THE RELATIONSHIP BETWEEN EYE DISTANCE to THE COMPUTER and COMPUTER VISION SYNDROME (CVS) COMPLAINTS

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Abstract

The use of computers is now commonplace among individuals, ranging from students to professionals. Computers offer numerous advantages, leading to a high dependency on them, particularly among office workers, who incorporate computer usage into their daily activities. In general, the occupational setting necessitates prolonged computer usage, thereby leading to inadvertent exposure to the computer screen/monitor and subsequent development of eye-related complaints, including Computer Vision Syndrome (CVS). This study aimed to investigate the correlation between eye distance to the computer and the occurrence of CVS symptoms. This research employs an analytical observational study design with a cross-sectional approach. The study sample consists of employees from the Middle Type Customs and Excise Service Office (KPPBC TMC) in Malang. The sample selection was based on the prolonged duration of computer usage, averaging 6 hours per working day. The study findings indicated a significant correlation between the viewing distance to the computer screen and the occurrence of CVS complaints among the respondents. Among the total of 65 respondents, 66.2% experienced CVS complaints, with the most predominant symptom being tired eyes at 53.8%. A higher proportion of respondents (53.8%) had an eye distance from the computer of less than 50 cm, compared to those with an eye distance of more than 50 cm (46.2%). The majority of respondents in this study were in the age range of 25-29 years, comprising 40% of the sample. Among them, the majority were male, accounting for 57.7% of the respondents.

Keywords: Computer, *Computer Vision Syndrome* (CVS), KPPBC TMC Malang

INTRODUCTION

The use of computer technology is currently essential in daily activities, particularly for workers who require efficiency in their tasks. The locations where computers are commonly used by the Indonesian population are at home (61.92%), office (42.08%), and school (12.12%). Meanwhile, the locations where laptops are commonly used are at home (61.72%), office (56.48%), and school (14.24%) (Kemkominfo, 2017). However, behind the benefits gained from computer usage, there are also negative impacts, such as adverse effects on eye health leading to complaints. Visual symptoms experienced due to computer usage reach a prevalence of 70-95% (Anshel, 2005).

Saputro (2013) stated that eye complaints can be caused by environmental factors such as prolonged computer usage, radiation, light intensity, and workload. Additionally, there are psychological factors related to blink frequency, age, and gender. The symptoms resulting from computer usage are referred to as Computer Vision Syndrome (CVS). The symptoms include blurred vision, dry eyes, eye fatigue, and discomfort in the neck and back (Roestijawati, 2015). There are numerous factors that contribute to the occurrence of CVS. The most influential common factors associated with CVS are computer usage at close distances and prolonged working durations (Putri and Mulyono, 2018).

This fact has piqued the interest of researchers to investigate the relationship between eye viewing distance to the computer and the emergence of CVS complaints among employees of the Middle Type Customs and Excise Service Office (KPPBC TMC) in Malang. Based on interviews conducted with 10 employees at KPPBC TMC, the office has a total of 110 employees who work for 9.5 hours per day, with an average computer usage of more than 6 hours among the employees. Furthermore, the office does not have an occupational physician, and no education or training

has been provided regarding Occupational Health and Safety Management System, as well as proper ergonomic practices in computer usage at the workplace according to the standards.

METHOD

This study is analytical observational research with a *cross-sectional* approach conducted to determine the relationship between eye viewing distance to the computer and the emergence of CVS complaints among employees of the Middle Type Customs and Excise Service Office (KPPBC TMC). The study included a total of 65 respondents out of the 110 employees. This research was conducted in February 2020.

Respondent selection was carried out using purposive sampling. Data was obtained using a questionnaire method conducted on the entire sample, who were previously given an explanation about how to fill out the questionnaire. The questionnaire used closed-ended questions that have been tested for validity and reliability. Below is the list of questions provided to the respondents:

The respondent should write their name, age, gender and phone number before fill the questionnaire.

