Analysis Factors Influences Musculoskeletal Disorders To Computer Operator

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Abstract — A Preliminary survey showed about 74% of computer operators experienced musculoskeletal disorders (MSDs) before and after doing their job. Due of the fact, MSDs research especially at neck and shoulders muscle would be conducted relating to awkward body position and another factor which influenced them.

This research was cross sectional design with analytical analysis. 38 Sample size was taken from 50 as population by simple random sampling and Lemeshow formula.

MSDs at neck shoulder was dependent variable and independent variable were awkward position, repetitive motion and overload tasks. The individual factors might influence MSDs were age, sex, work period and nutrient status. variables were analyzed by regression logistic test.

Result showed that computer operators with awkward body position is 65.8% and repetitive motion is 34.2%. 47.4% respondents experience MSDs (neck shoulders muscle pain). Long period of MSDs complaint for one day at 60% and absenteeism was 55% of 20 respondent in one month. Reasons of absenteeism were MSDs and others reason.

Individual characteristic consist of age < 36 years old was 50%, man was 71.1%, work period <5 years and > 10 years was 63.2% and ynormal nutrient status was 63.2%.

Work station (work chair and work table) showed not fit with antropometric body of operators computer and equipment computers too at Dispenda Province office.

There was association between neck pain with awkward body position at p = 0.04 (α = 0.05). Nutrient status influences MSDs with p < α and others factor such as age, work period, overload tasks do not influence to MSDs. Conclusion was computer operator doing the job with awkward body position. Information and socialization of ergonomic norm should be implemented to computer operator office.

Keywords — Factors Influences Musculoskeletal Disorders, Computer Operator

I. INTRODUCTION

Background

Work in ergonomics means working by observing the position or posture is correct.

The Initial observations found about 78% Officers work with the uncomfortable stance, such as: continuous work on the position of the neck to bend down for over 2 hours, do the job that is repeated over and over without intermission over 2 hours total a day often performed mostly on the operator's computer.

The risk may occur if disregarded factors ergonomics, musculoskeletal disorders is one of the muscles of the neck (neckshoulders), the back muscles (lowbackpin), etc.

These symptoms are usually not felt and will gradually become a serious damage or called Cumulative trauma disorders (CTD) that could lead to the occurrence of Tendinitis, Rotator Cuff Tendinitis, Tenosynovitis, Carp al Tunner. (Suhardi, 2008)

Musculoskeletal disorders are the perceived grievances on the part of the skeletal muscle is a result of static load on the muscles receive repeatedly and quite a long time so it could cause damage to the joints, ligaments and tendons. (Grandjean, 1993).

Reported by the Labor Department in 1982, Amirika shows that nearly 20% of all cases of pain due to work and 25% compensation costs incurred in connection with any complaint/pain in the muscle of the skeletal. Publications from NIOSH showing that financial compensation for complaint costs skeletal muscle has reached 13 billion Rupiahs US dollars every year. It shows the diseases caused by work disruptions muscle (skeletal) still ranked higher than other occupational diseases.

Based on the background of the above researchers wanted to study the musculoskeletal disorders and the factors that affect the computer operator officer specifically on the environment xxx with a high workload and a case that had befallen him.

Limit Problem

In this study, researchers will limit only complaints that relate to a job as a computer operator in the environment and the factors that affected him xxx (individu characteristics, work environments and work attitude).
Problem Formulation

(1) how much of the perceived musculoskeletal disorders on the operator's computer. (2) whether the complaint is affected by other factors, such as: individui, characteristics of the work environment or the manner of work.

II. RESEARCH OBJECTIVES

General Purpose

In General, this research aims to study the musculoskeletal disorders (neck muscles) on the operator's computers and the factors that affected it.

Special Purpose

(1) find out the characteristics of the individui, include: Age, gender, duration of work and nutritional status. (2) Measure the working attitude of Anthropometry and workstations. (3) an ergonomic work posture Knowing. (4) musculoskeletal disorders by Analyzing the factors that affected it.

Theoretical Benefits

For this study the researchers theoretically will add insight knowledge of occupational health studies in particular musculoskeletal disorders on the officer's computer operators.

Practical Benefits

Be gained experience about how the working attitude of Anthropometry measurements sit individui nutritional status and their relationship.

III. RESEARCH METHODS

Design Research

This type of research is observational, analytical research and is designed for cross-sectional.

Populations and Samples

As the population is computer operator with the sample amounted to 38 respondents, i.e. using the formula samples from Lemeshow, 1997 with an estimated population of 70% and a 7% error factor.

