

Lowering Location of Lights, Repair of Temperature, Repair Tables-Chairs, Setting Distance Eyes to Computer, And Adjustment Using Mouse to Improve Performance (Decrease Fatigue, Complaints and Pain Carpal Tunnel Syndrome (CTS)) On Computer Users in Company X

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Abstract - Performance of the company depends from the people who work there. Working is healthy and very fun let alone gets high lard, is constitute wishful thinking of all the people. With increasing demands of life concomitant with increasing the necessities of life are gradually. Work which carried out using computers and other supporting devices such as computer mouse and keyboard. The working conditions at the company could lead to the risk of eye fatigue, general fatigue, musk skeletal complaints, and ill Carpal Tunnel Syndrome (CTS). To reduce the risk of complaints, fatigue, and pain done by increasing the intensity of lighting, climate control, repair to table and chairs, setting the distance of the eye to the computer, and adjust the mouse in the size of the palm of the hands of workers. The method used has a draft pre-test and post-test design group. This study design is not same is the subject. The analysis in this study by comparing between groups before and after repair using ANOVA. The results of the analysis on the repair lighting, temperature, chair-table, the distance a eye on the computer, and use of the mouse is the average decline of general fatigue by 23%, musculoskeletal complaints by 14%, eye fatigue is 30%, and pain Carpal Tunnel syndrome (CTS) by 20%. Decreased fatigue, complaints, and pain due to improvements made in outline can increase the performance of the company. Model to improvement in research at the company x can done improvement back to get better results in a different Company.

Keywords: Intensity Lighting, Temperature, Tables, Chairs, and Computer.

I. INTRODUCTION

Company X is engaged in the sale of services of electrical pulses in Badung area, Bali. Company X has a pretty swanky building with employees is pretty much namely 45 people. Employees in completing work tasks using computer facilities. Computers used in completing a job require other a means such as mouse. The mouse which used with a variety of shapes and sizes. Judging from the condition existing that the company desire to improve the performance of the company by doing research. Research conducted by getting workplace room with size is 30 x 15 m² and a height the space of 3.20 m. The study also gain light intensity in the room was 212

lux, yet according to Indonesian National Standard between 250 to 500 lux [8]. Research also gets a temperature of cool the room achieves 26 °C. Whereas the temperature according to Indonesian standards between 25 ± 1 °C [4]. Noise in the workspace in this study after done the measurement obtain as big as 30 dB (A), the noise of 30 dB (A) includes not interfere with the work and including the level of calm [9],[16]. Research on with an eye distance with computer the workers average 50 cm, also not in accordance with the opinion of the experts is about 65 cm[18]. Research working company hours is 8 hours with an interval of work from 9.00 till 17.00. The study also found workers doing work with computers because work more many sending data. Delivery data through computer the use of mouse in continuously during for the work done. As a result of lighting conditions, temperature, tables and chairs, set the distance the eye with a computer, and using a mouse that does not conform occurring eye fatigue, general fatigue, musculoskeletal complaints, and experiencing symptoms Carpal Tunnel Syndrome (CTS) [2], [3], [7], [11], [13], [19]. Disease Carpal Tunnel Syndrome (CTS) is a phenomenon in which the hand or wrist rather weak and stiff, the fingers feel uneasy, especially tingling in the thumb, index and middle fingers. Due to eye fatigue, general fatigue, musculoskeletal complaints, and experiencing symptoms Carpal Tunnel Syndrome (CTS) research needs to be done. The study was done against: 1) Conditions prior to improvement. 2) After doing repairs against the intensity of illumination, temperature, an improvement on the desk-chair, adjust the distance of the eyes with a computer, and using the mouse.

II. METHODS

The samples in this study were 36 employees of company X and sampling with the taking in random. Data were collected using questionnaires and direct data retrieval. The method in this study had a draft pre-test and post-test design group. Analysis of the results using ANOVA performed on the group before and after the repair to get a drop on each treatment. Data were taken at

5 months from May 2 until October 5, 2013 in the company x.

| | | | |
|----------------------------------|--------|--------|--------|
| Thick the belly (abdominal) (cm) | 15.400 | 20.600 | 28.600 |
|----------------------------------|--------|--------|--------|

III. RESULT AND DISCUSSION

A. Research Results

- *Data the size hand to workers*

Measurements were taken at the time done of the research to workers.

