THE INFLUENCE OF ERGONOMIC WORKSTATION ON MUSCULOSKELETAL DISORDERS (MSDS) AWARENESS

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Abstract

Musculoskeletal Disorders continue to be a major reservoir of disability and affecting the productivity of workplace. Understanding the causes is the main key where action can be taken to reduce and prevent this occupational disease from being more serious. An ergonomic workstation was predicted as the determinants of MSDs experience. A quantitative study has been conducted in selected company in Malaysia. The data and information were collected using a questionnaire that was distributed to employees at ten oil and gas industries all over Malaysia offices staff and being analyzed using the Statistical Package Social Sciences (SPSS). Collected questionnaire received from 375 respondents. The results were found that long daily usage of computer effect the MSDS awareness among the office workers. Further recommendation towards the usage of computers at workplace and study limitation has been given at end section of the paper.

*Keywords: ergonomic; workplace; musculoskeletal disorders*

I. INTRODUCTION

1.1 RESEARCH BACKGROUND

It has been reported that musculoskeletal disorders has been increasing in the country since 2008 according to National Institute of Occupational Safety and Health (NIOSH) (The Star, 2012). Musculoskeletal Disorders otherwise called MSDs are injuries and disorders that influence the human body's development or musculoskeletal framework like muscles, tendons, ligaments and nerves. Occupational safety and health professionals also called different names for MSDs like repetitive motion injury and repetitive stress injury. (Administration, n.d.). MSDs directly referred as any aches, pain, disorders or numbness in a body region as a result of computer work. Body areas of interest incorporated the neck, shoulder, back (upper and lower), arm (upper and lower), elbow, wrist and fingers (Mahmud, Kenny, & Heard, January 2011). These includes the nerves (e.g. carpal tunnel syndrome), tendons (e.g. tenosynovitis and epycondylitis), and muscles (e.g. tension neck syndrome). The two most as often as possible examined issue are carpal tunnel syndrome (CTS) and tendonitis. CTS is a condition brought on by pressure of the median nerve in

the carpal tunnel of the wrist where happened to be a monotonous hand motions, awkward posture, mechanical stress and vibration., the common symptoms are pain, numbness and tingling in the areas innervated by the median nerve (Rempel, 1999). According to the statistics done by SOCSO in figure 1.1, it has been reported the increasing numbers of occupational musculoskeletal diseases where 10 cases were reported on 2005 and increased to 675 cases reported in 2014 (SOCSO, 2015) . With the statistics result, it shows that the lack of awareness on musculoskeletal disorders has brought the increasing reported cases over the last nine years. Due to this, an understanding on the risk factors of musculoskeletal disorders should be applied so that people will aware on the disease.
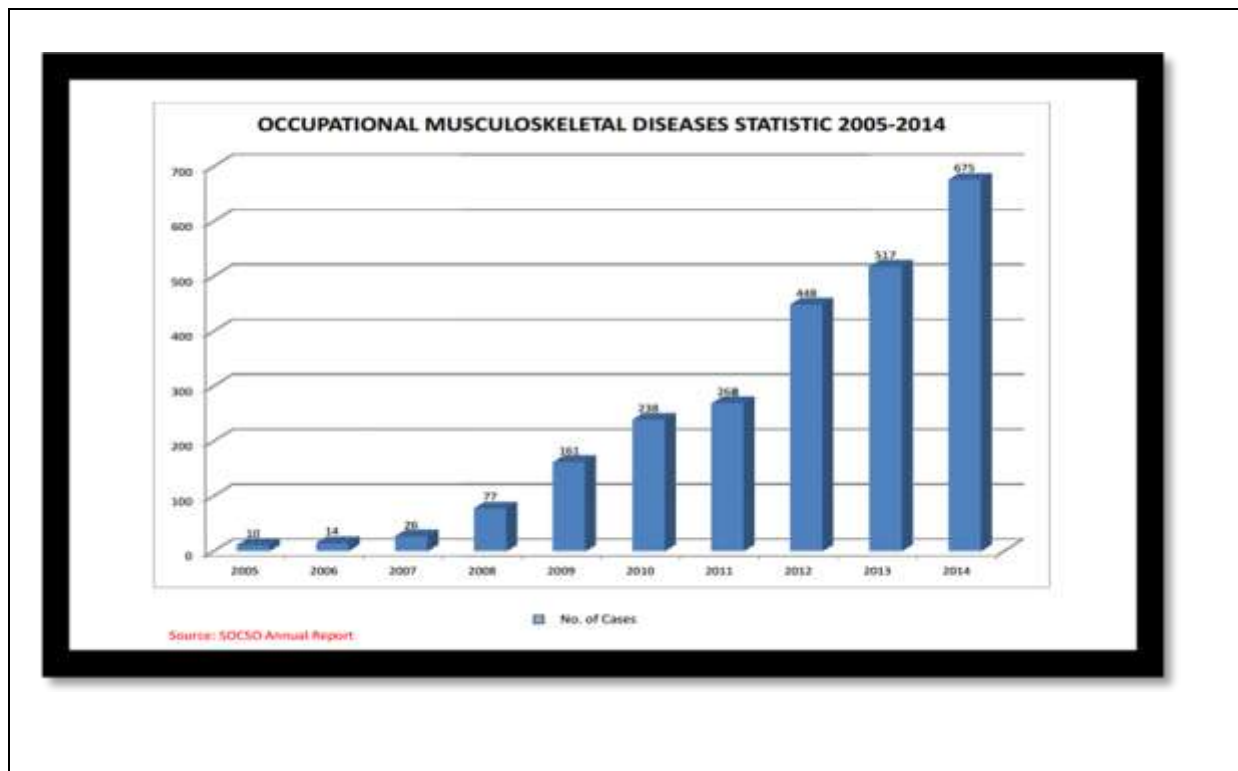
1. FIGURE 1. SOCSO ANNUAL REPORT ON MSD 2005-2014

