

CORRELATION BETWEEN COMPUTER VISION SYNDROME AND UPPER LIMB DISORDERS AT WIDYA MANDALA CATHOLIC UNIVERSITY SURABAYA

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ABSTRACT

Introduction: The world of technology that continues to develop, especially in computer, makes workers spend more time operating electronic devices. This can contribute to eye strain which is one of the most common symptoms of Computer Vision Syndrome (CVS). CVS may associated with musculoskeletal disorders, especially at upper extremities due to non-ergonomic body position, which can be referred to as Upper Limb Disorders (ULD). Therefore, CVS can affect the severity of ULD

Purpose: The purpose of this study was to describe data on age, CCT and IOP in patients aged 20 to 70 years in the outpatient polyclinic of Ophthalmology, PHC Hospital Surabaya.

Method: Analytics observational was the type of this research and the research design was cross sectional study.

Result: The groups of respondents who experienced CVS with the severity of ULD on a scale 0 (A): no pain; scale 1 (B): moderately painful; scale 2 (C): painful; scale 3 (D): very painful were found to be 34.3%, 25%, 2.3% and 0%. And the groups of respondents who did not experience CVS with the severity of ULD on a scale 0 (A), scale 1 (B), scale 2 (C), and scale 3 (D) were found to be 35.5%, 2.9%, 0%, and 0%. Results from Spearman test found that the $p=0.000$ so there's a significant correlation between the two variables with a weak correlation coefficient ($r=0,39$).

Conclusion: There was correlation between CVS and ULD with a weak correlation coefficient value in students at Widya Mandala Catholic University Surabaya

Keyword: Computer Vision Syndrome, Upper Limb Disorders.

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INTRODUCTION

The world of technology that continues to develop, especially in computers, makes workers who use it more informative and productive. Workers spend more time operating electronic devices such as computers, laptops, and cell phones which can contribute to eye strain as one of the most common symptoms of Computer Vision Syndrome (CVS).(1) CVS happens because the eyes and brain interpret images on a digital screen differently from paper. The image on the digital screen is in fact blurry and has not sharp angles but the eye can see clearly because digital screens have a high refresh rate.(2) Setyowati et al. (2021) reported an increase in computer use due to working or studying from home during the COVID-19 pandemic with an average use of digital screens of 7.34 hours/day. Increased use of digital screens is one of the risk factors for developing CVS.(3)

Musculoskeletal disorders (MSD) are one of the problems that are quite often experienced by workers who use computers for long periods of time. Work-related musculoskeletal disorders are major factor in decreased quality of life, and limitation or loss of working time.(4,5) According to Rezaee (2011), musculoskeletal disorders related to work using computers were found after sitting more than 4 hours per day.(6) MSD occurs in the upper and lower limbs.(4) The upper extremities such as the neck, shoulders, and back are the parts that computer users often complain having pain or discomfortness.(7–9) Upper limb disorders (ULD) are manifestations of a person using a computer for a long time. Menendez et al, found that upper extremity disorders or ULD are common occurrence of long-term computer use in young adults, especially college students.(10) Computer users who have ocular symptoms of CVS are forced into non-ergonomic posture such as bending over, tilting the head, and repetitive movements in order to see digital screens more clearly.(11) A study

by Batara (2021), reported that 76.5% of students who used gadgets at Sam Ratulangi University had musculoskeletal complaints, especially in the neck (50.3%), shoulders (41.5%), and upper back (34.4%).(12)

Using computers for long periods of time and non-ergonomic posture can cause major ocular problems as well as musculoskeletal complaints that can interfere performance in studying or working. Therefore, the correlation between Computer Vision Syndrome and Upper Limb Disorders in students needed to be studied further.

METHODS

The type of research was observational analysis, with a cross-sectional methodology. Non-probability sampling was the sampling method carried out by consecutive sampling. The population used was students of the Faculty of Medicine, Widya Mandala Catholic University, Surabaya, classes of 2018 to 2021. The minimum number of research subjects required was 130 samples. The study's inclusion criterias were: students from the Faculty of Medicine at Widya Mandala Catholic University in Surabaya, aged 17 to 22, who used a computer for at least four hours each day, were willing to be research subjects, and signed informed consent. History of eye trauma, history of eye surgery, use of contact lenses, usage of poorly corrected glasses, use of contact lenses, and history of upper extremity trauma were all considered as exclusion factors.

