ERGONOMICS FACTOR AND THEIR RELATIONSHIP TO JOB STRESS

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ABSTRACT

In this study, it is more emphasis on the impact and effects of ergonomic factors related to workplace stress. It is also to check whether there is a relationship between ergonomic factors such as job design, work environment, such as indoor air, lighting and noise, as well as the factor of job rotation, work hours and workloads with work pressure. Data were collected from 122 employees at a manufacturing company located in Kampong Janda Baik, Bentong, Pahang, mainly working on the production line. They were chosen because the environment and how to work more or less the same. The results showed there was a relationship between the variables workload and humidity with job stress in this manufacturing company. Five other variables, job design, lighting, working hours, noise, and shift work have no significant relationship to the job stress. A good implication can be seen if both sides, if employees and employer can work together in implementing and promoting the concept and work practices of ergonomic. Awareness of safety and health at work is important for employers and employee's a like good benefit.

ABSTRAK

Dalam kajian ini, ia lebih menekankan tentang kesan- kesan faktor ergonomik dan kaitannya dengan tekanan tempat kerja. Ia juga untuk memeriksa sama ada terdapat hubungan antara faktor-faktor ergonomik seperti rekabentuk kerja, persekitaran kerja seperti udara dalaman, pencahayaan dan bunyi bising, begitu juga dengan faktor pusingan kerja, waktu bekerja, dan bebanan kerja dengan tekanan kerja. Data kajian ini diperolehi dan dikumpulkan daripada 122 orang pekerja di satu syarikat pembuatan yang terletak di Kampung Janda Baik, Bentong, Pahang. Mereka dipilih kerana persekitaran serta cara kerja yang lebih kurang sama. Hasil kajian menunjukan terdapat hubungan antara pemboleh ubah beban kerja serta kelembapan persekitaran tempat kerja dengan tekanan kerja di syarikat pembuatan ini. Lima pemboleh ubah lainnya, rekabentuk kerja, pencahayaan, waktu bekerja, bunyi bising, serta kerja syif tidak mempunyi hubungan yang signifikan terhadap tekanan kerja. Implikasi yang baik boleh dilihat jika kedua- dua belah pihak jika dapat bekerjasama dalam melaksanakan dan mengalakkan konsep ergonomik dan amalan-amalan kerja secara ergonomik. Kesedaran tentang keselamatan dan kesihatan di tempat kerja adalah penting agar majikan dan pekerja sama-sama mendapat manafaat dan faedah yang baik.

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CHAPTER ONE

INTRODUCTION

This chapter will brief introduction of the study. This chapter also discusses the background of the study, problem statement, research question, objective of the study, scope of the study, significant of the study and brief operation of the keywords.

1.1 Background of the study

Continuous or repetitive stress to our body or emotion which our body or feels cannot cope up will give bad or negative impact to our body, especially in today's modern lifestyle, very complex and challenging compared to last decade. These also give impact to our action or response to certain situation which may wrongly, or without reasonable and practicable way. From the earlier study, has been identified generally in the world that stress having big impact and concern from both employees and employers. An individual could experience stress if he/she perceives negatively towards his/her work environment.

An ergonomic factor includes many aspects like humidity, lighting, work design, noise and etc. Research shows that ergonomics factor that characterized by extreme heat, dim lighting, and congested works area can be associated to stress at the workplace (Sutton and Rafaeli, 1987).Cited by Zafir and Durraishah (2009), statement by Yeow and Nath Sen,(2003): Mohamad Khan et al., (2005), mentioned, in the

process of designing a workstation, several factors especially ergonomic factors must be taken into consideration. The failure to implement the ergonomic principles at the workplaces can lead to emotional depression, physical exhaustive, productivity and products quality declining (Shikdar and Sawaqed, 2003). Stress can significantly affect working performance, little or big in any activity, or relationship between teamwork of workers. Stress must be managed effectively to reduce or minimize the impact especially negative impact individually or to organization generally. If stress can be managed effectively by tackling the sources it can be beneficial to work performance, including greater efficiency, increase in economic and social benefit at workplaces. It could also improve occupational health and safety and improve work environment generally. This study is focused on job stress caused by ergonomics factor at the workplaces in particular the production workers in one manufacturing company located in Kampung Janda Baik, Bentong, Pahang. This organization actually, manufacturer of copper wire, the products are used locally and 90% exported to Asia Pacific region. From the studies, the result will show whether ergonomics factor have the impact or not to the job stress of the workers.

