



THE EFFECT OF “PERMATA-KU” EXERCISES ON THE IMPROVEMENT OF COMPUTER VISION SYNDROME SCORE

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ABSTRACT

Background : Most human activities cannot be separated from the use of computers. Long-term and uncontrolled use of computers can lead to Computer Vision Syndrome (CVS). According to the Ministry of Health of the Republic of Indonesia (KEMENKES) CVS can be handled with ergonomics use of computers resultantly reducing the impact of computer exposure. Education on ergonomics use of computer and PERMATA-KU exercise is expected to improve CVS scores. **Research Purpose** : Proving the effect of PERMATA-KU exercises toward CVS score improvement **Method** : The research design is a Pre-Post Test with Control Group Design. Research subjects are divided into treatment group and control group, each group consists of 15 people. The treatment group received education about the ergonomics use of computer and PERMATA-KU exercises while the control group received education on the ergonomics use of computers. The measurement's instrument is the CVS questionnaire. The dependent variable of the study was the CVS score and the independent variable of the study was the type of treatment. Statistical test with Wilcoxon, paired t test, unpaired t test, Mann Whitney and Chi square. Meaning value $p < 0.05$. **Result** : There was a significant difference in CVS scores after the intervention in the treatment group and the control group ($p=0,017$). **Conclusion** : There is an effect of "PERMATA-KU" exercise on the improvement of CVS scores. **Key Words** : Computer Vision Syndrome, education on ergonomic use of computers, PERMATA-KU exercises

INTRODUCTION

The use of computers is currently in great demand by various ages from children to adults. Long-term and uncontrolled use will cause health problems, one of which is Computer Vision Syndrome. Computer Vision Syndrome (CVS) is a group of visual symptoms related with long-term computer use such as tablets, e-readers, and use of cell phones¹. CVS symptoms are divided into 4 categories, namely asthenopia symptoms, surface-related symptoms, ocular, visual, and extraocular symptoms.² The prevalence of CVS reaches 75% to 90% among computer users and globally it is estimated that at least 60 million people are suffering from CVS where each year there will be an increase in new CVS cases by 1 million.³ Computer Vision Syndrome (CVS) has an impact on someone's physical health, including vision and the musculoskeletal system.⁴ Towards medical students CVS will decrease the effectiveness, efficiency, productivity, and quality of learning.

The 'PERMATA-KU' (Eye Care - Loosen Shoulder) exercise is an extra exercise to minimize CVS symptoms. This study aims to analyze the effect of PERMATA-KU exercise on CVS complaints.

METHOD

The type of this research is a quasi experimental research and the research design is a Pre-Post Test with Control Group Design. The research was conducted at each research subject's houses in April-July 2020. The subjects of this study were students of the Faculty of Medicine, Diponegoro University who experienced CVS.

Based on the counting results, there are 16 people per group that for the two groups the total of research subjects are 32 people. The dependent variable in this study is the CVS score. The CVS score is a score obtained from the Computer Vision Syndrome Questionnaire (CVS-Q) which is used to diagnose CVS that consists of 16 complaint points including burning eyes, itchy eyes, foreign body sensation and blocky eyes, watery eyes, excessive blinking, red eyes, sore eyes, heavy eyelids, dry eyes, blurry vision, double vision, inability to focus on near objects, enhancements of light sensitivity, seeing rainbows around objects, worsening eyesight, headache. A person is diagnosed with CVS if they get a total score of ≥ 6 points. The independent variable in this study is the type of treatment.

The first stage was the recruitment of 2017, 2018, and 2019 Diponegoro University Medical



Faculty students. Furthermore, all research processes were carried out online, starting from giving pre-test questionnaires, informed consent, research, to giving post-test questionnaires. The control group will do the ergonomic education of computer use on daily basis, while the treatment group will do ergonomics education of computer use coupled with PERMATA-KU exercises every morning for 14 days. Every day the research subjects in the treatment group have to send their exercise videos as evidence. Research subjects will be considered dropout if they do not do the exercise 3 times in a row. The last stage is data processing and analysing.

'PERMATA-KU' is an exercise treatment in the form of gymnastic that includes blinking and flexibility exercises (range of motion and stretching) also endurance to the eyes, extremities, back, neck and shoulders with a frequency of 14 times which is done for 14 days in the morning, for 8 minutes 48 seconds long comprising of 40 seconds warm up and 1 time repetition, 7 minutes 28 seconds core with 2 times repetition each, and 40 seconds of cooling down with 1 time repetition. Exercise intensity between 141 times / minute to 171 beats / minute with a maximum heart rate of 201 beats / minute.

Statistical test is done with Wilcoxon test, paired t test, unpaired t test. Mann Whitney, and Chi square. The p value is considered significant if $p < 0.05$. Processing and analysis are done with a computer program.