1.2 Problem Statement

Musculoskeletal disorders (MSDs) are very common among office workers. There has been an increasing effort in recent years to investigate the causes of MSDs and to take action to prevent them. (Buckle, 2005). The purpose of this study is to   understand the impact of ergonomics implementation as the risk factors of musculoskeletal disorders among office workers. Based on the readings from previous researched done by other researchers, there are few main risk factors of   musculoskeletal disorders . However, in this study

will only highlighting the two main risk factors in order to provide a clear understanding, awareness and experience of this occupational disease. Various occupational risk factors have been previously documented during epidemiological studies, such as manual handling, static posture, and repetitive tasks (Smith, Mihashi, Adachi, Koga, & Ishitake, 2006).

A few past reviews have shown a possible causal relationship between ergonomic workstation and MSDs where the epidemiological studies concerning computer use and musculoskeletal health are mainly based on subjective measures of upper extremity musculoskeletal symptoms. This might give vital learning concerning in preventing these ailments. (Waersted, Hanvold, & Veiersted, 2010). In recent decades, occupational use of information technology has expanded drastically. In many countries, computer work is broadly seen as a new risk factor for musculoskeletal disorders which have become the most frequently diagnosed as occupational disease. Relationship between ergonomic and MSDs have been recorded in several studies, with reported 12 month prevalence rates of musculoskeletal pain (MSP) in neck, back and upper extremities. (Oha, Animagi, Coggon, & Merisalu, 2014).

Despite many years of ergonomics research, work-related MSDs is the single most expensive category of occupational health problems, remain a major issues for individuals, companies and societies. Various leading organisations in UK has perceived that a high prevalence of MSDs is a symptom of "system failure' that ought to be addressed to improve overall quality and productivity. In this way, programmes for the prevention of MSDs are incorporated within wider ergonomics approach to the continuous improvement of work systems, organisational design, use of technology and work environment where it is best describes as an ergonomics approach. (Winkel, 2008)

1.3 Objective of Study
The objectives of this study are to investigate the level of Musculoskeletal Disorders awareness and the influence of ergonomic workstation on Musculoskeletal Disorders Experience.

II.   LITERATURE REVIEW
Independent Variable

Ergonomics Implementation
Ergonomics in Malaysia has been presented over a decade ago with the foundation of the ergonomics division in National Institute of Occupational Safety and health (NIOSH) on 1st December 1992 (Mustafa, Kamarudidn, Othman, & Mokhtar, 2009). The word ergonomics is derived from Greek Words, "ergo" and "nomos" which means work and law. (Khan, Surti, Rehman, & Ali, 2012). Ergonomics deals with the application of information about human behaviour, capabilities and limitations to the design of systems, machines, tools, task or jobs and environment for productive, safe and effective human use. (Mustafa, Kamarudidn, Othman, & Mokhtar, 2009). The objective of ergonomics is to guarantee good fit between workers and their job, thereby maximising worker's wellbeing, productivity

and efficiency. (Mustafa, Kamarudidn, Othman, & Mokhtar, 2009). Ergonomics risk factors such as forceful exertion, awkward posture, repetitive exertions and environmental factors may cause MSDs to workers. (Mustafa, Kamarudidn, Othman, & Mokhtar, 2009)