Majority of the manufacturing company employees have been with the company more than 15 years. The continuous increasing target and growth in market require the manufacturing company to double up the capacity and increase the productivity. Started with less than 70 employees in 1993, now the number has increased to around 760 employees.

With additional machines, required additional manpower, but to increase productivity, the additional manpower is not in conformity with number of increasing machines. Workers are required to handle more production machines than usual, as new production machines were set up, to meet the production requirements. This growth created expansion of facility and a higher risk for potential ergonomics injuries and illness. There are several aspects related to the potential factors for causing stress among the production workers at the manufacturing company. Some of the factor, including how the process has been designed to cope with the target or to produce the required products. For products itself, many requirements involved and needs to be followed in terms of quality, design, specifications and also time consuming to cater the target quantity. Increasing trend of depression, number of medical leave taken by workers due to back pain, increasing number of burn out and high number of turnover among workers in this organization caused this study is important.

This study also supported by (Mondy, Noe & Premeux, 2002), which is mentioned repetitive stress injuries mostly result from failure to address ergonomics issue at workplace; the most common health issue from the repetitive stress is carpal tunnel syndrome. When ergonomics principles are not applied to the workplaces, chronic musculoskeletal disorder such as back injuries, arm and hand problem, accident and eye strain may be common. According to Malaysian Social Security Organization, the number of accident related to musculoskeletal disease increased from 10 cases in 2005 to 675 cases in 2014. In specific, in organization with good ergonomic workstation and design implemented, actually can reduce hazards related to human body or musculoskeletal disorder such as back pain, shoulder pain, fatigue, cumulative trauma disorder (CTD) and repetitive strain injury (RSI) (Grag and

Rastogi, 2005). Other ergonomics factor can cause stress is such long working hours, work load and work design or in other word as work process design.

1.2 Problem statements

According to Sekaran and Bougie (2010), the problem statement is the condition where gap occur between the actual and the desired ideal states. Studies on occupational safety and health revealed that job stress is much rely on working and good ergonomic condition at workplaces. However job stress level can be negatively affluenced by the low level of ergonomics implementation provided by organization. This is happened may due to lack of experience by organization on handling ergonomics issue, or management perception on high cost of implementing good ergonomics condition at workplaces. In the manufacturing sector this is determined as a stressful place. Stress at workplaces in manufacturing industry has reached the alarming stage, especially to the low level workers such as production workers, or if in manufacturing industries they are called operator or production assistants. The European survey on working condition (2001) estimated 45.5% of workers reported working in painful or tiring positions, 35% were required to handle heavy load in their work and 62.3% reported repetitive hand or arm movements. All of such activities were known to correlates closely with musculoskeletal disorder.

There is a conclusive evidence indicator that organizations that fail to control workplaces stress will experience an increase in loss-related expense. Therefore it is important for companies to have constant control of its human related losses in order

to secure reasonable profit (Spengler et al 1986). A Korean Occupational Safety and Health Agency reported in 2005, a total of 9114 employees in Korea received workers compensation due to illness. Out of these, 6223 (68.3%) cases were work related injuries. Highly demanding task is known to be high-risk sector of developing musculoskeletal injuries.

The significant correlations between ergonomic factor and employees' persistent pain, has demonstrated a relationship between ergonomic qualities and musculoskeletal complaints (cf. Bramwell & Cooper, 1995; Evans, 1987; Hedge, 1987, 1989). According to U.S Department of labor, approximately 12% of all cumulative trauma, or repetitive strain injury, that result in lost time are associated with office workers (Felsenthal, 1994; Litvan, 1994).

Earlier study by Loo, H.S and Stanley Richardson (2012), mentioned many ergonomics problems in Malaysia remain unsolved. For industrially developing countries such as Malaysia, in which ergonomics is in infant stage, it is essential to promote ergonomics concepts and practice by disseminating their application to various industrial so that employee and employer become aware of design and concept and work method that can help to improve workplace condition and enhance workers occupational safety and health.

