



(RESEARCH ARTICLE)



Overview of the incidence and risk factors of computer vision syndrome among office workers at PT XYZ, Pasuruan, East Java

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Abstract

Computers have millions of benefits and functions for their users, but excessive use of computers can also have negative impacts on health, one of which is Computer Vision Syndrome. Computer Vision Syndrome is an eye health problem commonly referred to as digital eye strain, which describes a group of problems experienced related to eye health and vision due to prolonged use of computers, tablets, digital magazines and cell phones. The research is quantitative descriptive research with a cross sectional approach. The research subjects used were all office workers at PT. XYZ, Pasuruan has 21 workers. From 21 samples, it is known that CVS occurred in section workers office PT. XYZ Pasuruan was 52.38% with the complaints most often felt by workers were dry eyes (66.67%), headaches or dizziness (52.38%), blurred vision (52.38%), and difficulty focusing when looking. short distance (47.62%). The incidence of CVS was found most frequently in female workers (80%), the duration of computer use was as long as ≥ 4 hours a day (58.82%), eye position that is not at the same level as the computer (75%), and respondents who have a viewing distance of < 50 cm from the computer. (100%).

Keywords: Computer; Computer Vision Syndrome; Eyes; Workers; Occupational Health

1. Introduction

According to a survey conducted by the Central Statistics Agency in 2022, it is known that 18.04% of Indonesian people own and are able to operate a computer [1]. Nowadays, computer use can be said to be one of the mandatory facilities that several people must have. This is because as time progresses, technology also develops which must be accepted by society.

Computers have millions of benefits and functions for their users, but excessive use of computers can also have negative impacts on health, one of which is *Computer Vision Syndrome* (CVS). CVS is a condition that arises from using computers for long periods of time without adequate rest, which often causes various symptoms such as eye strain, irritation, burning sensation, redness, dry eyes, headaches, and blurred vision [2]. Computer Vision Syndrome is defined by the American Optometric Association (AOA) as an eye health problem commonly referred to as digital eye strain, which describes a group of problems experienced related to eye health and vision due to prolonged use of computers, tablets, digital magazines and cell phones [3]. CVS symptoms are categorized into asthenopia, ocular surface-related, visual, and extraocular [4]. All of these symptoms are a combination of vision problems, poor working conditions or environments, as well as wrong or inappropriate work habits [5]. CVS can affect worker productivity. This is because the eyes are one of the important organs in the human body. The main cause of CVS is constant exposure to computer screens which causes the eyes to work harder than usual.

Based on the results of observations made at PT. XYZ, Pasuruan, it is known that the workers who are likely to have CVS complaints are workers in the department office. Department Office Most of them do their work by constantly staring

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at the monitor screen and sitting in front of the computer. The author is interested in exploring information regarding the description of CVS complaints among workers department offices. Thus, it is hoped that workers can learn about the dangers of computer display for a long period of time.

2. Material and methods

This research uses a quantitative descriptive method with an approach cross-sectional. This research is observational research because no intervention or treatment was carried out on the research object. The research location is PT XYZ Pasuruan. The research was conducted in February 2024.

The research population used was all office workers at PT. XYZ Pasuruan, totaling 21 people. Data collection was carried out using primary and secondary data. Secondary data was obtained through filling out the CVS-Q questionnaire, while secondary data was obtained through various external sources such as journal literature and articles related to *Computer Vision Syndrome*. The independent variables in this study consisted of gender, duration of computer use in a day, eye position with the monitor, and distance between the eyes and the monitor. Meanwhile, the dependent variable is the incidence of CVS.

3. Results and discussion

The research results showed that 11 workers (52.38%) experienced this *Computer Vision Syndrome* while 10 workers (47.62%) did not experience *Computer Vision Syndrome*. The frequency distribution of CVS symptoms experienced by research respondents can be seen in the following table.