The Conceptual Framework

IV. RESEARCH VARIABLES

Free Variables

Free variables in research is a position awkward, repetitive motion, computer workstations and individual characteristics. (age, gender, duration of work and nutritional status)

Variable Depends

Variables bound at the musculoskeletal disorders research is the neck muscles (neckmuscle)

Engineering data collection

Data collection techniques are executed immediately, a questionnaire (the nordic method body folder), measurement of body observation and Anthropometry.

Data Analysis Techniques

The Data collected are then processed, tabulated and analysed using statistical tests.
V. RESULTS AND ANALYSIS

Results

1. Measurement of the results of the work on the position of Anthropometry sit, as computer operator at: Suitability of placement of computer devices:

   a. This Type Of Observation of Height sitting
      Standard Deviation (SD): 2.82
      5% percentile : 73
      95% percentile : 85
      Average : 78.7

   b. This Type Of Observation of Knee High
      Standard Deviation (SD) : 3.2
      5% percentile : 43
      95% percentile : 57
      Average : 48.5

   c. This Type Of Observation of Knee Height Sitting
      Standard Deviation (SD) : 1.92
      5% percentile : 43
      95% percentile : 52
      Average : 48.5

   d. This Type Of Observation of lower arm
      Standard Deviation (SD) : 1.73
      5% percentile : 23
      95% percentile : 30
      Average : 27.5

   e. This Type Of Observation of upper arms
      Standard Deviation (SD) : 1.73
      5% percentile : 23
      95% percentile : 30
      Average : 25.8

Anthropometry data of the working position of the seat is used to determine the suitability of the size of the Chair that used computer operator. As measurement results below:

The Work stations Environment xxx
The Size Of The Seat Results (cm)
The pedestal height sitting : 56
-a minimum of : 48
-maximum : 56
The length of the base seat : 50
The Thickness Of The : 10
Pedestal seat width : 45
High backrest : 50
Corner pedestal seat : 3 derajat

The Size of work table xxx Environment on Prop. Jatim
The Size of work table Results (cm)
High Table
-Table Type A : 78
-Table Type B : 75
The Width Of The Table : 80
The Length Of The Table : 120
Thick Tables : 4
High Backrest Distance : 5

f. The results of observation and measurement of computer work station according to the layout of the monitor, the distance, the placement of the keyboard, the mouse position setting, laying flat on the attitude of the document and the wrist.

The Suitability Of Placing Computer Devices
Computer Device Placement in Percent (%)
1. According as much as 30 (78.0%)
2. not appropriate as much as 21.1% 8
3. Characteristics of respondents

3.1. Age
Of the 38 respondents age group, are as follows: age < 36th as many as 19 people (50%), age 36-45th as many as 15 people (and 39.5%), age > 45th as much as 4 people (10.5%).

3.2. Gender
Of the 38 respondent’s gender, gender: male as much as 27 people (71,1%) women and gender as much as 11 people (28,9%)

3.3. Working Time
Of the 38 respondents, obtained the work < 5th as many as 17 people (44.7%), the work 5-10th as many as 11 people (28.9%) and working period > 10th as many as 10 people (28.3%).

3.4. Nutritional Status
Of the 38 people IMT with skinny nutritional status as many as 12 people (31.6%), normal nutritional status as much as 26 people (68,4%)

4. The subjective Complaints
Of the 38 respondents who never had complaints of pain in neck muscles as much as 18 people (47.4%) and respondents who did not experience a complaints as much as 20 people (52.6%).
5. Complaint Longtime

Of the 18 respondents using the Nordic Body Map, sbb respondents who experienced pain in the muscles of the neck complaints with the frequency according to the length of the complaint 1 day as many as 12 people (60%), not having a complaint as much as 9 people (40%) while having a neck muscle pain complaints, with the old complaint > 2 hr as 6 people (60%) and not having a complaint as much as 4 people (40%).

6. The level of Absentisme

Of the 18 respondents were with the level absentisme 1 x/month as many as 11 people (55%) and not having a complaint as much as 9 people (45%) while with the level absentisme 2 x/month as many as 5 people (71.4%) and not having a complaint as much as 2 people (28%).

7. risk of Ergonomics

7.1. Awkward Body Position

The results of observation and questionnaire as many as 38 people. The respondent's awkward body position, obtained results that are not ergonomic position of as many as 25 people (65.8%) and ergonomic positions with as many as 13 people (34.2%).

