Pak. j. life soc. Sci. (2024), 22(2): 3021-3029 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.00222

RESEARCH ARTICLE

A Study on Risk Factors of Computer Vision Syndrome (CVS) Among Office Workers during Work from Home Mode

Nursyaza Inarah Binti Ramlan[1], Mohd Amran Mohd Daril[2]*, Mohamad Ikbar Abdul Wahab[3], Khairanum Subari[4], Sobia Irum[5]

[1,2,3,4] Quality Engineering Section, Universiti Kuala Lumpur, Malaysian Institute of Industrial Technology, Johor Bahru, Johor, Malaysia.
[5]Department of Management and Marketing, College of Business Administration, University of Bahrain, Sakhir, Kingdom of Bahrain.

ARTICLE INFO

Received: Apr 29, 2024

Accepted: Aug 24, 2024

Keywords

Computer vision syndrome

EFA

Factors

SPSS

***Corresponding Author:**

mamran@unikl.edu.my

ABSTRACT

Computer Vision Syndrome (CVS) is similarly recognized as Digital Eye Strain (DES), defined as a group of eye and vision-related problems related to comput-ers, tablets, e-reader, and cell phone use. Unfortunately, the study on Computer Vision Syndrome is still limited in Malaysia. This study will conduct on office workers who work in the manufacturing industry in Pasir Gudang, Johor, and work from home during this pandemic. Several risk factors contribute to the Computer Vision Syndrome: the type of work or department, computer visual screen usage, visible symptoms, lighting condition, time usage of a digital screen and others. Nearly 60 million office workers globally suffer from computer vi-sion syndrome and are unaware of their visual ergonomics during work from home until it becomes a health problem. This problem may affect the productiv-ity of work and the quality of their life. (Zalat et al., 2021). Several methods that have been used in this research are inferential and descriptive statistics. The data are analyzed according to the following steps: Pilot testing, full survey reliability test, non-response bias, data screening, and Exploratory Factors Analysis (EFA) and descriptive method. Data screening: Missing data, normality test, and outli-ers. The researcher obtained three constructions of factors after the data had been evaluated. From the 12 factors, all the elements are kept, which implies there are no removal factors for the risk factors which lead to Computer Vision Syndrome. The results of this study show that the actions taken to reduce the risk of Computer Vision Syndrome among office workers in the Pasir Gudang area who were working from home were effective. In addition, the research's goals were met with great success. The findings of this study have also led to rec-ommendations and ideas that may be used in future research.

INTRODUCTION

Since last year, computers or any digital screen usage was increased because most of the aspects of our lives in offices, universities, and at home are used to access information, communicate with others, and have professional use. Today, almost all institutions, colleges, universities, and homes use computers regularly [1]. Other researchers stated that 70% of computer operators are often reported health problems related to vision problems. They have determined that CVS is a visible disease that computing users have identified as the greatest occupational danger in the 21st century.

Millions of people, including youngsters and students, are accustomed to staring at digital screens and computers for extended periods in today's world. Nilsen (2005) stated that several studies indicate that almost 90% of the 70 million US workers who spend over 3 hours every day on computers may be affected by CVS. The visual symptoms that CVS may outcome from interacting with a computer presentation or the situation have recently been found to be specified. The signs, in most cases, occur when the task's visual demands exceed the person's graphical capability to execute the activity efficiently [2]

Computer Vision Syndrome (CVS) is similarly recognized as Digital Eye Strain (DES), defined as a group of eye and vision-related problems related to computers, tablets, e-reader, and cell phone use. Unfortunately, the study on Computer Vision Syndrome is still limited in Malaysia. CVS is characterized as a combination of visual and ocular disorders activities that pressure the near vision and are experienced while using a computer. CVS is recognized by the American Optometric Association and the Occupational Safety and Health Administration of the United States Government (OSHA) as a multidimensional set of eye and visual disorders.