Some ergonomic risk factors associated with MSDs in industrial environment are also present in operation of Video Display Thermal (VDTs) and alphanumeric keyboards, including repetitive motion 20,000 - 200,000 keystrokes per day with sustained neck, shoulder and, postures and force (David, 1999). One of the most important features for an office is chair where organisation should have an ergonomic chair so that every person will have the capacity to make the necessary adjustments to comfort him/herself. (Asmui, Hussin, & Paino, 2012). Chairs that are not properly meet the needs of user body may cause back pain, eye strain from not being properly positioned in front of the computer screen, fatigue from poor circulation and other health issue. (Asmui, Hussin, & Paino, 2012). Postural stress caused by poor workstation ergonomics such as inappropriate location of the VDU screen, keyboard or mouse have been associated with musculoskeletal problems. (Korhonen, et al., 2003). Ergonomics emerges as an issue since many of these musculoskeletal conditions are common computer-related injuries. (Khan, Surti, Rehman, & Ali, 2012). Studies suggest that when performing task while sitting in an ergonomically unfit chair for longer periods was associated with low back pain. (Khan, Surti, Rehman, & Ali, 2012). Ergonomic design workstation basically refers to minimizing the amount of energy used during the completion of any task. (Makhbul, 2012) A good ergonomic design not only maximises the capabilities of workers by increasing productivity and job satisfaction, but also benefits the employer by decreasing the cost for health and absenteeism. (Khan, Surti, Rehman, & Ali, 2012).

Dependent Variable

Musculoskeletal Disorders Awareness

Musculoskeletal Disorders (MSDs) are injuries and disorders of the soft tissues (muscles, tendons, ligaments, joints and cartilage) and nervous system. (Makhbul, 2012). Occupational MSD may be caused by mechanical (physical) exposure at work. (Winkel, 2008). OSHA characterizes MSDs as an injury or disorder to muscles, tendon, ligaments, joints, spiral discs and cartilage (Makhbul, 2012). Risks for the potential advancement of MSDs are recognizes as repetitive and forceful exertions, exposure to vibrations, frequent or heavy lifting, pushing, pulling or carrying, prolonged awkward positions, prolonged hours of computer use, contact stress and work organisation. (Makhbul, 2012)

MSDs labelled as the fastest growing workplace illness which responsible for more than 60% of all workplace in USA. (Makhbul, 2012). Globally, the number of people suffering from musculoskeletal conditions has increased by 25% over last decade and make up 2% of global disease burden. (Khan, Surti, Rehman, & Ali, 2012). Reality demonstrates that the effects of MSDs include potential permanent disability, difficult to everyday tasks, feelings of depression, anger, anxiety or hopeless, increased medical costs, decreased productivity, lower employee morale, cost in replacing an injured employee, frustration, dissatisfaction and stress. (Makhbul, 2012)

Relationship between Independent Variables and Dependent Variable

The dependent variable (musculoskeletal disorders) has strong relationship with both independent variables 1 (daily duration of computer work) and 2 (ergonomic factors). According to (Korhonen, et al., 2003) the increasing hours of computer use and incomplete work-rest cycle control, may give an impact to the discomfort in neck-shoulder area. Not only that, (Makhbul, 2012) did a test on a full time employees who using computers to determine their causes of neck and shoulder pain that contributed to MSDs. According to (Khan, Surti, Rehman, & Ali, 2012) the long duration of work on desktop with improper posture may contributes to repetitive injuries of the back that become the risk factors of MSDs. In (Khan, Surti, Rehman, & Ali, 2012) did said that the lack of ergonomic layout which is the failure of adjustability to the workstation and keyboard will give an impact to the muscular tension of the body. While (Makhbul, 2012) said that poor ergonomic knowledge and awareness will affect the health and safety of employees. They also said that with a proper application of ergonomic principles in designing the workplace environment can significantly reduce the musculoskeletal injuries.

