

The Incidence of Computer Vision Syndrome toward Rubber Tyred Gantry Operator in Container Surabaya Terminal

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Abstract: *The use of Visual Display Terminal (VDT) in addition to providing benefits to facilitate the work also can have an impact on health, one of which is the eye health problems. On the eye syndrome experienced by workers during VDT work with for a long time called Computer Vision Syndrome (CVS). Factors associated with the occurrence of CVS were age, years of service, long break interrupted VDT use, distance to the VDT, high monitor to eye with a horizontal line. This research is to identify the major risk of the relationship between ages, years of service, long break interrupted VDT use, distance eyes to VDT, high monitor to eye with a horizontal line on the operator Rubber Tyred Gantry (RTG) to CVS incidents in Surabaya Container Terminal. This study is an observational study using cross sectional design. The total respondent amounted to 34 people. This study was population study. All RTG operator was taken as respondent. Data were collected through an interview guide (interview), Body Map Nordic questionnaires and medical examinations. Data were analyzed with descriptive statistics, correlation and binary logistic regression analysis. The results showed that 58.8% of respondents experienced CVS. Statistical analysis of the risk factors found associated with the variable age CVS odds ratio =14 (95%CI=2,37-82,71), variable working time odds ratio =11 (95%CI=2,51-56,09), the old variable break interrupted VDT use odds ratio =7 (95%CI= 1,29-41,65), the variable distance to the VDT odds ratio =16 (95%CI = 1,73-145,78), high variable monitor to eye horizontal line odds ratio =4 (95%CI = 0,55-23,24). The variable distance to the VDT is the most risk factors for experiencing incidents CVS on RTG operator at Container Surabaya terminal.*

Keywords: computer vision syndrome, rubber tyred gantry operators, container surabaya terminal

1. Introduction

The information age today are using information technology tools. All agree that the development of technology many benefits. Likewise with the computer, only the use of computers in the work and activities is not without problems. Even has become a public issue that the uses of computer devices also have an impact. Problems of physical fatigue, mental, stress, pain, impaired vision and a variety of symptoms due to user inconvenience computing devices will interfere with the productivity of workers (Sulianta, 2010).

The impact of computer or VDT use may cause interference or on one's health complaints. Both disturbances in vision such eyestrain, blurred vision, dry eye (dry eye), headache, or other complaints relating to vision due to exposure to VDT namely skeletal muscle complaints eg pain in the neck, shoulders and back. Or symptoms of the syndrome were today better known as Computer Vision Syndrome (Roestijawati, 2007).

Musculoskeletal disorders among VDT workers: individual, ergonomics, and the work organizational factors according to National Institute of Occupational Safety and Health (NIOSH) (2000) showed that 88% of computer user complaints CSV for a long time. More of 75 millions worker sit in front of computer every day. 70% more of them get CVS (Bureau of Labor Statistics United States, 1998). United States Census report, 2001 showed 143 millions and more American people spend their time in front of computer every day, and 54 millions of them are children. More of 70% of

them get CVS (Torrey Jon, 2003). A survey on September 2001 report 72.300.000 people use computer in their working area (Sitzman, 2005).

Surabaya Container Terminal is a company engaged in container services, which in many operations using heavy equipment, one of which is a Rubber Tyred Gantry (RTG), the tool is used to lift the containers are transported by truck to do buildup Head in yard. The operation of the RTG using the panel and display monitor or visual display terminal (VDT), the VDT provides information on container, which is monitored continuously by the operator in the operation RTG. VDT exposure duration at RTG operator is 4 hours to 8 hours a day. Some operators sometimes do not rest throughout the working hours. Based on subjective information from the carrier at the time of the preliminary study; many complain of tired eyes, blurred vision, dry eyes, double vision, neck pain, back pain, dizziness while working as an operator RTG. Based on objective data from medical check-up results, obtained 36% decrease in visual acuity at RTG operators.

Based on the above data, the study aims to identify the risk factors associated with the incidence of CVS on RTG operator at Container Surabaya terminal.