Table 1 Distribution and Frequency of Individual Characteristics of Research Respondents

Variable	Frequency	Percentage
Gender		
Male	16	76.09%
Female	5	23.81%
Duration of Computer Use in a Day		
≥ 4 hours	16	76.09%
< 4 hours	5	23.81%
Eye Position with Monitor		
Aligned	17	80.95%
Not Aligned	4	19.05%
Eye Distance from Monitor		
≥ 50 cm	19	90.48%
< 50 cm	2	9.52%
CVS		
Yes	11	52.38%
No	10	47.62%

Based on table 1, it is known that the most dominant gender of respondents was male, 16 people (76.09%). Respondents worked using computers for ≥ 4 hours (76.09%), eye alignment (80.95%), eye distance from the computer monitor ≥ 50 cm (90.48%), and the incidence of CVS felt by respondents was 52.38%.

Table 2 Frequency Distribution of CVS Symptoms

CVS Symptoms	Frequency						Intensity			
	Never		Sometimes		Often/Always		Moderate		Severe	
	N	%	N	%	N	%	N	%	N	%
Q1	12	57.14%	9	42.86%	0	0%	21	100%	0	0%
Q2	12	57.14%	9	42.86%	0	0%	21	100%	0	0%
Q3	16	76.19%	5	23.81%	0	0%	21	100%	0	0%
Q4	14	66.6%	7	33.3%	0	0%	21	100%	0	0%
Q5	18	85.71%	3	14.29%	0	0%	21	100%	0	0%
Q6	16	76.19%	5	23.81%	0	0%	21	100%	0	0%
Q7	16	76.19%	5	23.81%	0	0%	21	100%	0	0%
Q8	15	71.43%	4	19.05%	2	9.52%	20	95.24%	1	4.76%
Q9	8	38.10%	12	57.14%	1	4.76%	20	95.24%	1	4.76%
Q10	10	47.62%	9	42.86%	2	9.52%	20	95.24%	1	4.76%
Q11	16	76.19%	5	23.81%	0	0%	21	100%	0	0%
Q12	13	61.90%	4	19.05%	4	19.05%	19	90.48%	2	9.52%
Q13	13	61.90%	8	38.10%	0	0%	20	95.24%	1	4.76%
Q14	17	80.95%	4	19.05%	0	0%	21	100%	0	0%
Q15	13	61.90%	7	33.3%	1	4.76%	19	90.48%	2	9.52%
Q16	9	42.86%	11	52.38%	1	4.76%	21	100%	0	0%

Based on table 2, it is known that the CVS questionnaire contains 16 questions which will then be answered according to the frequency and intensity felt. The questions are as follows: Q1= burning in the eyes, Q2= itchy eyes, Q3= Sensation of strange object in the eye, Q4= watery eyes, Q5= excessive eye blinking, Q6= red eyes, Q7= pain in the eyes, Q8=eyelids feel heavy, Q9= dry eyes, Q10= blurred vision, Q11= double vision, Q12= difficulty focusing when looking at close objects, Q13= sensitivity to light, Q14= seeing coloured shadows around objects, Q15= vision feels worse, and Q16= headache or dizziness. Next, an assessment is carried out to determine a person's CVS level. The severity of symptoms is assessed using a score of 0 for never, 1 for sometimes, and 2 for often or always. If respondents assign a value other than 0 to a symptom, its intensity will be assessed, with a score of 1 for moderate and 2 for severe. The final score is determined by multiplying frequency and intensity, with a score of 0 for a multiplication result of 0, a score of 1 for a multiplication result of 1 or 2, and a score of 2 for a multiplication result of 4. If the total score reaches or exceeds 6, the individual is considered to suffer from Computer Vision Syndrome.

Table 3 Overview of Computer Vision Syndrome Symptoms

Symptoms	Yes		No	
	N	%	N	%
Eyes feel burning	9	42.86 %	12	57.14 %
Itchy eyes	9	42.86 %	12	57.14 %
Sensation of strange object in the eye	5	23.80 %	16	76.20 %
Watery eyes	7	33.33 %	14	66.67 %
Excessive blinking	3	14.29 %	18	85.71 %
Red eyes	5	23.81 %	16	76.19 %

Pain in the eyes	5	23.81 %	16	76.19 %
Eyelids feel heavy	7	33.33 %	14	66.67 %
Dry eyes	14	66.67 %	7	33.33 %
Blurred vision	11	52.38 %	10	47.62 %
Double vision	5	23.81 %	16	76.19 %
Difficulty focusing when looking at close distances	10	47.62 %	11	52.38 %
Sensitive to light	7	33.33 %	14	66.67 %
Coloured shadows around objects	4	19.05 %	17	80.95 %
Vision are getting worse	8	38.10 %	13	61.90 %
Headache or dizziness	11	52.38 %	10	47.62 %

Based on this table, it is known that the complaints most often felt by workers are dry eyes (66.67%), headaches or dizziness (52.38%), blurred vision (52.38%), and difficulty focusing when looking at close distances (47.62%).