Theoretical Framework

Theoretical framework is the foundation on which the entire deductive research project is based. It is a logically developed, described and elaborated network of associations among variables that relevant to the problem situations. The relationship between the literature review and theoretical framework is that it provides a solid foundation for the next developing purpose. (Sekaran & Bougie, 2014). Based on the review of the past research, the research framework is developed as follows;

Ergonomic Workstation	→	Musculoskelital Disorders Awareness
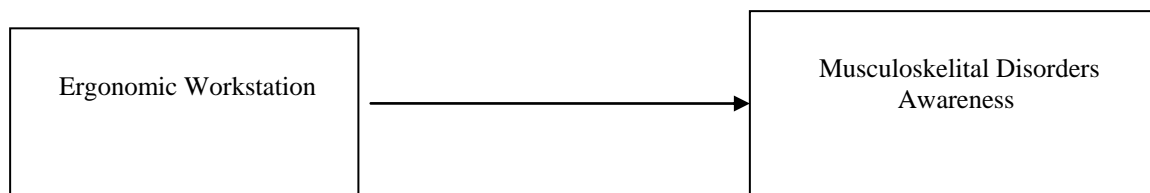
The framework of this study is daily computer usage and independent variables has an effects on the dependent variable. Dependent variable is the variable of primary interest to the researcher that leads to the finding of answers or solutions to a problem. (Sekaran & Bougie, 2014)

It is hypothesized that; there is a significant relation between daily duration of computer usage towards MSDs awareness.

III.   METHOD AND MATERIAL

Population

Population is the entire group of people, events, or things that a researcher desires to investigate. (Sekaran & Bougie, 2014) In this study, the targeted population was the staff of ABCD where it came from various departments under upstream and downstream with total number of approximately 300 populations.

Sample Size

Sample size is a subset or subgroup of the population. (Sekaran & Bougie, 2014) . According to the method introduced by Krejcie & Morgan, the sample size from 300 population is 100 with the confidence level of 95% and 8% error. In this study, 200 set of questionnaires distributed to ten location simultaneously.

Measurement of the study

Past researcher questionnaires are modified and reuse for data collection., adaptation from other researchers questionnaire has being used since it is more accurate and suitable. In section A, it started with the demographic section where age, gender, marital status, and education became the basic question. It is followed by section B for independent variable and section C for dependent variable.

IV.   ANALYSIS AND RESULTS

4.1 Reliability Analysis

The reliability analysis was used to check the internal consistency and reliability of the variables within the set. According to Sekaran and Bougie (2010), the definition for reliability is the consistency and stability of a measure by tested on the variables in the research. If the data was produced repeatedly the same, the data is considered reliable. Therefore, it is essential to assess score reliability in all studies as it will lead to research result. The Cronbach's Alpha is computed in terms of the average correlations among the item measuring the concept.

Meanwhile, Sekaran and Bougie (2010) stated that the reliability which is less than 0.60 are considered to be poor, those in the 0.70 range are acceptable, those in the range 0.80 are considered good and those over 0.90 are considered excellent. Moreover, the closer Cronbach's Alpha to 1, the higher the internal consistency is (Sekaran, 2010). The reliability analysis include on independent variables and dependent variables. It is does not include demographic variables.

Table 1: Reliability Statistics Summary

No of Items	Variables	Cronbach's Alpha	Remarks
5	Ergonomics Factor (IV2)	0.622	Acceptable
34	MSDs Awareness (DV)	0.836	Good

Table 1 shows the result of reliability for all the variables for both dependent and independent variables. As illustrated above, the Cronbach's Alpha for Awareness towards Musculoskeletal Disorders (Dependent Variable) was 0.836 which is Good; Ergonomics Factor (Independent Variable) was 0.622 both are acceptable.

With the calculated value for all the variables for both dependent and independent variables in are in the range of 0.8, where the variables used is considered good and is able to measure the Musculoskeletal Disorders awareness. As a conclusion, the instrument used in the study was reliable to carry out the survey.

4.2 Descriptive Analysis

Table 4.5: Descriptive Statistic

Variables	N	Min	Max	Mean	Standard Deviation
MSDs Awareness (DV)	75	6.78	8.61	8.1644	0.38818
Ergonomics Factor (IV2)	75	2.82	3.09	3.0642	0.06974

From the above table, the highest mean came from the Dependent Variable, Musculoskeletal Disorders Awareness which is 8.1644. This result showed that the awareness level of MSDs among the PRSB staff is high

4.2 Kendall Correlation Analysis

In order to indicate the direction, strength and significance of data variance among variable, a correlation test have been used where the researcher tested on bivariate relationship between one variable with another variable that was measured at an interval or ration level (Sekaran & Bougie, 2014) If the p value is below 0.05, there is a significance between the dependent variable and independent variables.