2. Materials and Methods

This study is an observational study using cross sectional design. The total respondent amounted to 34 people. The entire group RTG operator D on the morning shift. This study was population study. All RTG operator was taken as

respondent. This research was conducted at the Container Surabaya terminal - East Java - Indonesia. This study was conducted in December 2014 and January 2015.

The variables in this study consists of two, independent variables namely; age, years of service, long break interrupted VDT use, distance to the VDT, high monitoring of horizontal lines the eye, and the dependent variable; CVS incidents.

Technique data collection in this study is the interview guide (interview), Body Map Nordic questionnaires and medical examinations. Data were analyzed with descriptive statistics,

correlation and binary logistic regression analysis.

3. Results

3.1. Frequency distribution of the independent variables

The variables in this study is a factor of workers (age, years of service, a long break was interrupted by the use of VDT), a factor working device (eye distance with VDT, high horizontal line monitoring of the eye).

Table 1: Frequency Distribution of Factors Associated with the Incidence of CVS on RTG Operators

Variables	Incidence of CVS		n (%)
	Positif	Negatif	
Age			
1. > 33 years old	14 (87,5%)	2 (12,5%)	16 (100%)
2. ≤ 33 years old	6 (33,3%)	12 (66,7%)	18 (100%)
Work period			
1. > 6 years	15 (83,3%)	3 (16,7%)	18 (100%)
2. ≤ 6 years	5 (31,3%)	11 (68,8%)	16 (100%)
long breaks interrupted the use of VDT			
1. < 4 mnt	11 (84,6%)	2 (15,4%)	13 (100%)
2. ≥ 4 mnt	9 (42,9%)	12 (57,1%)	21 (100%)
distance to the VDT			
1. < 45 cm	11 (91,7%)	1 (8,3%)	12 (100%)
2. ≥ 45 cm	9 (40,9%)	13 (59,1%)	22 (100%)
Monitor high-frequency distribution of the horizontal line the eyes			
1. Higher	18 (63,4%)	10 (35,7%)	28 (100%)
2. Lower	2 (33,3%)	4 (66,7%)	6 (100%)

Based on Table 1 of the 34 respondents. Respondents with age more than 33 years who experience CVS total of 14 respondents (87.5%) and respondents with age less than or equal to 33 years old who have CVS total as 6 respondents (33.3%). The number of respondents with over age of 33 years are 16 people. The number of respondents with age less than or equal to 33 years are 18 people.

More respondents working period of 6 years or who have CVS are 15 people (83.3%). Respondents working period is less than or equal to 6 years old who have CVS as many as 5 people (31.3%). The number of respondents whose working period less than 6 years as many as 18 people. Respondents whose tenure is more than or equal to 6 years as many as 16 people.

Older respondents break interrupted VDT use less than 4 minutes every 1-2 hours, which undergo CVS as many as 11 people (84.6%). Older respondents break interrupted VDT use more or equal to 4 minutes every 1-2 hours, which undergo CVS were 9 people (42.9%). The number of respondents who long break less than 4 minutes every 1-2 hours worked as many as 13 people, the number of respondents who long break more or equal to 4 minutes every 1-2 hours as many as 21 people.

Distance eyes respondents to VDT less than 45 cm who have CVS as many as 11 people (91.7%). Distance eyes respondents to VDT more or equal to 45 cm are experiencing CVS were 9 people (40.9%). The number of respondents who distance to the VDT less than 45 cm by 12 people, the number of respondents whose distance to the VDT greater than or equal to 45 cm by 22 people.

Respondents who work with the monitor position is located higher than the horizontal line the eyes of respondents who experienced CVS as many as 18 people (63.4%). Respondents who worked with the position of the monitor that is located parallel or lower than the horizontal line the eyes of respondents who experienced CVS by 2 people (33.3%). The number of respondents who monitor the position higher than the horizontal line the eyes of many as 28 people, the number of respondents who monitor position is located parallel to or lower than the horizontal line the eyes of many as 6 people.

3.2. Dependent Variable Frequency Distribution

The dependent variable of this study was the incidence of CVS. Symptoms of CVS events are eye fatigue, dry eyes, blurred vision, neck pain, back pain, double vision, headaches, and dizziness.