Organization which has provided ergonomics workplaces to its employees is said to be practicing a safety work environmental that reduce impact of job stress to their workers. But the problem is, every employee defined ergonomics differently. Good ergonomic practice for some workers, it may not be ergonomics to others.

Even study on the effect of ergonomics factor to job stress among manufacturing company has been conducted by the past researcher, this research is intended to know the ergonomics factor is related to job stress especially to production workers at this manufacturing company. This study will enable employer to identify specific problem encountered at this manufacturing company, based on local respondent and environmental workstation.

The researcher select work design, humidity, acoustic (noise), lighting, shift work, working hours and work load as an ergonomics factor to be studied as variable to job stress. This variable has been used by Zafir (2009), to 33 manufacturing company registered with MICCI on their research. This research more closely to environment at this manufacturing company where the study is conducted.

More recently, however, it has been argued that external circumstances do not have any intrinsic capacity to produce stress, but instead their effect is mediated by the individual's perceptions, capacities, and understanding. Hence, this study identifies and discusses factors, considerations or aspects of ergonomics factor which contribute most to job stress in manufacturing industries, particularly in manufacturing company.

1.3 Research Question

Based on the problem statement, the main objective of this study is to investigate the factor that contribute to ergonomics problem and how these factors influence their relationship with stress at workplaces among the employees in manufacturing company. These studies are required to answer this question:

How significant relationship between ergonomics factor, such as work design, humidity, lighting, acoustics, shift work, working hours and work load to job stress?

1.4 Research Objective

The objective of the study is to examine what are the factors that having significant to the outcomes of job stress. The specific objectives of this research are listed below:

1. To evaluate the relationship between work design and job stress among workers.
2. To analyze the relationship between working hours and job stress among workers.
3. To study the relationship between work load and job stress among workers.
4. To investigate the relationship between physical environment such as humidity, acoustic, lighting and job stress among workers.

1.5 Significant of study

In facts working at manufacturing sector are become stressful and tiring, this study has aimed to examine the relationship between ergonomic factors and job stress among production workers of manufacturing company. The result of the study also will help management of manufacturing company in designing better work process, an information regarding the factor that contribute to job stress among their employees. This study also can contribute knowledge to the researcher and future researcher.

From the study, the result will provide the workers chances to explore and receives information regarding ergonomics and stress at workplaces including work design, humidity, acoustic, lighting, shift work, work load and duration of working hours. This research also can help workers to understand more on ergonomics issue and furthermore, on how to reduce stress. The information receives from this study may be beneficial on making complaint or a proper way to report to employer if employees are not provided or satisfied with the ergonomics condition at their workplaces.

1.6 Scope of the study

This study is conducted to identify the relationship between ergonomic factors to job stress. The targeted respondent of this study is production workers including production assistant, and production support assistant working at manufacturing

company. This targeted respondent usually having similarity in manual handling or handling heavy object, shift workers from different shift pattern. Same salary skill, with different number of year of service.

1.7 Organization of the Thesis

This project paper includes five chapters. Chapter 1 presents an introduction and covers about the background of the study, background of the problem, problem statement, research questions, research objectives significance of study, and definition of key terms. Chapter 2 covers about the literature review and describe the overview of the ergonomics factor on job stress. Chapter 3 discussed about the research framework, hypothesis or propositions development, research design and operational definition. Continue with measurement of variables, data collection, sampling, data collection procedures and techniques of data analysis. Chapter 4 is all about the findings and Chapter 5 represents the discussion and recommendations.

1.8 Conclusion

Chapter one covers about the background of the study, background of the problem, problem statement, research questions, research objectives and significance of study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The review for this chapter is relatively related with the relationship between ergonomics factor on job stress among workers at manufacturing company. Many researchers have stated different ergonomics factor and interacted correlations between different relationship between ergonomics factor and job stress. This section will look and understand the mechanism in which they affect each other. Most researchers concluded that ergonomics factor was pointedly correlated to the job stress. This study therefore tries to determine if the same factor could have been the cause of job stress among the production workers at manufacturing company.