Table 1. The size hand anthropometry

| | N | Mean | Std. Deviation |
|---|----|--------|----------------|
| • Length of hand | 36 | 18.000 | 0.640 |
| • Length of palms | 36 | 10.917 | 0.597 |
| • Width of hand up to thumb | 36 | 8.292 | 0.450 |
| • Width of hands up to meta carpal | 36 | 9.417 | 1.379 |
| • Circumference hands up to forefinger | 36 | 8.875 | 0.483 |
| • Circumference hand up to thumb | 36 | 11.167 | 0.835 |
| • The thickness of the hand up to meta carpal | 36 | 3.125 | 0.311 |

Source: ⁽¹⁰⁾

These data were obtained by measuring directly at the time the research was conducted.

- *The data anthropometric of workers*

Table 2. Results analysis percentile of data anthropometric of students on a seated position (N = 36)

| Item Anthropometry | Percentile 5 | Percentile 50 | Percentile 95 |
|-------------------------------------|--------------|---------------|---------------|
| Reach hand forward (cm) | 61.300 | 65.390 | 70.200 |
| Height the body (cm) | 125.400 | 131.60 | 138.320 |
| Height Eye (cm) | 113.510 | 118.620 | 127.520 |
| Shoulder height (cm) | 99.970 | 105.150 | 109.840 |
| Shoulder width (bideltoid) (cm) | 35.450 | 42.690 | 47.940 |
| Elbow height (cm) | 64.320 | 68.850 | 73.390 |
| Knee height (cm) | 46.930 | 50.900 | 55.870 |
| High the popliteal (knee fold) (cm) | 43.870 | 45.070 | 48.270 |
| Distance buttock-popliteal (cm) | 39.970 | 45.820 | 51.570 |
| Width the hip (cm) | 31.270 | 36.730 | 42.190 |

- *Results of analysis of the complaints*

Table 3. Mean of Complaints, fatigue, and ill before and After Repair

| Variabel | n | Mean | Std. Deviation |
|---|----|--------|----------------|
| Fatigue general before repair | 12 | 39.333 | 1.371 |
| Fatigue general after repair lighting and temperature | 12 | 36.250 | 5.207 |
| General fatigue after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 12 | 26.167 | 3.215 |
| Variabel | n | Mean | Std. Deviation |
| Musculoskeletal complaints before repair | 12 | 46.250 | 4.288 |
| Musculoskeletal complaints after repair lighting and temperature | 12 | 42.833 | 1.850 |
| Musculoskeletal complaints after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 12 | 36.833 | 3.407 |
| Variabel | n | Mean | Std. Deviation |
| Fatigue eye before repair | 12 | 16.250 | 2.050 |
| Fatigue eye after repair lighting, temperature | 12 | 12.167 | 1.642 |
| Fatigue eye after repair lighting, temperature, table, chair, distance eyes to komputer, and mouse | 12 | 9.417 | 0.515 |
| Variabel | n | Mean | Std. Deviation |
| Carval Tunnel Syndrome before repair | 12 | 25.167 | 1.642 |
| Carval Tunnel Syndrome after repair lighting and temperature | 12 | 22.500 | 1.446 |
| Carval Tunnel Syndrome after repair lighting, temperature, table, chair, distance eye to komputer, and mouse | 12 | 17.917 | 3.988 |

Table 4. Results Decline Analysis of Complaints before and After Repair

| (I) Group | (J) Group | Decrease Fatigue, Complaints, and ill | P | Fatigue after lighting, temperature | eye repair | Fatigue after repair lighting, temperature, table, chair, distance eyes to koputer, and mouse | Decrease Fatigue, Complaints, and ill | P |
|--|---|---------------------------------------|-------|--|------------|---|---------------------------------------|-------|
| Fatigue general before repair | Fatigue general after repair lighting and temperature | 3.083 | 0.045 | | | | 2.750 | 0.000 |
| Fatigue general before repair | Fatigue general after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 13.167 | 0.000 | Carval tunnel syndrome before repair | | Carval tunnel syndrome after repair lighting and temperature | 2.667 | 0.018 |
| Fatigue general after repair lighting and temperature | Fatigue general after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 10.083 | 0.000 | Carval tunnel syndrome before repair | | Carval tunnel syndrome after repair lighting, temperature, table, chair, distance eye kekomputer, and mouse | 7.250 | 0.000 |
| (I) Group | (J) Group | Decrease Fatigue, Complaints, and ill | P | Carval tunnel syndrome after repair lighting and temperature | | Carval tunnel syndrome after repair lighting, temperature, table, chair, distance eye kekomputer, and mouse | 4.583 | 0.000 |
| Musculoskeletal complaints before repair | Musculoskeletal complaints after repair lighting and temperature | 3.417 | 0.017 | | | | | |
| Musculoskeletal complaints before repair | Musculoskeletal complaints after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 9.417 | 0.000 | | | | | |
| Musculoskeletal complaints after repair lighting and Temperature | Musculoskeletal complaints after repair lighting, temperature, table, chair, distance eyes to computer, and mouse | 6.000 | 0.000 | | | | | |
| (I) Group | (J) Group | Decrease Fatigue, Complaints, and ill | P | | | | | |
| Fatigue eye before repair | Fatigue eye after repair lighting, temperature | 4.083 | 0.000 | | | | | |
| Fatigue eye before repair | Fatigue eye after repair lighting, temperature, table, chair, distance eyes to | 6.833 | 0.000 | | | | | |