1. How many hours do you work continuously in front of a computer in a day? (Without engaging in other activities)
   a. > 4 hours b. < 4 hours
   If choice B, Specify the exact time ..... hours
2. Do you wear any of the following glasses when working in front of the computer? (Minus glasses, Plus glasses, Cylinder glasses, Reading glasses)
   a. Yes, Specify ..... b. No
3. When you wear glasses, do you still experience blurry vision when looking at distant/near objects?
   a. Yes b. No
4. Do you use contact lenses when working in front of the computer? a. Yes b. No
5. Are you currently taking any specific medications? (Such as: antihistamines/antiallergy, antihypertensive/high blood pressure medication, antidepressants, contraceptives, and undergoing chemotherapy in the last 3 months.) a. Yes. Specify the name of the medication .....
   If unsure/forgot the name, specify the type of medication .....
   b. No
6. What is the distance between your eyes and the center of the monitor? ... cm (measurement taken) a. < 50 cm b. > 50 cm
7. Do you have any visual complaints while working with the computer?
   Complaints Yes/No
   - Watery eyes
   - Dry eyes
   - Tired eyes
   - Red eyes
   - Strained eyes
   - Irritated eyes
   - Pain in and around the eyes
   - Blurry vision when looking at close objects
   - Headaches
   - Frequent squinting

RESULTS

Based on the observation results conducted in the room, it was found that the workspace lighting has different intensity in each room. Some rooms are separated by room dividers with a height of approximately 2 meters. The type of monitor screen used is the same, which is a 20-inch LCD screen, the intensity of lighting on the monitor screen varies depending on the respondents' habits and the angle of their eyes towards the monitor. Many respondents have a parallel line of sight to the monitor. The air humidity in the room is quite humid, but it poses a risk of dry eyes.

Table 1. Distribution of Respondents Based on Age

Age	Frequency	Percentage
20 – 24 years	25	38,5%
25 – 29 years	26	40%
30 – 34 years	9	13,8%
35 – 39 years	5	7,7%
Total	65	100%

(The primary data processed is from 2020)

Based on Table 1, data was obtained from 65 respondents, where 26 respondents (40%) were in the age range of 25-29 years, 25 respondents (38.5%) were in the age range of 20-24 years, 9 respondents (13.8%) were in the age range of 30-34 years, and 5 respondents (7.7%) were in the age range of 35-39 years. The respondents in this study were workers so the age range was productive age which was dominated by those aged 25 - 29 years.

Table 2. Distribution of Respondents Based on Gender

Gender	Frequency	Percentage
Male	15	57,7%
Female	11	42,3%
Total	26	100%

(The primary data processed is from 2020.)

Based on Table 2, out of 26 respondents in the age range of 25-29 years, data shows that there are 15 male employees (57.7%) and 11 female employees (42.3%). Some research state that there is correlation between gender and CVS.

Table 3. Distribution of Respondents Based on Visual Acuity

Visual Acuity for Computer Distance	Frequency	Percentage
>50 cm	30	46,2%
<50 cm	35	53,8%
Total	65	100%

(The primary data processed is from 2020.)

Based on Table 3, out of 65 respondents, it was found that 30 respondents (46.2%) have a visual acuity distance from the computer of more than 50 cm, and 35 respondents (53.8%) have a visual acuity distance from the computer of less than 50 cm. The majority of respondents use the computer at a distance of less than 50 cm. This is due to workers' bad habits and there is no specific direction regarding this in the work environment.

