




# The Effect of a 20-20-20 Rule Educational Intervention on Computer Vision Syndrome (CVS)

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**Abstract.** Computers have become an essential part of our work nowadays. Since the government implemented the Work from Home (WFH) policy, the use of computers has significantly increased, leading to computer-related health problems. Computer vision syndrome (CVS) is a group of eye and vision-related problems caused by prolonged use of computers or other display devices. Not only does computer overuse have an impact on eye health, but it also has an impact on the musculoskeletal system, mental health, and work productivity. The 20-20-20 rule (taking a 20-second break to look at something 20 feet away every 20 minutes) can be used to prevent CVS. This study aims to examine the effect of a 20-20-20 rule educational intervention using leaflets on the Computer Vision Syndrome (CVS) of employees at the PT PLN UPT Malang office. This research is an experimental study that employs a quasi-experimental method with a one-group pretest-posttest design. The samples were 25 employees who were taken using a purposive sampling technique. The data were collected through observation, interviews, and the CVS-Q questionnaire. The data were then analyzed using SPSS 26 for Windows. Based on the results of the analysis, it was concluded that a 20-20-20 rule educational intervention using leaflets has an effect on the Computer Vision Syndrome (CVS) of the employees at PT PLN UPT Malang office ( $p = 0.000$ ).

**Keywords:** Occupational illness, Computer Vision Syndrome, CVS, 20-20-20 rule

## 1 Introduction

In offices, computers have become an essential part of the work and are used by almost all employees, be it in the administration, finance, planning and evaluation, and field departments. The use of computers can facilitate activities and increase time, energy, and cost efficiency. However, despite those benefits, the use of computers also has negative impacts on the workers' health of workers, also known as occupational diseases. Occupational disease is a part of work-related health problems that can be caused by various factors that exist in a work environment [1]. One of the occupational

diseases caused by continuous use of computers is computer vision syndrome (CVS). The American Optometric Association (AOA) explains that CVS is a complex problem related to near work experienced by someone who works with prolonged computer use time.

Since the beginning of the COVID-19 pandemic in Indonesia, the government has promptly implemented activity restriction measures to curb the spread of the virus, one of which is the Work from Home (WFH) policy. This policy increased the intensity of computer use, hence inducing muscle fatigue in the workers [2]. The long duration of exposure to the monitor screen and display can cause eye strain [3].

CVS is a prevalent public health problem in developing countries. It is estimated that nearly 60 million people suffer from CVS and 90% of computer users experience CVS with various symptoms, such as headache, eye fatigue, eye strain, dry eyes, double vision, and blurred vision [4]. The risk factors include individual factors, work environment factors, and computer factors. The individual factors that contribute to the high risk of suffering from CVS are age (25–30 years old), gender (male), medical history (immunosuppression, lupus, thyroid, rheumatoid arthritis, diabetes, hormonal fluctuations, and acne rosacea), medication history (antidepressants, antibiotics, antihistamines, stimulants, antihypertensives, hormone replacement therapy, steroids or vitamins), use of visual aids (glasses and contact lenses), total duration of working using computers (6 years), and duration of working with computers per day ( $\geq 4$  hours) [5]–[9]. Work environment factors that increase the risk of CVS are inadequate lighting and high room temperature with low humidity [10], [11]. The computer factors that trigger CVS are the type of computer (CTR), the visibility that exceeds 50–100 cm, the viewing angle that exceeds 10–20 degrees, and the unaligned monitor position [8], [10], [12], [13].

A study conducted on workers at PT Telkom Access Jambi shows that 78% of the workers experience CVS [14]. Several things can be done to overcome CVS, such as regularly taking a rest. The Ministry of Health of the Republic of Indonesia and the AOA recommend the 20-20-20 rule (taking a 20-second break to look at something 20 feet away every 20 minutes) as a method to reduce CVS symptoms. Another study conducted to examine the effect of an educational intervention using the 20-20-20 rule on 100 high school students in Kediri City also shows that it can be used to prevent CVS [15]. A similar study on the effect of an educational intervention using the 20-20-20 rule on CVS also showed a decrease in symptom scores after intervention from 9.00 to 8.35 [4].

One of the media used to deliver educational interventions is leaflets. Leaflets are used as a learning medium to deliver information because of their high usability. Leaflets can increase students' motivation and interest in learning because they can exchange ideas about the information contained in the leaflet. The leaflet is interesting to read. The 20-20-20 rule educational intervention is carried out because it can be used by the workers to prevent occupational diseases, as well as improve their ability to maintain their health [16].