2 METHODOLOGY

2.1 Data collection tools and analysis method

Table 2.1: Data Collection tools and analysis method table

Research Objectives	Sources of data	Research Question	Data Collection Tools	Analysis Method
RO 1	Respondent	What are the factors that contribute to computer vision syndrome and visual ergonomics?	Questionnaire	Inferential statistics EFA Reliability Cronbach's Alpha
RO 2	Respondent	What is the conceptual model?	Questionnaire	EFA Reliability Cronbach's Alpha
RO 3	Respondent	How prevalence of Computer Vision Syndrome and visual ergonomics among office workers during work from home mode?	Questionnaire	Descriptive Statistical Analysis

2.2 Sample and population

The research population is the total number of office workers working in Pasir Gudang, Johor manufacturing companies. Based on Kerijie Morgan,1970, N represents a population given, and S is a sample. In this case, 186 office workers should answer the questionnaire.

2.3 Research Instrument

The instrument used in this study is a development questionnaire and

analyzing the data using Statistical Package for Social Students (SPSS) software.

2.4 DATA ANALYSIS METHOD

2.4.1 Inferential Statistics

A sample is a subset of a population from which data may be obtained. Use this method to forecast and compare groups and test hypotheses. KMO and Barlett's Test will be utilized to analyze the data in this study. Exploratory factor analysis (EFA) will be used to interpret it.

a) Pre-testing questionnaire

Pre-testing is an essential component to identify the problem areas, reduce measurement error and respondent's burden, and determine the level of understanding of respondents in interpreting the questionnaire's content. It'll be returned to the researcher for additional investigation as soon as it's completed.

b) Pilot study

There is no agreed-upon sample size for a pilot test. From 10 to 25, some researchers recommend a sample size. The reliability of the pilot research may be assessed with Cronbach's Alpha technique.

c) Reliability Test

A reliability test is a method for examining the quality

measurement approach used to obtain information and data in research. This Test aims to examine the consistency outcome of the Test, as measured by Cronbach's Alpha Coefficient.

2.4.2 Non-response bias

Non-response bias is the non-response with the findings acquired from the questionnaire because the response to the questionnaire may differ amongst

respondents. The study includes the first 50 respondents and the final 50 respondents as early and prior respondents.

2.4.3 Data screening

a) Missing data

Individual cases or observations [3] recommend that missing data under 10% be ignored. A suitable number of instances or comments must be included in the chosen analysis method. Replacement values are not used to fill up the gaps in missing data.

b) Outliers

Outliers should be found to enhance the skewness, Kurtosis and critical ratio of any individual data set. Further scores known as z scores are used to identify outliers in a single variable. Researchers should raise the starting value of the standard scores by up to four standard deviations to find outliers.

c) Normality Test

Skewness and Kurtosis was used to confirm that the data were standard (2010). The permissible skewness limitations for the data are stated by [4] to be ±2.

2.4.4 Terrell Transformation Technique

Data from the Likert scale, which does not specify the size of disparities between ranks, is ordinal data in a questionnaire. Terrell Transformation Technique (Terrell, 2000) has been used to transform this raw data into interval data for analysis.

2.4.5 Descriptive statistics

Describing and characterizing data are the primary goals of descriptive analysis. This is a quick method for comparing different data sets. Using some sort of graphic or table to depict the data, a descriptive analysis shows the characteristics of the sample as a whole. It can produce numerical facts or data visualizations.

2.4.6 Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Measurement of Kaiser-Meyer-Oikin (KMO) ranges from zero to one. This indicates that the sample size is appropriate, but samples are too small at 0.6. The result is considered when the result is less than 0.5.

2.4.7 Exploratory Factor Analysis (EFA)

The interdependence method was used as the variables in this study were not defined either as independent or dependent. Exploratory Factor Analysis (EFA) is also used to identify the structure of the relationship between a variable and the respondent. The EFA can be helpful because it can maximize the factor and reduce it to a smaller set.

3 Risk factors of Computer Vision Syndrome (CVS)

3.1 Inferential Statistics

The data collected is analyzed by using SPSS statistics software. The data are analyzed according to the following steps:

1. Pilot testing
2. Full Survey Reliability test
3. Non-response bias
4. Data screening
5. Exploratory Factors Analysis (EFA)

3.2 Pilot reliability test

3.2.1 Pilot Reliability Testing for Overall Construct

Table 3.1: Reliability Statistics for Overall Construct

Reliability Statistics	
Cronbach's Alpha	N of Items
.930	12

The Cronbach's Alpha value for the 12 constructs is 0.930, which means that the questionnaire is reasonable to proceed. By referring to Cronbach alpha, the data are excellent internal consistency, and it is reliable to continue for the actual survey.