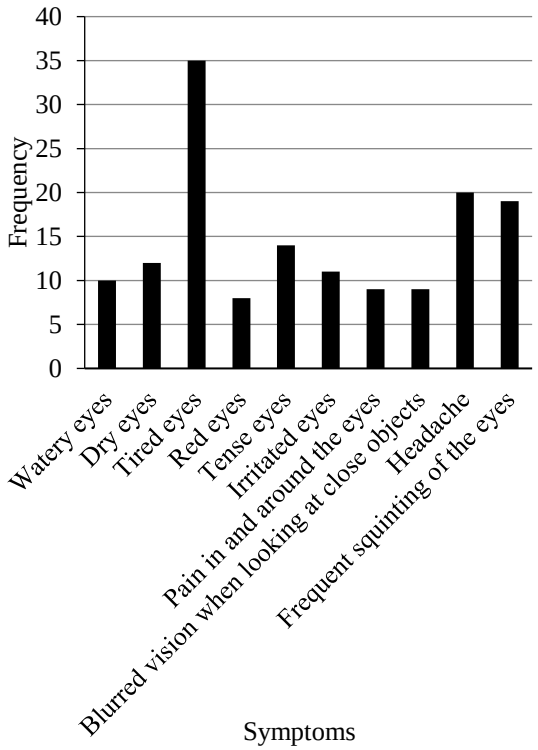
Table 4. Distribution of Respondents Based on CVS Complaints

CVS	Frequency	Percentage
Yes	43	66,2%
No	22	33,8%
Total	65	100%

(Processed data in 2020)

Based on Table 4, out of 65 respondents, it was found that 43 respondents (66.2%) experienced CVS complaints, while 22 respondents (33.8%) did not experience CVS complaints. This can be caused by many factors such as bad habits while using a computer which results in CVS symptoms.

Figure 1. Distribution of Respondents Based on CVS Symptoms



Based on Figure 1, it was found that 35 respondents (53.8%) experienced tired eyes, 20 respondents (30.8%) experienced headaches, 19 respondents (29.2%) frequently squinted their eyes, and 14 respondents (21.5%) had tense eyes, dry eyes were experienced by 12 respondents (18.5%), eye irritation by 11 respondents (16.9%), pain in and around the eyes by 9 respondents (13.8%), blurred vision when looking at close objects by 9 respondents (13.8%).

Table 5. Cross Tabulation between Eye Viewing Distance to the Computer and Complaints of CVS

Eye Viewing Distance to the Computer	CVS				Total	
	Yes		No			
	f	%	f	%	f	%
>50 cm	12	18,5	18	27,7	30	46,2
<50 cm	31	47,7	4	6,2	35	53,8
Total	43	66,2	22	33,8	65	100

Based on Table 5, it can be observed that there were 12 respondents (18.5%) who had an eye viewing distance to the computer of more than 50 cm and experienced complaints of CVS, while 18 respondents (27.7%) did not experience CVS complaints.

Respondents who had an eye viewing distance to the computer of less than 50 cm and experienced complaints of CVS amounted to 31 individuals (47.7%), while those who did not experience CVS complaints amounted to 4 individuals (6.2%).

Table 6. Distribution of Respondents Based on Gender with Distance Less than 50 cm and Complaints of CVS

Gender	Frequency	Percentage
Male	17	54,8%
Female	14	45,2%
Total	31	100%

(Primary data processed in 2020)

Based on Table 6, individuals who had an eye viewing distance to the computer of less than 50 cm and experiencing CVS complaints, data was obtained from 17 male employees (54,8%) and 14 female employees (45,2%).

Table 7. Chi-square Test of Association between Eye Viewing Distance to the Computer and Complaints of CVS

	Value	df	Asymptotic Significance (2-sided)
Person Chi-Square	17,021	1	,000

(Primary data processed in 2020)

Based on Table 7, using the *Chi-square* test that met the criteria, a *p-value* of 0.000 was obtained, which is smaller than 0.05. This indicates that there is a significant relationship between eye viewing distance to the computer and complaints of CVS among employees at the KPPBC TMC Malang office.

DISCUSSION

In this study, data distribution based on age, gender, eye viewing distance to the computer, complaints, and symptoms of CVS were obtained from questionnaires distributed to the employees of the Middle Tax Customs Supervision and Service Office. There were 65 respondents out of 110 respondents who met the inclusion criteria.