Table 4 CVS incidence based on risk factors

	CVS					
Risk Factors	Yes		No		Σ	%
	N	%	N	%		
Gender						
Male	7	43.75%	9	56.25%	16	100%
Female	4	80%	1	20%	5	100%
Duration of Computer Use in a Day						
≥ 4 hours	10	58.82%	7	41.18%	17	100%
< 4 hours	1	25%	3	75%	4	100%
Eye Position with Monitor						
Aligned	8	47.06%	9	52.91%	17	100%
Not Aligned	3	75%	1	25%	4	100%
Eye Distance from Monitor						
≥ 50 cm	9	47.37%	10	52.63%	19	100%
< 50 cm	2	100%	0	0%	2	100%

Table 4 shows that female respondents had a greater number of CVS symptoms than male at 80%. Respondents who had a duration of computer use ≥ 4 hours a day felt greater CVS symptoms (58.82%), eye positions that were not aligned to the computer (75%) also felt greater CVS symptoms compared to respondents who had eye positions aligned to the computer, and CVS symptoms are also felt more by workers who have a visibility of < 50 cm (100%).

4. Discussion

Based on the research results, it is known that females have a greater risk of experiencing CVS compared to males, which is 80%, while male respondents have a percentage of 43.75%. CVS in females is caused by the thinning of the tear layer that occurs in females as they age, leading to dry eyes, as well as the influence of estrogen hormones [6]. This hormone estrogen will decrease when a female has experienced menopause, causing hormonal changes in the lacrimal glands [5].

Another reason females are more prone to CVS is because females tend to have higher levels of concentration and precision, causing female workers to focus their gaze on computer screens to minimize errors in their work.

A total of 76.09% of office workers at PT. XYZ Pasuruan work for more than 4 hours. Respondents who experience CVS complaints feel symptoms appearing around 11:00 a.m. until near lunchtime because office workers almost every day conduct meetings online, causing complaints felt in the eyes to appear quickly. The duration of computer used for more than 4 hours a day can increase the risk of CVS in someone. The optimal exposure duration for computer use is no more than 4 hours a day. If it exceeds 4 hours, then the eyes tend to experience refraction more quickly. Therefore, to reduce the occurrence of rapid eye refraction when a worker uses a computer for more than 4 hours a day, it is better to take more frequent eye breaks [7].

Based on the research results, it is known that the not aligned position between the eyes and the monitor has a possibility of causing CVS compared to respondents who have a aligned position between the eyes and the monitor. A total of 75% of respondents who work with a monitor that is not aligned to their eyes admit to experiencing CVS symptoms. This is caused by differences in the viewing angle that can affect a person's tear production. When the viewing angle becomes larger, the blinking frequency will decrease, causing tear production to decrease and leading to dry eyes [8]. Additionally, when the monitor position is higher or lower, it can cause neck strain for workers.

The distance between the eyes and the computer for office workers at PT. XYZ Pasuruan during work can be considered good because out of 21 workers, only 2 have a distance of < 50 cm, while the other 19 workers (90.48%) have a distance within the normal range. This is because the respondents have used adjustable chairs, but for some people, seeing the monitor at a close distance is more comfortable than seeing it at a normal distance. The eyes will be in a physiological position where the eyes will rest from accommodation if the eye distance is 50 - 70 cm from the monitor screen [5]. OSHA states that the recommended distance when viewing a computer is around 45.72 cm - 60.95 cm or an average of 50.80 cm.

5. Conclusion

The incidence of CVS among office workers at PT. XYZ Pasuruan is 52.38%. The occurrence of CVS tends to be found in females, with a computer usage duration of ≥ 4 hours per day, misalignment of eye position with the computer, and respondents who have a viewing distance of < 50 cm from the computer.

Compliance with ethical standards

Acknowledgements

The research was conducted at PT XYZ Pasuruan (Names were anonymized according to the company's request).

Disclosure of Conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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