2.2 Job Stress

Many definitions are being used to interpret job stress. Stress disorder can be declared as an illness caused by repetitive or continuous stress received by body. Continuous or repetitive stress to our body or our emotional which body or our feeling cannot cope will give bad impact or negative impact to our body. It will also give impact to our action or response to certain situation which might be incorrect, with no reasonable and practicable explanation. From the earlier study it has been identified generally to the world that stress has big impact and therefore concerned from both employees and employers. Stress can significantly affect work performance, either small towards or big an activity, or relationship between the workers. Stress must be managed

effectively to reduce or to minimize the impact especially negative impact individually or to organization generally. If stress can be managed effectively by tackling from the sources it can be beneficial to work performance, which include delivering greater efficiency and also increasing economic and social benefit at workplaces. It could be also improve occupational health and safety and work environment generally.

A decrease in demands is, in its turn, associated with a reduction in stress-related problems, such as emotional exhaustion and psychological or somatic complaints (Gelsema et al.) This theory states distress is caused by an imbalance of high effort (demand) and low rewards (Siegrist, 1996). Demerouti, Bakker, Nachreiner, and Schaufeli (2000) found that a low salary was a source of stress, and low salary was even a greater source of stress when work pressure was high. Demand and reward thus seem to be related in the prediction of job stress.

2.3 Factor that affect job stress among workers.

Work-related stress occurs when there is a mismatch between the demands of the job and the resources and capabilities of the individual worker to meet those demands. The cause of stress may come from work related, living environment, poor time management or others situation which make our feeling became frustrated, angry, nervous or anxious. All above causes are called stress factor or stressor.

One of the cause or stress factor at workplaces is bad ergonomic design or condition, which is due to improper work design, humidity, acoustic (noise at workplace) working hours, lighting, working shift and work load.

Proper ergonomic design is necessary to prevent repetitive strain injuries and other musculoskeletal disorder, which can develop over time and can lead to long term disability. Due to this factor, ergonomics can be defined as one of the factor that can influence the productivity in the workplace. According to Centers for Disease, control and prevention, CDC 24/7: saving lives, protecting people, ergonomics is the scientific study of people at work. The goal of ergonomics is to reduce stress and eliminate injuries and disorder associated with the overuse of muscle, bad posture, and repeated task. This is accomplish by designing work process, work design, working hours and work load to fit the employee's physical capabilities and limitation. Essentially, ergonomics is the relationship between the worker and the job and focuses on the design of work areas to enhance job performance and reduce stress.

Of particular concern to professionals in occupational health, as well as to risk managers and others in organizations, is the recent upsurge in cumulative trauma disorders across industries; cumulative trauma disorders now account for over 56% of all workers compensation claims (Felsenthal, 1994).

2.3.1 Work Design

Work design can be described as; work arrangement in avoiding of dissatisfaction came from mechanical and repetitive work. It's important stage to improve humanization of work, is to improve quality of work by reducing employee problem during conducting specific job or difficulty in task.

According to Tarcan et al., (2004), taking ergonomics concern for work design will decrease the problems of work stress. Tarcan mentioned if an organization does not consider the work design from the earlier stage and doesn't provide good working environment to the employees, the risk of becoming illness to the workplaces will increase.

On the basis of the above evidence, it is likely that adverse work and environmental conditions that may be prevalent in a typical industry might affect serum uric acid levels. To our knowledge, this possibility has not been addressed by past research. Workers in a typical industry are likely to be simultaneously exposed to safety hazards, overcrowding, cognitive and physical demands, and environmental stressors (Melamed, Yekutieli, Froom, Kristal-Boneh, & Ribak, 1999). There is evidence to support the contention that combined exposure to these factors, expressed as the ergonomic stress level (ESL), associated with the stress-related outcomes, such as the outcome of occupational injuries (Melamed, Luz, Najenson, Jucha, & Green, 1989).

H1: The work design has a significant relationship with job stress at workplaces.

2.3.2 Humidity

Another factor determining the workplaces comfort level is air quality. A good indoor air quality will improve production quality and help to minimize the outcome of work stress (Martin,1999). High humidity environments have a lot of vapors in the air, which prevents the evaporation of sweat from the skin. In hot environments, humidity is important because less sweat evaporates when humidity is high (80%+). The evaporation of sweat is the main method of heat reduction. When non-breathable

vapors-impermeable personal protective equipment (PPE) is worn, the humidity inside the garment increases as the wearer sweats because the sweat cannot evaporate. If an employee is wearing this type of PPE (eg asbestos or chemical protection suits etc) the humidity within the PPE will be high.