The research "The Effects of PERMATA-KU Exercises on The Improvement of Computer Vision Syndrome Scores" has been approved by the Ethics Committees of Medical Research (KEPK) of the Faculty of Medicine, Diponegoro University with Number 135 / EC / KEPK / FK-UNDIP / VI / 2020. In this study there were no conflicts of interest and no special funds were provided.

RESULTS

The number of research subjects who are able to finish this research in the treatment group and the control group are 15 people each. One person from the treatment group and the control group dropped out due to other activities.

The groups average age and gender can be seen in table 1. The results show that before intervention in the treatment group 12 (80.0%) people had occasionally or frequently symptoms frequency and mild to severe symptom intensity

with watery eyes and blurred vision condition, whereas in the control group as many as 13 (86, 7%) people had occasional or frequent symptom frequency and mild to severe symptom intensity in the form of blurred vision. The results show that after the intervention in the treatment group 10 (66.7%) people have occasionally or frequently symptoms frequency and a mild to severe complaints intensity in of watery eyes, while in the control group 9 (60.0 %) people have occasionally or frequently symptoms frequency and the intensity of mild to severe complaints of dry eyes. The research results regarding the CVS case before and after the intervention in the treatment and control groups can be seen in table 2.

The results showed that there were significant differences in CVS scores before and after the intervention in both the treatment group ($p = 0.001$) and the control group ($p = 0.006$). It can be seen in table 3. The results showed that the average CVS score after intervention in the treatment group was lower than the control group and there was a significant difference in CVS score ($p = 0.017$) after the intervention between the treatment group and the control group. It can be seen in table 4. The results showed that there was a significant difference in the delta CVS score ($p = 0.008$) between the treatment group and the control group. It can be seen in table 5. The results showed that there was no significant difference in the incidence of CVS after the intervention between the treatment group and the control group using the chi square test ($p = 0.259$). It can be seen in table 2.

Table 1. Research Subjects Characteristics

	Treatment Group	Control Group
Average age	19,33±0,976	19,80±0,941
Oldest	21	21
Youngest	17	18
Woman (n (%))	9 (60%)	10 (66,7%)
Man (n (%))	6 (40%)	5 (33,3%)



Table 2. Research subjects distribution based on CVS case before and after the intervention in the treatment and control groups

	Treatment Group		Control Group		Post Intervention p Score				
	Pre Intervention	Post Intervention	Pre Intervention	Post Intervention					
	N	%	N	%					
CVS Case (-)	0	0	14	93,3	0	0	7	46,7	0,259 [^]
CVS Case (+)	15	100	1	6,7	15	100	8	53,3	

*significant if $p < 0,05$ [^] Chi square test

Table 3. CVS score before and after the intervention in treatment and control group.

	Treatment Group			Control Group		
	Average±S D before intervention	Average±S D after intervention	P value	Average±S D before intervention	Average±S D after intervention	P value
CVS Score	9,13±2,475	3,40±1,639	0,001 [§]	7,93±1,751	5,53±2,800	0,006 [¶]

*significant if $p < 0,05$ [§] Wilcoxon test [¶] t paired test

Table 4. The average CVS score after the intervention in treatment group and control group.

Treatment Group	Control Group	P value	
Average±SD after Intervention	Average±SD after Intervention		
CVS Score	3,40±1,639	5,53±2,800	0,017 [#]

*significant if $p < 0,05$ [#] unpaired t test

Table 5. Delta CVS score in treatment group and control group.

Delta	Treatment Group	Control Group	P value
	Average±SD	Average±SD	
CVS Score	5,73±3,011	2,40±2,874	0,008 [@]

*significant if $p < 0,05$ [@] Mann whitney test

DISCUSSION

This research found the average age with standard deviations in the treatment group was 19.33 ± 0.976 years, the oldest was 21 years, while the youngest was 17 years old. The average age with standard deviations in the control group was 19.80 ± 0.941 years, the oldest was 21 years, and the youngest was 18 years old. This study is in accordance with the research of Arisandi et al.⁵ which showed that the age of the research subjects in the treatment group (77.8%) and the control group (81.5%) was 22 years. The treatment group

consisted of 9 (60%) women and 6 (40%) men, while in the control group consisted of 10 (66.7%) women and 5 (33.3%) men. The results of this research are similar with research conducted by Pritadesya et al.⁶ which showed that the treatment group consisted of 14 (93.3%) women and 1 (6.7%) men, while the control group consisted of 11 (73,3%) women and 4 (26.7%) men. Research by Logaraj M et al.⁷ shows that 47.6% who suffer from CVS are women and 52.4% are men therefore it is not in accordance with the results of this study. Women's hormones influence the tears production a lot, among them are estrogen and androgen which disrupt the tears production due to women's percentage of estrogen and androgen decrease faster than men's. Basically, women are more conscientious than men in doing work, including when using computers where women will be more focused and concentrate, thus increasing the risk of CVS.⁸