3.3 Full survey Reliability Testing

Table 3.2: Reliability Statistics for Overall Construct

Reliability Statistics	
Cronbach's Alpha	N of Items
.908	12

Table 3.2 above shows that Cronbach's Alpha value for 12 items of the overall construct is 0.908 and all of them have a reliability coefficient of more than 0.7. This implies that all the items from the construct are statistically reliable.

3.4 Terral transformation technique

$$\text{Transformed} = \frac{(\text{Actual raw score} - \text{Lowest possible raw score})}{(\text{Possible Raw Score Range})} \times 100\%$$

Where,

Y represent construct.

X representing attributes for construct Y,

n = number of facts (X) for construct Y

a) Actual Raw score for Y

=Average score of X / n

= $\sum$ (Xi)/n, where i=1

b) Lowest Possible Score

For five-point scale of 1 to 5, the lowest score for individual attribute is "1", therefore, Lowest Possible Raw score

= (Number of attributes per construct) X 1

= n

c) Possible Raw Score Range for a five-point scale of 1 to 5, a possible raw score range is 4.

3.5 non-response bias

Table 3.3: T-test of Earlylate response

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
EARLY LATE2	Equal variances assumed	.632	.431	1.209	48	0.233	8.41560	6.96339	-5.58524	22.41644
	Equal variances not assumed			1.209	47.042	0.233	8.41560	6.96339	-5.59261	22.42381

Table 3.3 shows the T-test of Earlylate Response which includes 25 early responders and 25 late responders. Based on the overall result, it shows that the significant value is 0.233. The significant value of all constructs is more than 0.5, so that there are no significant differences between early and late respondents.

3.6 Data Screening

3.6.1 Missing data

Zero surveys were classified as applicable after coding and sorting the data from those who completed the questionnaire. Missing data under 10% for individual instances or observations may often be discarded (Hair et al., 2010). Only useful questionnaires will be used in this study.

3.6.2 Outliers

Table 3.4: List of Number data that need to be deleted

Univariate outlier	Multivariate outlier
123	14 18 21 27 50
175	63 112 140 174 187

Based on Table 3.4 above, the data numbers are 14, 18, 21, 27, 50, 63, 112, 140, 174, and 187. Two data points must be removed from the analysis because they are more than -4 and +4, which are 123 and 175.

3.6.3 Normality Test

Table 3.5: Skewness and Kurtosis of all constructs

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
F1	177	1	5	3.37	1.132	-.774	.183	-.077	.363
F2	177	1	5	3.63	1.209	-1.004	.183	.211	.363
F3	177	1	5	3.20	1.084	-.522	.183	-.219	.363
F4	177	1	5	3.39	1.039	-.654	.183	.087	.363
F5	177	1	5	3.49	1.178	-.725	.183	-.209	.363
F6	177	1	5	3.46	1.153	-.582	.183	-.332	.363
F7	177	1	5	3.68	1.231	-.917	.183	.017	.363
F8	177	1	5	3.60	1.057	-.716	.183	.167	.363
F9	177	1	5	3.19	1.186	-.296	.183	-.837	.363
F10	177	1	5	3.49	1.159	-.644	.183	.013	.363
F11	177	1	5	3.56	1.196	-.688	.183	.021	.363
F12	177	1	5	3.56	1.186	-.797	.183	-.130	.363
Valid N (listwise)	177								

There is no abnormal data for any of the constructions in Table 3.5 above, which shows the result of Skewness and Kurtosis for all constructs. There are 12 constructs which are:

F1: Working department

F2: Duration of working hours

F3: Spending screen time

F4: Location of devices

F5: Sitting position

F6: Viewing distances

F7: Types of devices used

F8: Using more than one device simultaneously

F9: Duration of devices used

F10: Wearing glasses while working in front of devices

F11: Taking regular rest

F12: Adjust the brightness of the devices

3.7 Descriptive Statistics

This method is used to evaluate all the data except for that which may be inferred via inferential statistics. In-depth explanations of statistics descriptive analyses were used to examine the demographics, personal characteristics that contribute to CVS, symptoms of the user, and preventative strategies to alleviate this CVS.