The Transmission Implementation Unit (Unit Pelaksana Transmisi or UPT) of Malang is a part of PT PLN's (Persero) implementation unit in charge of maintaining the electrical energy distribution equipment (transmission) in Malang. There are 59

employees at UPT Malang, divided into eight departments, namely the Manager of PLN UPT Malang, OHS and Security Implementer (LAKSK4), Procurement (LAKSDA), Environment (LAKSLK), Planning and Evaluation (RENEV), Work under Electrical Hazards (PDKB), Finance and Administration (KEUAD), and Construction.

The preliminary study revealed that many workers at PLN UPT Malang complained about suffering from eye strain due to the online working arrangement using the Zoom Virtual Meeting application with a duration of more than two hours a day. Due to the outbreak of the COVID-19 pandemic, online meetings usually last longer. Such prolonged computer use can cause eye fatigue, which is exacerbated by the fact that PT PLN UPT Malang has not made any interventions to control the risks. Exposure to computer monitors is a physical hazard factor in the work environment and can affect work activities. Based on the observations and interviews, there are four parts of the work that are mostly exposed to the risk, namely LAKSDA, RENEV, KEUAD, and Construction. Ten employees from those departments stated that there were no interventions from PT PLN UPT Malang to reduce eye health risks, be it in the form of preventive efforts or routine eye health checks.

Previous studies have explored the application of the 20-20-20 rule to prevent CVS. However, no research has made a 20-20-20 rule educational intervention on workers' CVS using leaflets. Therefore, this study aims to determine the effect of education and application of the 20-20-20 rule using leaflets on the CVS of the employees at PT PLN UPT Malang office.

## 2 Methods

This study is a quasi-experimental study using a one-group pretest-posttest design. The study was conducted in May 2022 at PT PLN UPT Malang office. The research samples were drawn using a purposive sampling technique with a total of 25 employees. The research instrument used was the Computer Vision Syndrome Questionnaire (CVS-Q). The variable scales are nominal and ordinal, which are non-parametric statistics, meaning that a data normality test is not needed [17]. The data analysis consisted of a univariate analysis and Wilcoxon bivariate analysis.

First, the CVS-Q was given in the pretest to understand the workers' CVS complaints before the treatment. Then, an educational intervention of the 20-20-20 rule was given using leaflets for five working days. In the end, the posttest was conducted using the CVS-Q again to understand the result of the intervention. The workers were given information related to the definition of CVS, its symptoms, the benefits of the 20-20-20 rule, and practicing the steps in the rule. To fulfill the requirement of researching living beings, an ethical feasibility test has been carried out by Komisi Etik Penelitian Kesehatan Politeknik Kesehatan Kemenkes Malang with Ethical Approval Reg. No.: 442/KEPK-POLKESMA/2022.

### 3 Results

#### 3.1 Characteristics of Respondents

**Table 1.** Characteristics of Respondents

Variable	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	16	64
Female	9	36
<b>Age</b>		
20–29	8	32
30–39	13	52
40–49	2	8
50–59	2	8
<b>How many years have you worked using a computer?</b>		
1–9	13	52
10–19	10	40
20–29	1	4
30–39	1	4
<b>How many hours do you work using a computer in one day?</b>		
4 hours	2	8
5 hours	7	28
6 hours	5	20
7 hours	3	12
8 hours	8	32
<b>Pretest score</b>		
<6	0	0
≥6	25	100
<b>Posttest score</b>		
<6	15	60
≥6	10	40

Table 1 shows that the majority of respondents in this study are male (16 people, or 64%). A total of 13 respondents (52%) are between 30–39 years old. Most respondents (52%) have worked using computers for 1–9 years. The highest duration of computer use in one day is eight hours for eight respondents. The data above also indicate that 25 respondents (100%) have a score of  $\geq 6$  (categorized as having CVS) in the pretest. In the posttest 15 respondents have a score of  $< 6$  (categorized as not having CVS category), whereas 10 others got a score of  $\geq 6$ .

#### 3.2 Types of CVS Complaints

As seen in Figure 1, before the intervention, the most common type of CVS experienced by the respondents was headache, with the least common being double vision.