The results of this research before the intervention were in line with the study conducted by Talwar et al.⁹ regarding visual and musculoskeletal health disorders in computer workers in Delhi showing that 23.2% had watery eyes and 13.2% had blurred vision. After the intervention, the results show that the frequency and intensity of blurred vision symptoms has not been complained by the research subjects. The results are different from Pritadesya et al.⁶ research which showed that 10 (66.7%) people in the treatment group and 12 (80.0%) people in the control group experienced blurred vision. Blurred vision occurs when the eye is unable to focus the vision's object precisely on the retina and thus form an unclear image. This causes fatigue of the intraocular and extraocular muscles, resulting in disrupt accommodation that obstructs the retinal light focus function. The results of this research show that there are significant differences between the CVS scores before and after intervention in the treatment group ($p = 0.001$) and the control group ($p = 0.006$). These results are in line with the research of Arisandi et al.⁵ which showed that there were significant differences before and after the eye exercise intervention in the treatment and control groups. This shows that PERMATA-KU exercises and education on ergonomics using computers are effective in reducing the frequency and intensity of CVS score complaints. The results show that the average CVS score after intervention in the



treatment group is lower than the control group and there is a significant difference in CVS scores ($p = 0.017$) after the intervention between the treatment group and the control group. The results of this research are in line with the research of Arisandi et al.⁵ which showed that there were significant differences after the eye exercise intervention in the treatment and control groups. However, it is different from those of Pritadesya et al.⁶ where they explained that there was no significant difference in CVS scores after the intervention between the treatment group and the control group.

The results show that there is a significant difference in delta CVS scores ($p = 0.008$) between the treatment group and the control group. The results of this research are different from the research of Pritadesya et al.⁶ that showed that there was no significant difference in CVS delta scores between the treatment group and the control group. This is due to the different exercises movements and positions compared to the previous studies.

The results show that there is no significant difference in the CVS case after the intervention between the treatment group and the control group using the chi square test ($p = 0.259$). The CVS case is lower in the treatment group than in the control group, although it is not statistically significant. The results of this research are in accordance with the research of Arisandi et al.⁵ which showed that eye exercises can improve CVS scores in the treatment group compared to the control group that was not given eye exercises. The results of this research are different from those of Pritadesya et al.⁶ which showed that there was a significant difference in the incidence of CVS after the intervention between the treatment group and the control group.

CONCLUSION AND SUGGESTION

Conclusion

The CVS scores are getting smaller after exercise compared to before exercise. The CVS scores are smaller after treatment in the gymnastics group as opposed of the control group. Compared with the control group, the treatment group's CVS scores are better while the CVS case is not statistically significant, but it is also smaller in the treatment group compared to the control group.

Suggestion

Further research with a longer period than fourteen days is needed in order to get a better and lasting CVS improvement. Hopefully the next

research on PERMATA-KU exercise can be done face-to-face.

REFERENCES

1. American Optometric Association. Computer Vision Syndrome [Internet]. Workplace Health and Safety. 2017;65;p. 328. Available from:<https://www.aoa.org/patients-and-public/caring-for-your-vision/protecting-your-vision/computer-vision-syndrome>
2. Muchtar H, Sahara N. Hubungan Lama Penggunaan Laptop dengan Timbulnya Keluhan Computer Vision Syndrome (Cvs) Pada Mahasiswa / I Fakultas Kedokteran Umum. J Med Malahayati. 2016;3(4):197–203.
3. Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N, et al. Computer Vision Syndrome among Computer Office Workers in a Developing Country: an Evaluation of Prevalence and Risk Factors. BMC Res Notes. 2016;9(1):1–9.
4. Permana MA, Koesyanto H, Mardiana. Faktor Yang Berhubungan dengan Keluhan Computer Vision Syndrome (Cvs) pada Pekerja Rental Komputer di Wilayah Unnes. J Public Heal Unnes. 2015;4(3):48–57.
5. Arisandi P, Utami GT, Novayelinda R. Efektivitas Senam Mata terhadap *Computer Vision Syndrome* (CVS). JOM FKp. 2018;5(2);p.245-250.
6. Pritadesya MR, Susilaningsih N, Rahmi FL, Kesoema TA.. Pengaruh Senam “E-BACKNSHOU” Terhadap Perbaikan CVS (Skripsi). Semarang: Fakultas Kedokteran Universitas Diponegoro; 2019.
7. Logaraj M, Madhupriya V. Computer Vision Syndrome and Associated Factors among Medical and Engineering Students in Chennai. Ann Med Heal Sci Res. 2014;4(2):179.
8. Azkadina A, Julianti HP, Pramono D. Hubungan Antara Faktor Risiko Individual Dan Komputer Terhadap Computer Vision Syndrome. J Media Med Muda. 2012.
9. Talwar R, Kapoor R, Puri K, Bansal K, Singh S. A Study of Visual and Musculoskeletal Health Disorders among Computer Professionals in NCR Delhi. Indian J Community Med. 2009;34(4):326–8.