3.8 Exploratory Factor Analysis (EFA)

3.8.1 Measure of sampling adequacy

Table 3.6: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.936
Bartlett's Test of Sphericity	Approx. Chi-Square	2530.498
	df	66
	Sig.	.000

Table 3.6 shows the sampling adequacy measures the amount of variance in the variables that may be attributed to underlying sources. The Kaiser-Meyer-Olkin (KMO) coefficient is 0.936 in Table 4.29 above. Bartlett's Test suggests that the significant values are less than 0.5.

3.8.2 Rotated Component Matrix

Table 3.7: Rotated component matrix

Rotated Component Matrix[a]	Component		
	1	2	3
F1	.771		
F2	.805		
F3			.600
F4		.782	
F5	.617	.649	
F6		.736	
F7	.820		
F8	.673		
F9			.886
F10	.741		
F11	.792		
F12	.693		.500

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 5 iterations.

Table 3.8 shows a new conceptual model has been developed to understand better the risk factors for the Computer Vision Syndrome (CVS) among Pasir Gudang's office employees. Table 3.6 shows that three constructs were constructed from the original questionnaire's one construct of factors and are compared to the original one in the table.

3.9 New conceptual model of risk factors that lead to Computer Vision Syndrome

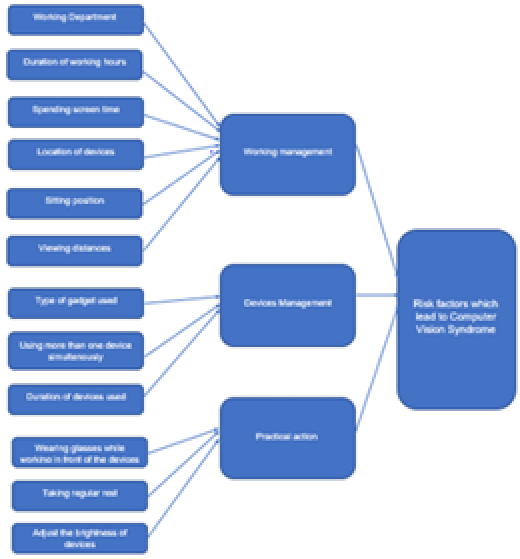

Figure 3.1: New Conceptual Model of the Risk Factors which Lead to Computer Vision Syndrome

New conceptual model of the risk factors for Computer Vision Syndrome (CVS) are represented in Figure 3.1. A total of 12 sub-constructs were used to create the three main constructs. The model is formative. When it comes to grouping items together, the title comes first.

4.0 CONCLUSION

4.1 Review of the findings

The questionnaire's variables are all valid and easy to understand. After examining the data, a new conceptual model for risk factors leading to computer vision syndrome (CVS) was developed. Risk factors for CVS were identified among office workers in the Pasir Gudang area who work from home.

4.2 Limitation of the research

a) Questionnaire

b) Number of Respondents

c) Limited Literature Review Research

d) Cannot Generalize to all industry

4.3 Future recommendation

This study's sample included only office employees in the Pasir Gudang area who were working at home throughout the pandemic. In order to acquire more specific and accurate data for the purposes of the study, the researcher should hand out physical questionnaires to participants. To bolster this study, the same methodology should be used in a different Malaysian industry. Consequently, it is hoped that fresh information will be gained concerning the risk factors for Computer Vision Syndrome (CVS).

In conclusion, The results of this study show that the actions taken to reduce the risk of Computer Vision Syndrome among office workers in the Pasir Gudang area who were working from home were effective. In addition, the research's goals were met with great success. The findings of this study have also led to recommendations and ideas that may be used in future research.

5 Acknowledgment

I sincerely thank my family and friends for their constant support and encouragement. Authors are grateful to corresponding authors Ts. Dr. Hj. Mohd Amran Mohd Daril for the guidance and support. Without them, I would not be able to complete this research.

REFERENCES

[1] Logaraj, M., Madhupriya, V., & Hegde, S. (2014). Computer vision syndrome and associated factors among medical and engineering students in Chennai. Annals of Medical and Health Sciences Research, 4(2), 179. https://doi.org/10.4103/2141-9248.129028.

[2] Anshel, J. (1999). Visual ergonomics in the workplace. ASSE Professional Development Conference and Exhibition 1999, 414–420.

[3] Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2010). Multivariate Data Analysis. 7th ed. Upper Saddle River, NJ:

[4] Field, A. (2000). Discovering statistics using spss for windows. London-Thousand Oaks- New Delhi: Sage publications.

Prentice-Hall.