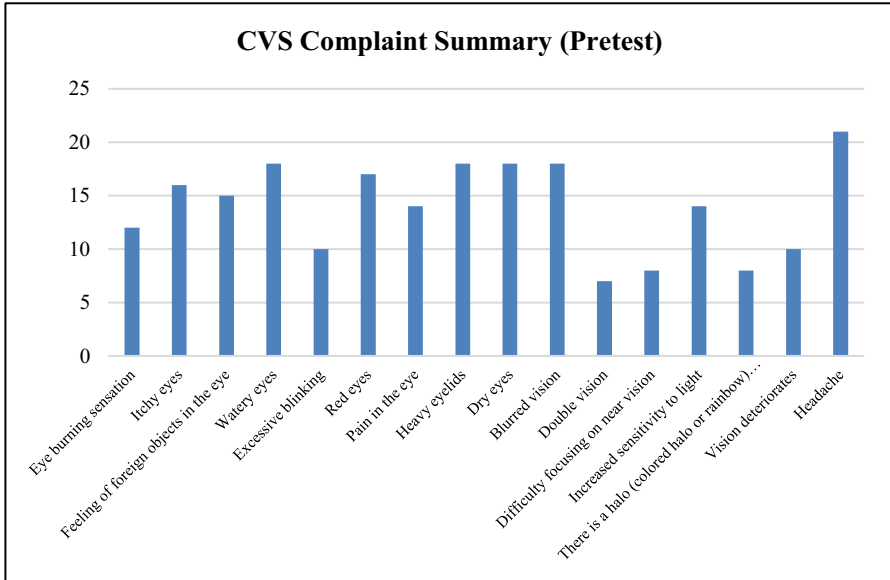


Fig. 1. CVS Complaints from the Respondents at PT PLN UPT Malang from the Pretest

Based on Figure 2, it can be seen that after the educational intervention of the 20-20-20 rule, the most common types of CVS experienced were headaches, with the least common being vision deterioration.

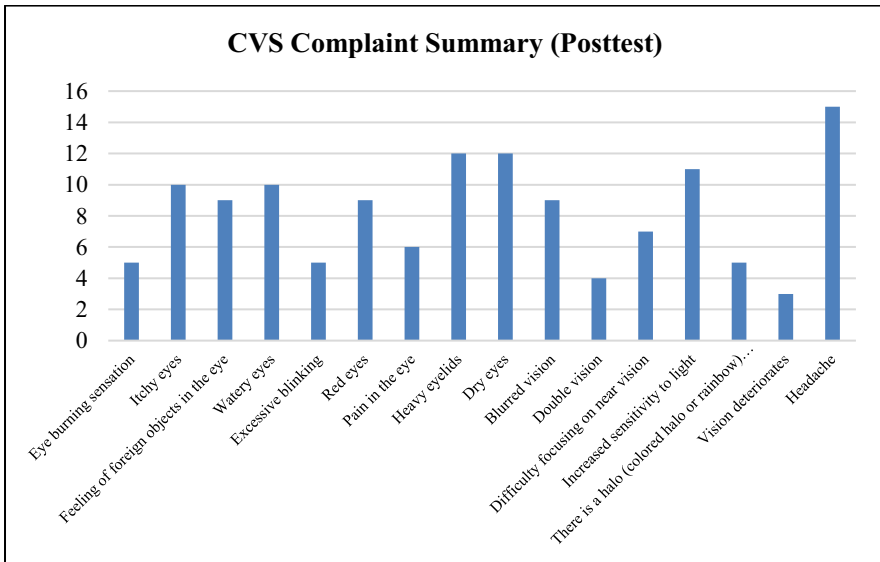


Fig. 2. CVS Complaints from the Respondents at PT PLN UPT Malang from the Posttest

### 3.3 CVS Scores before and after the Educational Intervention Using Leaflets

**Table 2.** Results of the Pretest and Posttest of CVS Variables at PLN UPT Malang

Variable	Category	Pretest		Posttest		Statistic Z	<i>p</i> -value
		n	%	n	%		
CVS	CVS	25	100	10	40	-4.406	0.000
	Not CVS	0	0	15	60		

From Table 2, it can be seen that before the educational intervention, all respondents (100%) were categorized into having CVS. After the intervention, 60% of the respondents did not have CVS. Table 2 also shows that the *p*-value is 0.000, which is  $<0.05$ , meaning that there is an effect of the educational intervention of the 20-20-20 rule using leaflets on CVS.