H2: Humidity has a significant relationship with job stress at workplaces

2.3.3 Noise (Acoustic)

Certain production area in manufacturing company which has been classified as noisy area, should be tested and verified by registered consultation for personal exposure monitoring and area monitoring. There are two type of noise, continuous and intermittent, continuous noise normally produced by machine rotation and accelerations of certain machinery due to faulty bearing and worn out of rotation shaft. Intermittent noise normally caused by usage of high power vacuum, and usage of compressed air in production line. High impact between production spool (metal) and floor sometime could produce impulsive noise exceeding a peak sound pressure level of 140 dB.

Noise at workplaces is one of the factor that influences stress to human life. A large number of experimental and field studies have demonstrated that exposure to excessive noise can change the human behavior (Cohen, 1980). One aftereffect index, task persistence, was used in a series of experiments by Glass and Singer (1972). They found that when individuals were exposed to uncontrollable noise, they were

less likely to persist on challenging puzzles following noise exposure. These effects, which have been replicated in many studies of noise both in the lab and in the field, are generally considered indicative of diminished task motivation related to learned helplessness (Cohen, 1980; Cohen, Evans, Stokols, & Krantz, 1986; Evans, 2000). One of the major reasons for this explanation is the reliable finding that manipulations of perceived control over the noise stimulus largely ameliorate the aftereffects of noise. Furthermore, other indices of helplessness (e.g., giving up instrumental responding when effective behavioral options are available) show parallel noise deficits. These other measures of helplessness are also sensitive to manipulations of perceived control (Cohen et al., 1986; Evans, 2000; Evans & Lepore, 1993).

Continuous exposure to noise and loud is one of a physical stressor for many employees. Interventions designed to reduce noise exposure have focused on changing employees' behavior, changing the environment, and changing policies. Intervention research study examples include attempting to increase firefighters' awareness of the hazards of noise so that they will begin wearing hearing protection on the job (Ewigman, Kivlahan,Hosokawa, & Horman, 1990), engineering an enclosed and insulated container to protect sawmill workers from excessive noise exposure (Fairfax,1989), and instituting strategies such as rotating shifts (Fairfax, 1989) and supervisor and management training (Harrison, 1989) designed to limit employee exposure to noise during the workday.

H3: Noise has a significant relationship with job stress at workplace

2.3.4 Lighting

Lighting is one of the factor that influence job stress at workplaces. Workplaces lighting contributes to the increase of worker's productivity and capability and fatigue minimization (Wojecikiewicz, 2003). At any industrial or office setting, proper lighting is one of the factor which influences good productivity. People received about 85 percent of their information through their sense of sight. Proper lighting, without glare and shadow, can reduce eye fatigue and headaches. Improvement in productivity, a decrease in accidents, an increased level of mental performance, improvements in sleep quality, and an increase in morale among night shift workers also been attributed to better lighting (Luo 1998).

H4: Lighting has a significant relationship with job stress at workplaces.

2.3.5 Working Hours

Workers who have a workload demands and work in long hours are likely to limit the time people could recover from the exertions involved in these and enjoy normal nonworking activities that help this process. In theoretical terms this implies that work nonworking interference is a mediator of workload and strain (Geurts, Kompler, Roxburgh, & Houtman, 2003). The time outside work and particularly leisure time is thus a way that can help the individual recover from tiring workloads— excessive or otherwise (Grandey & Cropanzano, 1999; Sonnentag, Binnewies, & Mojza, 2010). Working long hours and without rest will increase the stress level and contribute to industrial accident, Zafir (2009), supported by Lacovides et al, (2003) stated that the longer working hours will cause the work stress outcomes.

