or always. However, a mere 2.6% of participants reported rarely taking breaks, indicating a potential lack of awareness regarding the importance of taking time to recharge. The findings of this study reveal a prevalent trend among the participants to incorporate intermittent breaks as a preventive measure or remedy for the symptoms of computer vision syndrome. Other researchers also agree that there are potential benefits in reducing eye strain and maintaining visual focus during computer use, the practice of taking short breaks has been suggested as a strategy as mentioned in Tika and Fitria (2023). Evaluating the extent to which participants engage in the practice of gazing into the distance to alleviate ocular strain caused by prolonged computer usage.

Looking At Far Objects In Between Computer Use and Eye Massage

32.0% of participants in the study (Q2) were found to be frequently averting their gaze from the screen, with a mere 11.9% indicating rare instances of doing so. The findings suggest that a prevalent strategy among participants for mitigating symptoms of computer vision syndrome involves looking at far objects in between computer use. On other hand, a significant proportion of participants (55%) were found to engage in the practice of eye massage with moderate to high frequency (Q3). However, a minority of respondents reported either rare or frequent instances of eye massage. The findings suggest that eye massage is another technique employed by participants to alleviate symptoms of CVS.

Screen Filter and Eye Drop Utilization

55.0% of participants were found to be utilizing screen filters at a moderate to frequent rate, with a mere 20.7% reporting rare usage of such filters (Q4). Note only that, in Q5 an evaluation of the respondents' employment of eye drops to alleviate ocular dryness or irritation. 42.6% of the participants revealed that they scarcely resort to the use of eye drops. However, a meager proportion of the respondents admitted to using eye drops moderately, often, or always (33%). The present findings suggest that the utilization of eye drops is not a prevalent modality among the participants for mitigating the symptoms of computer vision syndrome.

Computer Adjustment

The next items in Q6 aim to evaluate the extent to which participants modify the placement of their computer to optimize their visual encounter. More specifically, adjusting computer monitors to a viewing angle of around 15 degree lower than the horizontal level. A staggering 61.0% of participants were found to have moderate to frequently adjusted their computer's position, indicating a significant need for ergonomic optimization. Conversely, a mere 17.1% of respondents reported rarely adjusting their computer, highlighting a concerning lack of attention to proper posture and positioning. The present findings suggest that the act of modifying the computer position is a prevalent and effective strategy employed by the participants to mitigate or alleviate the symptoms of computer vision syndrome.

Assessment of Proper Sitting Posture

76.8% of participants (Q7) were found to be adhering to good posture practices between moderate and always, with a mere fraction of respondents admitting to only sometimes or rarely practicing good posture (23.2%). The present findings suggest that the implementation of proper posture is a ubiquitous strategy among the participants in mitigating or alleviating the symptoms of computer vision syndrome.

Screen Brightness Adjustment

66.7% of participants were found to consistently modify their screen's brightness, indicating a significant reliance on this feature (Q8). Conversely, a minority of respondents (14.8%) reported sometimes or rarely do adjustments to their screen's brightness. The present findings suggest that the act of modifying screen brightness is a prevalent and widely adopted measure among the participants to mitigate the symptoms of computer vision syndrome.

DISCUSSIONS

The findings revealed a high prevalence of Computer Vision Syndrome (CVS) among Malaysian university students during the COVID-19 pandemic, with many students reporting significant eye discomfort linked to prolonged digital device use. The most adopted preventive measure was adjusting computer screen brightness, reflecting a widespread awareness of its importance in reducing eye strain. However, despite this awareness, the majority of respondents acknowledged that CVS negatively impacted on their lifestyle and eye health. Alarmingly, few students consistently practiced the full range of recommended preventive strategies to mitigate CVS symptoms. For instance, only a small percentage utilized screen filters, and an even smaller fraction regularly used eye drops to alleviate eye discomfort.

Proactive measures to prevent CVS are crucial for online learners who experience extended screen time. CVS encompasses a range of symptoms, including headaches, dry eyes, blurred vision, and neck or shoulder pain, all of which are exacerbated by prolonged digital device use. To minimize these effects, it is imperative that students adopt comprehensive prevention strategies. One key measure is maintaining appropriate lighting in the study environment, as improper lighting can intensify eye strain and hinder focus. Students should adjust monitor brightness to match their surroundings to alleviate this issue. Additionally, incorporating regular breaks into study sessions is vital, as continuous exposure to screens leads to eye fatigue and discomfort. Frequent breaks provide necessary relief for the eyes, reducing the risk of long-term strain (Jamaludin et al., 2023). Ergonomic adjustments also play a pivotal role in maintaining proper posture during extended periods of screen use. Poorly configured workstations can result in neck and back pain, further exacerbating discomfort during study sessions. Together, these preventive measures are essential for mitigating the negative impact of CVS and promoting healthier digital learning habits.

CONCLUSION

In conclusion, preventive strategies are essential for mitigating the negative effects of Computer Vision Syndrome (CVS) that arise from increased screen time in online learning environments. Regular breaks not only provide necessary rest for the eyes but also promote physical movement, reducing the health risks associated with sedentary behavior. Additionally, adopting proper ergonomic practices—such as maintaining correct posture while using digital devices—can alleviate common CVS symptoms, including neck pain, headaches, and backaches (Jamaludin et al., 2023).

Effective management of CVS requires coordinated efforts at both the individual and institutional levels. Educating students on the importance of proper workstation setup and fostering healthy habits, such as taking frequent breaks, can significantly alleviate the symptoms of CVS and improve academic performance. Institutional intervention is equally important, as universities can implement comprehensive strategies to minimize the risks associated with prolonged digital device use. This may involve introducing policies to reduce excessive screen exposure during academic activities and leisure, creating a supportive framework for healthier digital learning habits. Implementing these measures is critical for optimizing visual health and enhancing productivity by minimizing discomfort and improving overall well-being.

Universities should provide resources and guidelines for optimal workstation setup, potentially subsidize ergonomic equipment, and educate students and staff on the importance of balancing digital convenience with visual and musculoskeletal health. Future research should consider objective clinical assessments and investigate the long-term efficacy of preventive interventions to improve generalizability.

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