(REVIEW ARTICLE)

Factors that cause the occurrence of Computer Vision Syndrome (CVS) complaints in a person: A literature review

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Abstract

Computer Vision Syndrome as a complex eye and vision complaint experienced when using a computer. CVS is a compound eye experiences when using a computer. Nothing can explain the exact cause of CVS because including individual factor, environmental factors and computer factors. The purpose of this study was to identify the factors that influence the occurrence of Computer Vision Syndrome (CVS) complaints in a person. The research method utilized is a literature review, which involves searching for research articles from the electronic database Google Scholar and Research Gate using keywords such as Computer Vision Syndrome, causative factor, eye complaints, individual factor, and length of computer use. From the results of the study, it can be concluded that CVS complaints are caused by factors such as length of time working at the computer (2 articles), length of rest after using the computer (3 articles), length of computer use (2 articles), duration of computer use (3 articles), and viewing angle of the computer screen (1 article).

Keywords: Computer Vision Syndrome; Causative Factor; Eye Complaints; Individual Factor; Length of Computer Use

1. Introduction

Information technology is a technology that is used to process data, including processing, obtaining, compiling, storing, manipulating data in various ways to produce quality information. This technology uses a set of computers to process data, a network system to connect one computer to another as needed. Advances in information technology have developed more than 20 years, one of them with the invention of the computer.

A computer is an electronic device that is capable of carrying out the task of receiving input and providing output in the form of computational results which will be converted into visual data that can be viewed using a monitor of Video Display Terminal. Computers have become an inseparable part of life for modern citizens, hours of computer use are no longer limited. The use of computers can cause a number of health problems, one of which is an eye sight problem called Computer Vision Syndrome (CVS) [1].

The occupational Safety and Health Administration defines CVS as a complex eye and vision complaint experienced when using a computer. According to the American Optometric Association, CVS is a compound eye experiences when using a computer [10]. Nothing can explain the exact cause of CVS because including individual factor, environmental factors and computer factors.

Computer Vision Syndrome is influenced by individual factors, environmental factors, and computer factors. Individual factors that play a role in the occurrence of CVS include age, gender, use of contact lenses, use of glasses, length of time working at a computer, length of time working at a computer, and length of rest after using a computer. Factors originating from the computer include viewing distance, the position of the top of the monitor at eye level horizontally, the polarity of the monitor, and the type of computer.

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Current technological developments allow humans to use technology more often in their lives so it can be said that computer use will increase over time. This can increase the incidence of CVS, especially if the existing risk factors are not detected and prevented early. Based on the background described above, the purpose of this study was to identify the factors that influence the occurrence of Computer Vision Syndrome (CVS) complaints in a person.

2. Material and methods

The research is classified as a qualitative study utilizing the literature review method and employing a descriptive analysis approach. The data used in this study were sourced from scientific article from national journals, obtained from the Google Scholar database and research Gate using keywords such as "Computer Vision Syndrome," "causative factor," "eye complaints," "individual factor," and "length of computer use". The inclusion criteria for this research were scientific articles published within the last 5 years (2018-2023). The collected data will be analyzed, and conclusions will be drawn based on the analysis.

3. Results and discussion

Based on the collected and analyzed articles, the findings are presented as follows:

Table 1 List of Articles

No.	Author	Method	Result
1	Nopriadi et al.	Cross sectional	The most dominant factor affectiong CVS is length of work, other factors are acts as a confounder that affects CVS, namely monitor position, work station lighting, working period with a computer.
2	Pratiwi AD et al.	Cross sectional	Factors that influence the incidence of CVS in computer user employees at PT. Media Kita Sejahtera Kendari is the length of computer usage and length of rest. While gender, use of glasses, and eye distance did not affect.
3	Darmaliputra and Dharmadi	Cross sectional	Individual factors that result in the occurrence of CVS include gender, visibility, point of view, duration of the exposure to the computer, resting time after using computer, and the use of glasses.
4	Cinthya et al.	Cross sectional	Risk factors for the incidence of CVS in undergraduate students of Computer Science Major of Mathematics and Nature Sciences Faculty of Lampung University is gender, total duration of computer use, daily duration of computer exposures, spectacles wearing, taking a break, eyes distance, and angle gaze.
5	Bilal M et al.	Cross sectional	Factors that lead to CVS to employees of PT. Depoteknik Duta Perkakas is duration of computer use, duration of smartphone use, glasses users and viewing distance to the monitor. Meanwhile, age, gender, years of service, contact lens users, and room lighting do not cause CVS.
6	Ibrahim H et al.	Cross sectional	Factors that influence CVS complaints in computer operator workers at PT. Semen Tonasa is the length of time the worker's eyes rest and the period of work.
7	Amelia Septiyanti R et al.	Cross sectional	Factors associated with the incidence of CVS in computer user workers at Universitas IBN Khaldun Bogor 2020 is a long time working at the computer, long time working at the computer, long rest, visibility distance, and lighting level.
8	Jundiah RS et al.	Cross sectional	Factors that influence the incidence of CVS in undergraduate nursing students are the length of time using the computer and the length of rest after using it computers.

Based on the 8 articles presented in Table 1, the discussion will now focus on identifying the factors that contribute to the case of Computer Vision Syndrome (CVS) complaints in a person.

The length of time working in front of the computer was identified as the most influential factor on CVS. According to Septiyanti et al. it was found that as many as 50 people (73,5%) worked at a computer for more than 4 hours continuously, while less than 4 hours as many as 18 people (26,5%). Workers who work at a computer for more than 4 hours continuously will have 9 times higher odds (risk) of CVS events than workers who work at a computer for less that 4 hours (95% Cl = 1.727-48.153) [8]. The results of this study support the research conducted by Nopriadi et al. entitled "factor related to the occurrence of Computer Vision Syndrome in bank employees". It shows that the length of time working at the computer has a P-value = 0.002 (P-value 0.000<0.05), so there is a relationship between the length of time working at the computer and the incidence of CVS [2].

Another factor that causes the occurrence of CVS is the length of rest after using the computer [3][9]. Resting for 10-5 minutes after using the computer is a protective measure against the appearance of CVS symptoms, while not giving rest is a risk factor for developing CVS. In a study conducted by Ibrahim H et al. showed that in shift 2 in the central control room there were 7 respondents who were in the category of abnormal eye rest, all of them (100%) suffered from CVS complaints. Meanwhile, in the normal rest category, out of 26 people, 12 respondents (46,2%) had CVS and 14 people (53,8%) did not [7].

Length of computer use is one of the factors that influence the incidence of CVS [3]. In the study of Cinthya et al. stated that there were more people who had used a computer for ≥6 years, namely 73,2% and of that number 80,49% experienced CVS [5]. This number is more when compared to respondents who have used computer for 9 years. In addition to the length of computer use, the duration of computer use use in a day also affects the incidence of CVS [6]. This was obtained from research by Cinthya et al. as many as 75,51% of computer users >2 hours experienced CVS compared to computer users ≤2 hours who had a CVS prevalence of only 28,57% [5]. Computer users >2 hours have a 7,7 times greater chance of experiencing CVS complaints. This result is supported by other research which states that computer users >2 hours continuously are significantly associated with the occurrence of CVS complaints on these computer users [4].

Another risk factor that also has a significant relationship with CVS is the viewing angle of the computer screen. Research Cinthya et al. get results as much as 85,7% of the number of respondents looking at a computer screen with a viewing angle of 20° and as much 75% of that number experience CVS and statistical test results show a significant relationship with a 5-fold increased risk [5]. According to the AOA (American Optometric Association), the viewing angle of the eye to the computer screen is ideally 15°-20° below eye level [10]. Optimum quality of vision will decrease as the viewing angle increases. A viewing angle that is greater than an ideals vision can also reduce the frequency of blinking thereby reducing the production of tears which function to lubricate and clean the surface layer of the eye and can also increase tear evaporation causing dry eyes.

4. Conclusion

According to research findings, there are a number of variables that contribute to the occurrence of Computer Vision Syndrome (CVS) complaints in a person, including length of work where this factor has the most dominant effect on CVS. Other factor that influence the occurrence of CVS complaints are the length of rest after using the computer, length of computer use, 2the duration of computer use, and the viewing angle of the computer screen.

Compliance with ethical standards

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