H5: Working hours has a significant relationship with job stress at workplaces

2.3.6 Shift work

Working in shift schedule has been become an establish labor pattern, due to demands of continuous process in industries. But shift work has long been known to disrupt circadian rhythm, sleep and work life balance. Mott (1965) demonstrated that shift satisfaction is strongly related to problem of physiological rhythmic and social adjustment. This shift work related problem mainly on physical health, refer to study by Colqhoun (1969), demonstrated that body temperature rhythms gradually adjust to new schedule: partially adaption occur after one full day, a more complete adjustment require two weeks; and a minority of workers never fully adapt. Sleepiness, insomnia, fatigue, cognitive impairment and digestive trouble have been discussed as major health effect caused by shift work due to disrupted circadian rhythms (Costa, 2003). Shift work also as one of the factor for cardiovascular and metabolic disorder (Takahasi, 2014).

H6: Shift work has a significant relationship with work stress at workplaces

2.3.7 Work Loads

Especially salient are likely to be changes in people's workloads, which have been found in a wide range of studies to adversely affect levels of depression, anxiety, job satisfaction, and other measures of well-being (Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010; van der Doef & Maes, 1999). Working long hours and fulfilling tough

workload demands are particularly likely to limit the time people have to recover from the exertions involved in these and enjoy nonwork activities that help this process. In theoretical terms this implies that worknonwork interference is a mediator of workload and strain (Geurts, Kompler, Roxburgh, & Houtman, 2003).

In past research has documented the negative effects of work overload on physical health (Ono, Watanabe, Kaneko, Matsumoto, & Miyao, 1991; Sparks, Cooper, Fried, & Shirom, 1997) and mental (Bianchi, Boffy, Hingray, Truchot, & Laurent, 2013; Cooper, Davidson, & Robinson, 1982; McCall, 1988; Virtanen, Stansfeld, Fuhrer, Ferrie, & Kivimäki, 2012). A review of recent research reports that at least 50% of practicing psychologists report clinically significant levels of depression (Smith & Moss, 2009).

Workloads, which have been found in a wide range of studies to adversely affect levels of depression, anxiety, job satisfaction, and other measures of well-being (Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010; van der Doef & Maes, 1999). Workers who have tough workload demands and work in long hours are likely to limit the time people have to recover from the exertions involved in these and enjoy normal nonworking activities that help this process. In theoretical terms this implies that work nonworking interference is a mediator of workload and strain (Geurts, Kompler, Roxburgh, & Houtman, 2003). Some studies have indeed tested the mediating effect of work nonworking interference or a similar concept, and found some support for the theory that the impact of job demands on work–nonwork interference is a

significant explanation for the effect that such demands have on well-being (e.g., Bacharach, Bamberger, & Conley, 1991; Frone, Russell, & Cooper, 1992; Geurts et al., 2003; Hall, Dollard, Tuckey, Winefield, & Thompson, 2010; The time outside work and particularly leisure time is thus a way that can help the individual recover from tiring workloads— excessive or otherwise (Grandey & Cropanzano, 1999; Sonnentag, Binnewies, & Mojza, 2010). The routine aspects of a person's workload will have a negative effect on well-being to the extent that the demand imposed by the workload is excessive, sustained, and out of the person's control (van der Doef & Maes, 1999).

H7: The excessive workload has a significant relationship with job stress at workplaces

2.3.8 Ergonomics

Ergonomics is a science concerned with the 'fit' between people and their work. It puts people first, taking account of their capabilities and limitations. Ergonomics aims to make sure that tasks, equipment, information and the environment fit each worker. At the present time, a musculoskeletal disorder (MSDs) is one of the most important problem ergonomist encounters in workplaces around the word. According to Alireza Choobineh, Sayed Hamidireza Tabatabaei, Abbas Mokhtarzadeh and Maryam Salleh.: musculoskeletal problem in a rubber factory, in 37.5% of the workers studied, the calculated exposure level is between 51% and 70%, indicating that the level of exposure to musculoskeletal risk was high and ergonomics intervention to decrease exposure level seemed essential (high risk). In past study, it was proved that stress

level at today workplaces is greater than past generation (Minter, 1999). This is due to current situation required employees to increased their productivity including require employees to stand in a longer period (Konz and Rys, 2002/2003), added by low ergonomics awareness, studies on ergonomics would really help the manufacturing sector to understand the principles lie underneath it (Yeow and Nath Sen, 2003). The manufacturing sector reported a highest number of industrial accidents from 1999 to 2003 compared to the other industries (Mohamad Khan, 2005). The blue collar worker are exposed more to the health related to work compared to the white collar and professional workers (Cooper and William, 1991).