B. Discussion

A. Size hand workers

The size of the mouse is taken from the size of the hands the workers to reduce ill Carpal Tunnel Syndrome [12] . To be able to work well must be search the mouse with the size anthropometry own hands. Many models and sizes the mouse which there are and sale on the market. The Mouse is the one that causes the ill of Carpal Tunnel Syndrome [12] .

B. Size anthropometric workers

To get a chair-table size, distance of the eye to the computer and height the computer with the eyes is very necessary to know worker anthropometry [17]. The size required is the seat height of 43 cm, height the computer against the eye is 113 cm , High the keyboard is 64 cm (high elbow see Table 2), a distance of eye to the computer is 65 cm [1] , [7] , [17] .

C. General fatigue

General fatigue may occur due to the temperature that is not in accordance with the existing working conditions [17] . Be done improvement temperature by adjusting the of the temperature becomes [4] , because the temperature of the air in Bali also experience improved

which sometimes the temperature of the outside air from the sun reaches.

Improvements in lighting and air temperature in the room adds to the power to the see and perceived coolness of workers resulting in a general decrease fatigue by 27% [2] , [3] .

D. Musculoskeletal complaints

Musculoskeletal complaints can be caused by a seat that does not fit the size of workers [10] . Seat which good is a seat with size the height folding knee of mean of 43 cm (Table 2). This size is used as a measure high the chair in the study [1] . Musculoskeletal complaints in the neck can be caused by high computer from eye, then the height of the table should be regulated so the computer slightly lower than the eye.

Improvements which made on the lighting, temperature, chair-table, the distance eye to the computer, and the mouse resulting in a decrease in musculoskeletal complaint [2] , [3] , [11] , [17] , [18] . After repair occur decreased of musculoskeletal complaints by 20%.

- **Fatigue eye**

To provide comfort to the eyes done of the calculation against the lights, so the obtained the addition of light intensity. The addition of the intensity of the light is done by lowering position of the lights be 25 cm from its original position by provide iron pipe to withstand the force due to weight of the lights [5] . Improvements conducted provide an impact with the addition of light intensity to be 260 lux (14). The addition of light intensity resulted in a decrease of eye fatigue by 25%. Eye fatigue can also occur due to eye distance is too close to the computer [18] , [19] .

- **Carpal tunnel syndrome**

Carpal Tunnel Syndrome ill caused by too long to use the mouse and aggravated by working conditions in the workplace such as conditions the intensity of lighting, temperature, chair-table, the distance of eye to a computer, and a mouse [13] , [15] . We recommend using a mouse with a length of 18 cm (Table 1), appropriate the with length of the hands of workers. Repairs performed occur a decrease ill Carpal Tunnel Syndrome by 22%.

- **Performance**

Performance resulting from the research which was conducted covers the reduction in eye fatigue, general fatigue, musculoskeletal complaints, and ill Carpal Tunnel Syndrome (CTS) [17] , [18] .

Performance constitute the purpose of the work performed, but the size which is used on the basis of the ability of humans to done the that job. Ability which referred is if human can do work without feel the pressure because of fatigue, complaints, and ill that is felt as a

result of doing the job [17] , [18] . In the graph shows a decrease of fatigue, complaints, and pain in workers then an occurs increase of the average performance of 22%.

IV. CONCLUSION

1. Model improvements which done very good to lower the eye fatigue, general fatigue, musculoskeletal complaints, and ill Carpal Tunnel Syndrome. The result of these improvements can be done anywhere or as a reference if any working environment using a computer.
2. The results of this study can be used as a reference to improve working conditions in relation to achieving the company's performance.
3. Model to improvement on research in the company x can done improvement be back to get better results.

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