7.2. Repetitive Motion

From the results of observation and questionnaire as many as 38 people. Respondents with repetitive motion (repetitive motion) obtained results that do not work as much ergonomic 13 people (34.2%) and respondents do work ergonomically as many as 25 people (65.8%).

8. Analysis

With logistic regression analysis between variables that influence against complaints of pain in neck muscles, obtained results are as follows:


It brings the relationship between complaints of neck muscle pain with awkward positions or (p < 0.05) or x 2 = 10,175; p = 0.001.

8.2. Complaints of Neck muscle pain with Repetitive Motion

There was no relationship between complaints of muscle pain neck, with repetitive motion or x 2 = 1.286; p = 0.256

8.3. Complaints of neck muscle pain with overtime work

It brings the relationship between complaints of muscle pain neck, with overtime work values obtained significant p = 0,146; p < 0.25.

8.4. Complaints of muscle pain neck, with The Work

There was no relationship between complaints of muscle pain neck, with significant values obtained working period p = 0,215; p < 0.25.

8.5. complaints of Neck muscle pain with nutritional Status

It brings the relationship between complaints of muscle pain neck, with nutritional status is obtained significant value p = 0,017; It means there is a 0.25 p < influence.

9. Analysis of Multiple Regression Logistic between complaints of Neck muscle pain with risk of ergonomics (awkward position) and the influential factors (Period of work, overtime work and nutritional Status)

Multiple regression logistic analysis results (MLR) obtained results that nutritional status or the value of p = 0,004 and awkward position or value p = 0.001 affect pain in the neck muscle complaints or value (p < 0.05) is the risk of other such as: the ergonomics of work, overtime work and risk of ergonomics (repetitive motion) with a value of p > 0.05 so as not to affect the complaints of muscle pain.

10. Analysis of Multiple Regression Logistic between complaints of Neck muscle pain with risk of ergonomics (awkward position) and the influential factors (Period of work, overtime work and nutritional Status)

Multiple regression logistic analysis results (MLR) obtained results that nutritional status or the value of p = 0,004 and awkward position or value p = 0.001 affect pain in the neck muscle complaints or value (p < 0.05) is the risk of other such as: the ergonomics of work, overtime work and risk of ergonomics (repetitive motion) with a value of p > 0.05 so as not to affect the complaints of muscle pain.

VI. DISCUSSION

1. Characteristics of respondents

Most male-sex of 71.1%, and age group aged < 36 years (50%), aged > 45 years (10.5%). Results of the cross-table shows the age group 45-year tendency > respondents complained of pain in the muscles of the neck, the shoulders about 75% higher compared with the age of around 36 years old < 47.3%.
2. Working Time

The majority of respondents had job working period (5 years < 44.7%). Cross table analysis results, the work of the respondents (52.6 5 years <%) more are not subjected to complaints of pain in neck muscles, rather than experiencing pain complaints (47.4%)

3. Nutritional Status

Nutritional Status of respondents with normal nutritional status (68.4%) were other respondents with its nutrition value status of nutritional status are ugly or skinny (31.6%). There are cross-tabulated analysis of relationship of nutritional status with complaints of muscle pain or (p < 0.01), meaning those with nutritional status skinny leaning more experienced pain complaints than respondents who had normal nutritional status.

Nutritional Status with The Index of the body (IMT) are very appropriate to see the condition of the nutritional status of adults differences in nutritional status associated with the level of caloric intake of food that is eaten. According to Sum’mur, (1982) and Grandjean, (1993) in addition to the amount of calories the calorie supply, deployment during the work is very important.

4. Overtime work

Respondents who worked overtime every day is 63.2% sebayak with workload > 8 hours/day. From the cross table analysis showed respondents who experienced a neck muscle pain complaints (63.2%) worked overtime every day higher than they do not complain of neck muscle pain (36.8%).

5. Work stations

Determination of work stations must be designed with ergonomics consider: body size (Anthropometry) workers, the environment (indoor) are used, the equipment will be used. So in the design must always be a compromise between the biological needs of operators with physical work requirements, size and function of the tool in the work station. Each of the system's work contains some or all of the components work, each other and interact with each other. (Corlett and Clark, 1995).

5.1. Working Chair

From the results of observation and measurement data of computer work stations, Office Chair that is used is the average of the same, where average seat ketinggihan adjustable (adjustable), there are some uses backrest, arm rest, have a walk the wheel of 5 pieces. This is in accordance with the requirements of a Chair that is designed using the principles of ergonomics.