Table 2: Frequency distribution of the dependent variable; Symptoms of CVS on the carrier

Symptoms of CVS	N	%
eye fatigue: 1. yes 2. no	27 7	79,4% 20,6%
dry eyes: 1. yes 2. no	4 30	11,8% 88,2%
blurred vision: 1. yes 2. no	23 11	67,6% 32,4%
neck pain: 1. yes 2. no	25 9	73,5% 26,5%
Back pain: 1. yes 2. no	24 10	70,6% 29,4%
double vision: 1. yes 2. no	1 33	2,9% 97,1%
headaches: 1. yes 2. no	0 34	0% 100%
dizziness: 1. yes 2. no	2 32	5,9% 94,1%
Symptoms of CVS: 1. yes 2. no	20 14	58,8% 41,2%

Research of Variable factors working device	CVS Incidents		n (%)	r	OR (95%CI)
	Positif	Negatif			
distance to the VDT 1. < 45 cm 2. ≥ 45 cm	11 (91,7%) 9 (40,9%)	1 (8,3%) 13 (59,1%)	12 (100%) 22 (100%)	0,442	16 (1,73 - 145,78)
high monitors to the horizontal eye 1. Higher 2. lower	18 (63,4%) 2 (33,3%)	10 (35,7%) 4 (66,7%)	28 (100%) 6 (100%)	0,233	4 (0,55 - 23,24)

Based on Table 2, respondents who experienced eye fatigue as many as 27 people (79.4%). Respondents who experience dry eyes as much as 4 people (11.8%). Respondents who experienced blurred vision 23 people (67.6%). Respondents who experienced neck pain as much as 25 people (73.5%). Respondents who experience back pain as much as 24 people (70.6%). Respondents who experienced double vision as much as one person (2.9%). Respondents who experienced no headaches, experienced dizziness for 2 persons (5.9%).

3.3. Large Risk Factors Genesis Workers with CVS on RTG Operators

Correlation analysis of factors working with CVS incidents at RTG operators include factors; age, Work Period, and long breaks interrupted VDT use. Correlation analysis of factors working with CVS incidents listed in the following table:

Table 3: Great working with the incidence of risk factors CVS on RTG operators

Variables Research Factor of work	CVS Incidents		n (%)	r	OR (95%CI)
	Positif	Negatif			
Age 1. >33 years old 2. ≤ 33 years old	14 (87,5%)	2 (12,5%)	16 (100%)	0,481	14 (2,37-82,71)
	6 (33,3%)	12 (66,7%)	18 (100%)		
Work Period 1. > 6 years 2. ≤ 6 years	15 (83,3%)	3 (16,7%)	18 (100%)	0,467	11 (2,51-56,09)
	5 (31,3%)	11 (68,8%)	16 (100%)		
Long breaks interrupted VDT use 1. < 4 mnt 2. ≥ 4 mnt	11 (84,6%)	2 (15,4%)	13 (100%)	0,381	7 (1,29-41,65)
	9 (42,9%)	12 (57,1%)	21 (100%)		

The results of correlation analysis between the independent variables workers factors include: age, years of service, long break interrupted VDT use with the dependent variable; CVS incidents, based on Table 3. The age variable, showed that age above 33 years old have a 14 times greater the risk of experiencing CVS compared with respondents aged under or equal to 33 years. Variable working period, showed that respondents who had worked for more than six years had 11 times the risk of experiencing a large CVS compared with respondents who have worked for less than or equal to 6 years. Variable long break interrupted VDT use, showed that respondents who long break interrupted VDT use less than 4

minutes every 1 hour has 7 times the risk of experiencing major incidents compared with respondents CVS long break interrupted VDT use more or equal to 4 minutes every 1 hour.