The majority of respondents in this study were aged 25-29 years. Age has an influence on complaints of eye fatigue because as age increases, visual acuity tends to decrease. Physiologically, as age increases, the tear film layer tends to thin more quickly. This thinning can lead to dry eyes (Azkadina, 2012; Rosenfield, 2011)

Furthermore, based on the age data, there were more male respondents compared to female respondents. Darmawan and Wahyuningsih (2021) also stated that there is a relationship between gender and complaints of CVS. Females tend to experience higher complaints of CVS because they generally have higher attention to detail than males, leading them to gaze more intensely at computer screens.

The research results also mention that the eye viewing distance of respondents to the computer is less than 50 cm more frequently than respondents who have an eye viewing distance to the computer of more than 50 cm. Close proximity causes excessive accommodation, resulting in the increased workload of the ciliary muscles of the eye, leading to a feeling of eye strain and headaches (Akinbinu & Mashalla, 2014).

The dominant symptom of CVS occurring in employees at KPPBC TMC Malang is tired eyes, accounting for 53.8%. This symptom originates from the characteristics of each content on the computer screen, which consists of pixels with its darker edges, it forces the eyes to focus. Prolonged exposure to this can result in tired eyes. The issues of visual impairment and various symptoms due to discomfort from using computer devices can disrupt the productivity of workers.

Based on the cross-tabulation results between eye viewing distance to the computer and complaints of CVS among employees at the KPPBC TMC Malang office, it was found that there were 12 respondents or 18.5% who had an eye viewing distance to the computer of more than 50 cm and experienced CVS complaints. This can occur because in addition to the eye viewing distance factor, CVS complaints are also influenced by other risk factors. Gowrisankaran and Sheedy (2015) mentioned several other risk factors that can cause CVS, such as the intensity of light from the computer screen and the room, font size, and image quality on the computer screen.

Based on the cross-tabulation results, it was found that there were 4 respondents, equivalent to 6.2%, among employees who had an eye viewing distance to the computer of less than 50 cm and did not experience CVS complaints. This can be attributed to the good habit of respondents who frequently take eye breaks. Dessie et al. (2018) reported that eye breaks are a protective factor against CVS. After working for one

hour, it is recommended to take a short break for 5 minutes to reduce eye-related issues without affecting work productivity.

Based on the cross-tabulation results, it was found that there were 31 respondents, equivalent to 47.7%, among employees who had an eye viewing distance to the computer of less than 50 cm and experienced CVS complaints. According to the Occupational Safety and Health Association (OSHA) (1997), the recommended distance between the eyes and the computer monitor is 18-24 inches or 46-61 cm, while the ideal distance is 20 inches or about 50.80 cm. The close proximity between the computer and the eyes requires the eyes to work harder to accommodate. The eyes are demanded to adjust to the movement of objects on the computer screen, causing the ciliary muscles to work hard and resulting in fatigue and a feeling of eye strain (Rohmah, et al., 2022)

Out of the 31 respondents who had an eye viewing distance to the computer of less than 50 cm and experienced CVS complaints, the majority of them were males. This is not consistent with the research conducted by Darmawan and Wahyuningsih (2021) explains that the occurrence of CVS is more common in females than in males.

Based on the *chi-square* test of association between eye viewing distance to the computer and complaints of CVS among employees at KPPBC TMC Malang, a p-value of 0.00 was obtained, indicating that $p < 0.05$. This indicates that there is a significant relationship between eye viewing distance to the computer and complaints of CVS among employees at KPPBC TMC Malang. In a study conducted by Insani and Wunaini (2018), it was also mentioned that there is a significant relationship between eye viewing distance and complaints of CVS.

The occurrence of CVS is attributed to the inadequate implementation of Occupational Safety and Health Management System (SMK3) due to the lack of commitment from company leaders. Additionally, based on interviews, there is no policy regarding the proper use of computers according to standards. Planning, implementation, and evaluation are also not being carried out effectively, resulting in many employees experiencing CVS complaints.