Table 2: Kendall Correlation Analysis

			Daily Duration of Computer Work	Ergonomics Factor	(DV) MSDs Awareness
Kendall's tau_b	Ergonomics Factor	N	75	75	75
		Correlation Coefficient	.156	1.000	.441**
		Sig. (2-tailed)	.163	.	**.000**
		N	75	75	75
	(DV) MSDs Experience	Correlation Coefficient	-.226*	.441**	1.000
		Sig. (2-tailed)	.039	.000	.
		N	75	75	75

From the above findings, independent variable is significant with dependent variable. It has the significant value of 0.039   it is below p value of 0.05. Due to this, both null hypotheses are rejected.

Logically, working with computers may cause back pain and fatigue. Due to these reasons this study found that ergonomic workstation contributed to MSD awareness among employees. This findings being supported by previous study where the increasing hours of computer use according to (Korhonen, et al., 2003) has given an impact as the risk factors for Musculoskeletal Disorders Not only that, result from scholar (Makhbul, 2012) found the same findings where employee who work long hours with computer were tend to experience the Musculoskeletal Disorders pain. Not only had that, matching employees and office equipment also contributed to MSD which can effect work performance. Just like the previous study by (Khan, Surti, Rehman, & Ali, 2012) the long duration of work on desktop with improper posture may contributes to repetitive injuries of the back that become the risk factors of MSDs as that the lack of ergonomic layout which is the failure of adjustability to the workstation and keyboard will give an impact to the muscular tension of the body.

4.3 Summary of Hypothesis Testing

Table 3: Hypothesis Decision

Hypothesis	Analysis Tools	Result	Hypothesis Decision
H0: There is no significant relation between ergonomic workstation towards MSDs awareness. H1: There is a significant relation between duration computer work towards MSDs awareness.	Kendall Correlation	p=0.039	Accept the alternate hypothesis (H1)

V. DISCUSSION, CONCLUSION AND RECOMMENDATION

This study aimed to investigate the level of awareness on Musculoskeletal Disorders among Oil and Gases sub-diaries staff towards the daily duration of computer work and ergonomic factors. From the findings, the reliability of the questionnaire distributed was "good". However, the questionnaire need to be improve by adapting more questionnaire designed by previous researchers and a number of pilot testing may be conduct so that it will meet the flexibility of respondent. Daily duration of computer work and ergonomic factors is significant with the musculoskeletal disorders awareness showing that most probably the body posture during working with the computer in long hour. This result also being supported by the previous study from Jordan, (Shbair & Abdulla, 2010) where the posture being said which is mainly the head posture followed by break time and vision problems actually contribute to the ergonomic discipline. In the study also proved that with a changing sitting position and taking breaks, it helped to increase the body comfort. Several previous study has proven that ergonomic discipline during working with computer has a major impact in MSDs. In journal done in Jordan, (Shbair & Abdulla, 2010) stated that different individuals with a different ergonomic knowledge have an associations with the risk of musculoskeletal disorders. Due to this, there should have a physical therapist educating the computer users and employers on the proper biomechanics to minimize the risk factors of musculoskeletal disorders incidence. By purchasing fit furniture and proper equipment only contribute a small percentage in solving the MSDs issue.

As a summary, this research has found that the level of MSD awareness among workers are very high and both factors which are daily duration of computer work and ergonomic factors play an important role in MSD awareness. All analysis met the research objective and the result is support the hypothesis.

Recommendation

In oil and gases industry, there are two departments that correlate to each other which is the administration and customer service. On top of that, industry may design a new workplace layout that is more ergonomic friendly in terms of the chair, lightning, the height of the VDU screen and foot rest together with FIMA to provide the facilities and maintain them. Prevention is better than cure as the old day's dictum said where we need to emphasize the need to know on what machine we are working with so it will enables us to derive the maximum output from the machine without compromising our health. The ergonomic knowledge need to be circulate to employees so that they are well-informed on the ergonomics hazards and automatically will participate in controlling the exposures. If administration department could not provide facilities that being recommend through the employees' feedback, customer service department may provide an educational training regarding ergonomic to get the involvement from the employees. Employees' participation may include bringing their own leg rest like a small chair that can be put under their table to rest their leg, or bringing their own laptop cooler pad so that it will increase the height of the VDU screen or even bringing their own VDU screen filter to decrease the direct light from the screen towards the eyes so that it will helps to reduce he eye strain. Some of the employees may not aware on those options taken for ergonomic purpose if there is no ergonomic education being carried out.

Limitation of the Study

The study had its limitation as the correspondents were quite busy and having a tough time to respond to the questionnaire. On top of that, this type of study was quite rare being conducted at the respondents.

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