## 4 Discussion

The current study was conducted based on an urgent reason. Before the COVID-19 pandemic, computers had been widely used at PLN because they required large-scale coordination. Due to the outbreak, the use of computers increased significantly, and based on the interviews conducted, the employees complained about their eye health issues and the lack of preventive measures from PLN. CVS is an eye syndrome and symptoms experienced by those who use computers for a long time [18]. Rassignol et al. (1987) revealed that the prevalence of CVS symptoms is higher in people who spend  $\geq 4$  hours using computers in a day. It was also found that CVS is more prevalent in employees who use computers  $\geq 5$  hours in one day and even more in those who use computers  $\geq 4$  hours continuously (Baqir, 2017). Based on those studies, it was determined that the targeted departments in the current study are the Planning and Evaluation (RENEV), Procurement Executor (LAKSDA), Finance and Administration (KEUAD), and Construction.

Based on the employees' complaints regarding their eye health, the researchers determined preventive measures through administrative control using the 20-20-20 rule. The AOA (2016) recommended the application of the 20-20-20 rule to maintain eye health by employees. The rule aims to reduce tension in the muscles that move the eyeballs (muscle fatigue occurs after 15–20 minutes of working in front of a computer without resting). By looking at an object as far as six meters (20 feet) for 20 seconds every 20 minutes, it is hoped that the eyes will relax. CVS is temporary, as it can disappear when the user no longer uses computers or other display devices. Regular breaks can also prevent CVS [19].

The CVS symptoms before and after the intervention were measured using the CVS-Q, which was designed and validated by Segui et al. [20]. This questionnaire evaluates the frequency (“never”, “occasionally”, “often”, and “always”) and intensity (“moderate” or “severe”) of CVS, consisting of 16 ocular and visual symptoms: burning, itching, feeling of a foreign object in the eyes, watery eyes, excessive blinking, red eyes, eye pain, heavy eyelids, dry eyes, blurred vision, double vision, difficulty

focusing on near objects, increased sensitivity to light, halos in surrounding objects, deteriorating vision, and headaches. A person with a score of  $\geq 6$  on the questionnaire will be classified as suffering from CVS [20].

Based on the results of the pretest, it is known that the types of CVS experienced by the employees are headaches, blurred vision, dry eyes, heavy eyelids, and watery eyes. These results are from previous research, where it was found that the CVS symptoms that commonly occur due to computer use are headaches, eye strain, double vision, watery eyes, and blurred vision [21]. Another research shows that CVS symptoms that are often experienced due to computer use are tired eyes, headaches, and eye strain [22]. A recent study conducted by Zulkarnain et al. (2021) revealed that the main symptom of CVS is dry eyes [15]. The results of the pretest and posttest were used to understand the effect of the 20-20-20 educational intervention using leaflets on CVS experienced by the employees at PT PLN UPT Malang. Based on the statistical tests using SPSS 26 (Windows), the Wilcoxon test in Table 2 shows that the number of respondents experiencing CVS after the intervention decreased. A similar study was also conducted by Anggrainy (2018) on the employees at the Medan Class I Port Health Office [19]. It was found that there was a significant effect score of 46.5% after the 20-20-20 rule intervention. In addition, this result is also in line with the study conducted by Zulkarnain et al. (2021), where the CVS symptoms declined after the high school student respondents in Kediri implemented the 20-20-20 and artificial tears [15]. Several respondents admitted that with a regular application of the 20-20-20 rule, the CVS symptoms subsided, and they increased their work effectiveness because they did not need to change places.

## 5 Conclusion

This study revealed that there is an influence of a 20-20-20 rule educational intervention using leaflets on CVS experienced by the employee's PT PLN UPT Malang. The most common CVS symptoms experienced by the employees are headaches, blurred vision, dry eyes, heavy eyelids, and watery eyes. The researchers recommend the employees apply the 20-20-20 rule independently to reduce the CVS symptoms. In addition, the researchers also recommend PT PLN UPT Malang implement an administrative policy for employees to apply the 20-20-20 rule with maximum supervision to prevent the occurrence of occupational diseases that can trigger accidents when doing work. In this study, there was no analysis related to risk factors that influence the occurrence of CVS. The researchers also did not use any other alternatives to prevent CVS. Hence, further studies can be conducted on the risk factors that affect CVS and use other alternatives to prevent CVS.

## Author's Contribution

QM, MY, AS contributed to the design selection. QM, MY, AS, and AH contribute to the data analysis. All authors write the manuscript.

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