The data were collected during July to September of 2021. Samples were collected after respondents signed informed consent forms and continued to complete out two questionnaires online using Google Forms, namely Computer Vision Syndrome Questionnaire (CVSQ), and Nordic Musculoskeletal Questionnaire (NMQ). The CVSQ is a self-anamnetic questionnaire with 16 questions with

measurements based on frequency, and intensity of symptoms; if the result of the calculation is ≥ 6 , the respondent is considered experiencing CVS. And the NMQ is a self-anamnetic questionnaire about 27 body parts. In this study, only questionnaires about 15 body parts were used, that focus on the upper extremities. The severity of complaints of 15 body parts was calculated by mean value to establish the severity of ULD in each respondent. This was a non-parametric study with CVS as the independent variable and ULD as the dependent variable with a nominal and ordinal scales, so Spearman was the data analysis approach. A computer application, IBM SPSS 25, was used to do the analysis.

RESULT

The following data was discovered from research and data processing

Table 1. Distribution of respondent characteristic

Variable	n (%)
Gender	
Male	77 (44,8%)
Female	95 (55,2%)
Computer Vision Syndrome	
Yes	106 (61,2%)
No	66 (38,4%)
Upper Limb Disorders	
Yes	52 (30,2%)
No	120 (69,8%)

Table 2. Distribution of respondent to Computer Vision Syndrome

Variable	n (%)	Variable	n (%)
Burning	71 (41,3%)	Blurred Vision	93 (54,1%)
Itching	134 (77,9%)	Double Vision	60 (34,9%)
Feeling of a Foreign body	73 (42,4%)	Difficult Focusing for Near Vision	35 (20,3%)
Tearing	114 (66,3%)	Increased Sensitivity to Light	76 (44,2%)
Excessive Blinking	62 (36%)	Colored Halos Around Objects	20 (11,6%)
Eye Redness	87 (50,6%)	Feeling that Sighth is Worsening	49 (28,5%)
Eye Pain	67 (39%)	Headache	105 (61%)
Heavy Eyelids	78 (45,3%)		
Dryness	85 (49,4%)		

Table 3. Distribution of respondent on the severity of Upper Limb Disorders

Variable	Upper Limb Disorders			
	Scale 0 (A)	Scale 1 (B)	Scale 2 (C)	Scale 3 (D)
	n (%)	n (%)	n (%)	n (%)
Upper Neck	75 (43,6%)	61 (35,5%)	31 (18%)	5 (2,9%)
Lower Neck	95 (55,2%)	47 (27,3%)	25 (14,6%)	5 (2,9%)
Right Shoulder	98 (57%)	50 (29%)	18 (10,5%)	6 (3,5%)
Left Shoulder	103 (59,9%)	49 (28,5%)	17 (9,9%)	3 (1,7%)
Upper Left Arm	138 (80,2%)	21 (12,2%)	11 (6,4%)	2 (1,2%)
Back	64 (37,2%)	68 (39,5%)	34 (19,8%)	6 (3,5%)
Upper Right Arm	132 (76,7%)	28 (16,3%)	10 (5,8%)	2 (1,2%)
Left Elbow	152 (88,4%)	17 (9,9%)	3 (1,7%)	0 (0%)
Right Elbow	151 (87,8%)	19 (11%)	2 (1,2%)	0 (0%)
Lower Left Arm	150 (87,2%)	21 (12,2%)	1 (0,6%)	0 (0%)
Lower Right Arm	146 (84,9%)	22 (12,8%)	4 (2,3%)	0 (0%)
Left Wrist	146 (84,9%)	23 (13,4%)	3 (1,7%)	0 (0%)
Right Wrist	133 (77,3%)	33 (19,2%)	6 (3,5%)	0 (0%)
Left Hand	150 (87,2%)	18 (10,5%)	4 (2,3%)	0 (0%)
Right Hand	141 (82%)	24 (14%)	7 (4%)	0 (0%)

*Scale 0 (A): no pain; scale 1 (B): moderately painful; scale 2 (C): painful; scale 3 (D): very painful.