CONCLUSION

Based on the findings of this research, the conclusions that can be drawn are as follows:

1. There is a significant relationship between eye viewing distance to the computer and the occurrence of CVS complaints among the respondents.
2. The prevalence of worker that using computer experiencing CVS complaints among the 65 respondents indicates that 66.2% of the respondents experienced CVS complaints with the most dominant symptom of CVS was tired eyes, accounting for 53.8%.,
3. The eye viewing distance to the computer among the respondents in KPPBC TMC Malang is still suboptimal. The percentage of respondents with an eye viewing distance to the computer of more than 50 cm is 46.2%, while the percentage of respondents with an eye viewing distance to the computer of less than 50 cm is 53.8%.

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REFERENCES

1. Akinbinu, T. R., & Mashalla, Y. J. 2014. Impact of computer technology on health Computer Vision Syndrome (CVS). Academic Journals. Vol. 5(3) p. 20–30.
2. Anshel J. 2005. Visual ergonomics handbook : CRC / Taylor & Francis.
3. Azkadina, A. (2012). Hubungan Antara Faktor Risiko Individual Dan Komputer Terhadap Kejadian Computer Vision Syndrome. Jurnal Kedokteran Diponegoro. Vol. 1(1) p. 1-15
4. Darmawan, D. dan Wahyuningsih, A.S. 2021. Keluhan Subjektif Computer Vision Syndrome Pada Pegawai Pengguna Komputer Dinas Komunikasi dan Informasi. Indonesian Journal of Public Health and Nutrition. Vol. 1(2):172-183
5. Dessie A, Adane F, Nega A, Wami SD, Chercos DH. 2018. Computer Vision Syndrome and Associated Factors among Computer Users in Debre Tabor Town, Northwest Ethiopia. Journal of Environmental and Public Health. Vol. 2018 p. 1-8
6. Gowrisankaran S, Sheedy JE. 2015. Computer vision syndrome: A review. Albin TJ, editor. Work. Vol. 52(2) p. 303–14.
7. Insani, Y. dan Wunaini N. 2018. Hubungan Jarak Mata dan Intensitas Pencahayaan dengan *Computer Vision Syndrome* (CVS). Jurnal Manajemen Kesehatan. Vol 4 (2) p. 153-162.
8. Kemkominfo (2017). Survey Penggunaan TIK Tahun 2017.

9. OSHA., 1997. Working Safety with Video Display Terminal a Dozen Things You Should Know about Eyestrain. Dikutip dari: http://www.osha.gov.
10. Putri, D.W. dan Mulyono. 2018. Hubungan jarak monitor, durasi penggunaan komputer, tampilan layar monitor, dan pencahayaan dengan keluhan kelelahan mata. The Indonesian Journal of Occupational Safety and Health. Vol. 7 (1) p. 1-10
11. Roestijawati, Nendyah. 2015. Sindrom Dry Eye pada Pengguna Visual Display Terminal (VDT).
12. Rohmah, S. Hendriana, Y. dan Moonti, M. A. 2022. Hubungan Jarak Pandang dan Intensitas Penggunaan Komputer dengan Kejadian Computer Vision Syndrome (CVS) pada Mahasiswa S1 Keperawatan Tingkat Akhir di STIKES Kuningan. Journal of Health Research Science. Vol. 2(2) p. 84-92
13. Rosenfield, M. 2011. Computer vision syndrome a review of ocular causes and potential treatments.Ophthalmic & Physiological Optics. Vol. 31 p. 502–551
14. Saputro WE. 2013. Hubungan Intensitas Pencahayaan, Jarak Pandang Mata ke Layar dan Durasi Penggunaan Komputer dengan Keluhan Computer Vision Syndrome. Jurnal Kesehatan Masyarakat. Vol. 2(1) p. 1–9.