3.4. Big risk factor working device with CVS incidents at RTG operators

Correlation analysis of factors working device with CVS incidents at RTG operators include factors; distance to the VDT, high monitors to the horizontal eye. Correlation analysis of factors working device with CVS incidents listed in the following table:

Table 4: Large risk factors working device with CVS incidents at RTG operators

Research of Variable factors working device	CVS Incidents		n (%)	r	OR (95%CI)
	Positif	Negatif			
distance to the VDT 3. < 45 cm 4. ≥ 45 cm	11 (91, 7%)	1 (8, 3%)	12 (100%)	0,442	16 (1,73 - 145,78)
	9 (40, 9%)	13 (59, 1%)	22 (100%)		
high monitors to the horizontal eye 3. Higher 4. lower	18 (63, 4%)	10 (35, 7%)	28 (100%)	0,233	4 (0,55 - 23,24)
	2 (33, 3%)	4 (66, 7%)	6 (100%)		

CVS 4 times compared with respondents who work with high monitor parallel to the horizontal eye or lower.

3.5. The risk factors associated with the incidence of CVS on RTG operators with logistic regression analysis

Correlation analysis with a view of the risk on any factors associated with the incidence of CVS on RTG operators on variables such as; age, years of service, long break interrupted the use of VDT, distance to the VDT, high monitor to eye horizontal line, then analyzed binary logistic regression to determine risk factors that most influence on the incidence of CVS (Dahlan, S, 2012).

Table 5: Results of Binary Logistic Regression Analysis of the risk factors associated with the incidence of CVS on RTG operators

Independent Variables	B	Exp (B)
Age	1,473	4,362
Work Period	1,432	4,187
Long breaks interrupted VDT use	1,556	4,740
distance to the VDT	1,770	5,872
high monitors to the horizontal eye	1,550	4,712

Data were obtained from Table 5 shows the results of the regression analysis of the risk factors associated with the incidence of CVS on RTG operator at Container Surabaya terminal. Age variable indicates that each additional year of age, it will cause great risk of 4.362 times the incidence of CVS. Variable working lives shows that each additional working period of one year, it will cause great risk of 4.187 times the incidence of CVS. Variable long break was interrupted by the use of VDT show that any reduction in one minute rest period was interrupted by the use of VDT per hour; it will cause great risk of 4.740 times the incidence of CVS. Variable distance to the VDT shows that each additional centimeter closer to VDT at work, it will cause great risk incidents CVS 5,872 times. Variable height to the horizontal eye monitor shows that each additional person using VDT operators monitor a higher high above the horizontal line, the eyes will cause great risk of 4.712 times the incidence of CVS on the operator.

Variables that have the highest risk for experiencing CVS is a variable distance to the VDT, showed that respondents VDT distance to less than 45 cm have 16 times the risk of experiencing major incidents compared with respondents CVS distance to the VDT greater than or equal to 45 cm . Variable distance to the VDT shows that each additional centimeter closer to VDT at work, it will cause great risk incidents CVS 5,872 times.

4. Discussion

The relationship between ages at CVS

Age aging causes further loss of elasticity of the eye lens, lens flexibility decreases every year and lose the ability to adjust so that the power of accommodation dwindle because the eye muscles increasingly difficult to thicken and thin out the eye lens causes a tendency to experience greater eyestrain. Instead the younger you are, the light needs to be less than that of older age. According to Guyton (1991) states that the power of accommodation decreases at the age of 45-50 years.

The results of this study indicate that the age of the respondents above 33 years had 14 times the risk of experiencing a large CVS compared with respondents aged under or equal to 33 years. With increasing age the more risky for CVS incidents, each additional year of age, the greater the risk of 4.362 times the incidence of CVS.

This is consistent with studies conducted by Das and Ghosh (2010) states that workers VDT users over the age of 40 years complained of discomfort using VDT related to health, with the highest level compared with other age groups. This can be explained as a result of the aging process that causes a decrease in the function of the body, in this case is a function of vision.

The relationship between tenure with CVS

The existence of similar results from this study could be due to workers who have worked long course at greater risk for the occurrence of eye complaints due to long exposure to the risk factor. Haeny N. research (2011) on the analysis of risk

factors for subjective complaints of eyestrain on the radar controller PT. Angkasa Pura II, the main branch of the Soekarno-Hatta Airport, reported a total of 63.5% of radar controller who has worked more or equal to four years of experience in eye fatigue.

According to the research results Roestijawati (2007) that the presence of eye disorders workers after work with a long working range of more than four years. Prevalence of dry eye increased to 48% in the period of employment of workers with more than four 4 years.