Table 4. Correlation analysis of Computer Vision Syndrome with the severity of Upper Limb Disorders

Variable	Upper Limb Disorders				Total	P (asy. Sig)
	Scale 0 (A)	Scale 1 (B)	Scale 2 (C)	Scale 3 (D)		
	n (%)	n (%)	n (%)	n (%)		
Computer Vision Syndrome						
Yes	59 (34,3%)	43 (25%)	4 (2,3%)	0 (0%)	172	0,000
No	61 (35,5%)	5 (2,9%)	0 (0%)	0 (0%)	(100%)	

*Scale 0 (A): no pain; scale 1 (B): moderately painful; scale 2 (C): painful; scale 3 (D): very painful

According to table 1, 106 respondents (61.2%) had Computer Vision Syndrome, while 66 respondents (38.4%) did not; 52 respondents (30.2%) had Upper Limb Disorders, while 120 respondents (69.8%) did not. Itchy eyes (77.9%), watery eyes (66.3%), headache (61%), blurred vision (54.1%), and red eyes (50.6%) were the most prevalent CVS symptoms reported, according to table 2. According to table 3, on a scale of 1 (B), the most commonly encountered pain in the upper extremities was on the back (39%), upper neck (35.5%), and right shoulder (29%); on a scale of 2 (C), was on the back (19.8%),

upper neck (18%), and lower neck (14.6%); and on a scale of 3 (D), was on the back and right shoulder (3.5%), upper neck, and lower neck (2.9%). According to table 4, the data analysis test used the Spearman test, and found a significant correlation ($p=0,000$) between CVS and ULD with a weak correlation correlation of 0,39.

DISCUSSION

The analytical test with the Spearman test discovered a p value = 0.000, indicating that there was an correlation between Computer Vision Syndrome and Upper Limb Disorders, according to the findings of this study's data analysis. If $p < 0.05$, the p value is significant, indicating there's a correlation was found in this investigation. And it was discovered that the correlation coefficient was 0.39, indicating a weak correlation.

The most common CVS symptoms found in the research were directly proportional to the research conducted by Altalhi et al (2020), using a student population of 334 respondents, found that headache (68%), itchy eyes (63%), watery eyes (58%), blurred vision (52%), and red eyes (51%) as the most common CVS symptoms, which were appeared to correspond to significant symptoms in this study.(13) Furthermore, the frequency of eyes blink could affect dry eyes symptoms, with 85 respondents (49.4%) reporting dry eyes symptoms in this study. This can be caused by the tendency that people who use digital screens blink only 4-6 times per minute, but their eyes blink 20-22 times each minute in normal situations. The eyes does not obtain enough irrigation from the lacrimal gland to secrete tears when the frequency of blinking decreases. Dry eyes, which disrupts tear film homeostasis, can cause CVS and have a deleterious impact on tear stability and hyperosmolarity. Due to ocular cell injury and the production of inflammatory mediators, this can result in red eyes.(11,14)

CVS is triggered by prolonged use of digital screens for 4 hours or more, as well as musculoskeletal issues, particularly in the upper extremities. Rezaee (2011) found that sitting for four hours or more induces musculoskeletal diseases associated with digital screen work. Research by Nakatsuka (2020), found that the neck (47%), and the shoulder (50%) were the body parts that respondents often complained about, so that's corresponding to the results of this study, where the upper and lower neck areas, as well as the right shoulder were found to be significant on a scale 1 (B), scale 2 (C), and scale 3 (D). Non-ergonomic posture can affect the distance and eye angle which is one of the risk factor of CVS. And Poor posture, immobility, or the presence of repetitive motions might enhance the prevalence and severity of ULD that impacts activities.(2,3,6,15)

CONCLUSIONS

This study found significant correlation between Computer Vision Syndrome and Upper Limb Disorders in students of the Faculty of Medicine, Widya Mandala Catholic University, Surabaya

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