Results of the data found the presence of Anthropometry mismatch between the size of the required seats (standard ergonomics) with seats that are used in computer operator environment officer Office of East Java Dispenda Prop. .. The mismatch can affect the attitude of the body computer operator in a State of discomfort (awkward body position). According to Clark, (1996) States the design work stations with a sitting position has a high degree of stability of the body, reduces fatigue and subjective complaints when you work more than 2 hours. In addition, the workforce can also control the legs to do the movement.

5.2. Work desk

From the results of observation and measurement about computer work station, a desk that is used is the average of the same size and not ergonomic, where average work desk coated with glass that can reflect light lights giving rise inch anti-glare, space is limited because there are some things that should not be placed in the room, for example, litter box, documents.

Such discrepancies could affect the position of the body that are not natural. In determining the size of the work stations, a work tool data Anthropometry of labour play an important role. According to Sutarman (1972) that by knowing the size of the Anthropometry of the workers will be made of a tools design tools work best for manpower that will use, in hopes of creating comfort, health, safety, it is basically a human has a body shape and size vary, so that only people with the appropriate tentu body size or the right to use it.

5.3. The placement of a computer Device

Based on the results of observation and logging is done, the placement of the device in the computer Environment Agency XXX Province Jatim is included in the category are less appropriate because much less fulfill terms of the placement of the device, including the position of computer monitors under the worktop, position the keyboard is not in place and handle the mouse accordingly. The very troubling discrepancies in performance and work efficiency, one of the factors that affect it much influenced by factors of its resources, one of which factors discipline workers. Discipline is a mental attitude that is reflected in the works of individual behaviour, group or community in the form of obedience or adherence to regulations, so that the pattern discipline is reflected on the suitability of existing equipment placement. (Suma'mur, 1985)
6. Musculoskeletal neck muscles

Based on the analysis results table cross between complaints of perceived pain neck muscles, shoulders with awkward position (44.7%) people experience pain in the muscle of leher dan complaints on the position awkward (not ergonomic) work officer sitting position, the operator computer work in uncomfortable positions and there is a bit of nötigung attitude, this is because the operator officer working too long dealing with computers and a room with A.C. with temperatures that cold once and natural lighting are very less.

Indoor air quality is not examined is a significant factor that can affect the level of the health workforce. According to Morey, et al (1991) indoor air quality is a factor that is related to the degree of health workers, so that complaints are purely irreversibal arising simultaneously with complaints of pain in the muscles.

The case at work sitting position for too long can meyebabkan melembek the abdominal muscles and the spine is curved so that the fast will experience fatigue. (Grandjean,1993).

The results of the analysis of the test of Fisher's exact test between complaints of neck muscle pain with awkward position is meaningless (p. < 0.05) was repetitive motion movement on position of operators who complained of pain in the muscles of the neck (10.5%) than not complaining (23.7%), and the results analysis of fisher's exact test is meaningless (p. > 0.05).

By using multiple regression analysis to see the influence between these three factors relate between complaints of neck muscle pain with repetitive motion, awkward positions, working time, overtime work and nutritional status. Statistical analysis of the results indicates on position awkward with nutritional status is meaningless (p. < 0.05).

VII. CONCLUSION

From the results of research conducted on 38 respondents (computer operator) in the neighborhood of East Java province XXX Establishments can be drawn conclusions, as follows:

1) The Operator of a computer in the Environment Agency's East Java province was XXX: mostly male, age ranged from 21 years and > < 53 years and having aged > 45 years many experiencing pain in the neck muscle complaints, out of which has age < 21 years. The work ranges from 2 – 20 years and most of his work < 5 years. Most have normal nutritional status.

2) In the Workstation Environment Agency XXX Prop. East Java is the mismatch between seat sit sitting work Anthropometry and with most positions the work table and the suitability of computer equipment is not ergonomic. 3) Logistic Regression analysis of Multiple trials, there is a positive effect between muscle pain with neck complaints awkward body position as well as a computer operator in the nutritional status of the Environment Agency of East Java province.

VIII. ADVICE

From the results of this research, can be advised as follows:

1) Required socialization issues ergonomics work sitting position on the comfort position of repetitive motion and awkward computer operator, in order to terciptakan the suitability between the workload, the working capacity, and computer equipment. 2) For other researchers more into account in terms of design, the instruments and research methods, especially in the field of ergonomics and Anthropometry research body as well as other factors more manageable.

BIBLIOGRAPHY