The results of this study found that respondents who worked more than 6 years have an 11 times greater the risk of experiencing a CVS compared to respondents who work less or equal to 6 years. With each additional working period of one year, it will cause great risk of 4.187 times the incidence of CVS.

The relationship between the Old Rest Interrupted VDT use with CVS

A short break but often can reduce worker discomfort computer users and increase productivity when compared with a 15 minute break in the morning and at lunch hour break (Blehm, et, al., 2005). Research by Ye et al (2007) found that a break for 10-15 minutes after the use of a computer is a protective factor against the emergence of complaints CVS while not taking a break is a risk factor with an odds ratio of 5.1.

The results of this study found that respondents who are not taking the time to break the routine was interrupted by a job for less than 4 minutes per hour, it will have a big risk 7 times to experience the CVS compared with respondents who took time off for more than or equal to 4 minutes on each hours to do the eye and muscle relaxation.

The relationship between the distance eye to VDT with Genesis VCS

Distance to the VDT when the worker is at least 20-40 inches or 50-100 cm. This is in accordance with reason or the main cause of eyestrain is the distance the eye is too close to the monitor, so that the eyes are forced to work to see from a short distance away in a fairly long period of time, while the function of the eye itself was not devoted to view at close range (OSHA, 1997).

Eye fatigue occurs when the eyes focus on the VDT view where the object seen is too small, less bright, moving, and vibrate. Light entering the eye of the object being viewed is not enough so that the concentration of light on the retina is not perfect. Accommodation involves working senses and extra ocular muscles that cause narrowing of the pupil (miosis) approaches the point of near vision and the convergence of the position of the eyeball. When the eyes do contractions of time can cause eye muscle spasm and can lead to pain. Therefore, fatigue eye on VDT users can be associated with eye sight distance (Hanum and Iiz, 2008).

The results of this study found that respondents who work with the distance to the VDT less than 45 cm have 16 times

the risk of experiencing major incidents CVS compared with respondents who work with eye distance of more than 45 cm. With each additional centimeter closer to VDT at work, it will cause great risk incidents CVS 5,872 times.

High relationship to the horizontal eye monitors of CVS incidence

Position the top of the monitor is higher than the height of the horizontal eye causing a greater viewing angle which then can reduce the frequency of blinking, thereby reducing the production of tears, lack of tear production will affect a person's eyes to experience the sensation of dry eyes or irritation, besides it is also the position of the eye see VDT with a greater angle above the horizontal line will cause the eyeball eyes opened wider, causing greater evaporation process (Herman, 2001).

Research conducted by Chiemeke et, al (2007) who reported that symptoms of visual impairment more complaints by workers computer with viewing angle upwards of 300-500 opposite the VDT workers who work with visual angle towards the top of less than 150 is not much complain of vision problems.

The results showed that respondents who work with the monitor height higher than the horizontal line has a great eye 4 times the risk of experiencing incidents CVS compared with respondents who work with the monitor higher or lower than the horizontal line of the eye. This could be due to the respondent at the sight of VDT with a higher viewing angle up causing more wide open eyes and when such a process of evaporation of larger eyes, especially accompanied with less eye blink response because the focus to see the characters in the VDT, causing the eye can dry quickly.

5. Conclusion and Acknowledgements

The conclusion from this research is that workers factors associated with the incidence of CVS seen big risk is age, year, old break interrupted VDT use. Factors working device in connection with the CVS seen big risk is the distance from the eye to the VDT, high monitors to the horizontal eye.

Variable distance to the VDT is the factor that has the greatest risk for experiencing incidents CVS at RTG operator at Container Surabaya terminal.

6. Suggestion

Company management should enable the safety talk by inserting information relating to health and safety. Tightening regulations on the use of PPE, especially in efforts to control the incidence of CVS on RTG operator VDT users. And to evaluate the state of the physical environment of work, related to the exposure of workers to the working conditions which are not ergonomic.

Worker of VDT user must conduct a princident act toward the occurrence of CVS by growth desire and improving the awareness in princidenting effort the impact of VDT using.

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