According to www.cdc.gov/niosh/wp- solution, it was mentioned that manual lifting and material handling have been shown as main factor for work related musculoskeletal disorder. Proper ergonomics design is necessary to prevent repetitive strain injuries and others musculoskeletal disorder, which can develop over time and can lead to long-term disability.

2.4 Theory of Job stress or underpinning theory of the research.

A lot of theories of stress have been proposed by the past researchers. It has been made to interpret and define stress. The first theory on stress was highlighted by Freud (1978) and reported that individual or employees that faced with stress may lead to energy reduction. This theory is called cognitive approach. It explains how the stress is created when the individual believed that he is not capable of meeting the demands of a certain situation and indirectly turned to pressure and become a harmful

threat to one‟s health. Furthermore, Aldwin (1994) has indicated that stress refers to the experience created as a result of the interaction between the individual and work environment. The interaction between these two components may lead to psychological and physiological tension to the individual. In different research, Selye (1964) reported that stress can be interpreted as the non-specific reaction of the body to any demand placed on it. The individual that recognized the meaning of positive stress may clear about the stress which not only cause degeneration and malfunctions, but can also act as a productive factor. In different theory by Karasek (1979), he outlined a theoretical model which has the basic several factors that affect stress:

a) The work where the employee or individual is entitled to put into effect in itself.

b) The independence and the margins of control or limits, the initiative taken by the employee or individual have in the job.

c) Social relationships with their peer and subordinates. It will not generate stress if only one of the factors exists. If all of those three factors mentioned above were merged together, it will definitely affect the employee or individual. According to Warr (1990), each of Karasek‟s work aspects must occur at a suitable analogy so as not to create stress. Warr (1990) also stated that the abilities and experiences, satisfactory remuneration, working duties that are interesting and varied, precise roles, physical safety, tangible targets, social recognition and the potential for interpersonal communication can be the significant reasons of stress. Siegrist (1996) stated that what has the employees invested in and what they get back in return must be balance to make them satisfied with their job. For instance, social recognition. The employees who get financial remuneration from the job, high potential to upgrade their working position, expectation satisfaction and security may fulfill their needs for social

recognition. This is corresponding with Siegrist‟s statement saying that in order for the employees to satisfy, they should be rewarded as much as what they have done for their work. In another research by Maslow (1954), he revealed a hierarchy of various needs of the individual. Initially this theory has physiological needs, security needs, social needs, self-esteem needs and actualization needs. The individual may be satisfied if the levels in the Maslow‟s hierarchy were achieved. Halpern (1999) reported that there are some cases where the employees left their career or organization because of the job dissatisfaction. This situation became an issue because it costs the company to recruit, select and train new employees.

Researchers have investigated and studied job satisfaction in a variety of professions and scopes. For example, customer service workers (Carless, 2004), student support personnel (Brewer and Clippard, 2002), youth development organizations (Petty, Brewer, and Brown, 2005) and management of healthcare workforce (Labiris, Gitona, Drosou, and Niaks, 2008). The job satisfaction theory by Alderfer (1972) shared the same belief as Maslow‟s theory. Maslow‟s theory stated that if the individual cannot satisfy his needs on a higher level, then individual will return to the needs of a lower level that are already been achieved. Through Alderfer‟s ERG theory of existence, relatedness, and growth, he sorted the needs into three categories such as Existence (Maslow‟s physical and safety needs), Relatedness (Maslow‟s social needs) and Growth (Marlow‟s estimation and self-realisation needs).

2.5 Conclusion

This chapter discussed a literature review regarding the relationship between the relevant factors that might contribute to job stress as the impact of the entire ergonomic problem.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter discussed and explained the methodology of the research. It includes research framework, sampling frame, population, sampling technique, sample size, unit of analysis, data collection procedures, survey instrument, validity of instrument and plan for data analysis.

3.1 Research Framework

According to Sekaran and Bougie (2010), the research framework is the foundation on which the entire project paper is based on dependent variable and independent variable. The dependent variable is job stress and independent variable is the seven ergonomics factor such as work design, humidity, lighting, acoustic (noise), working hours, shift work and work load. The relationship among various factors discussed in this framework for this project paper as showed on Figure 3.1.

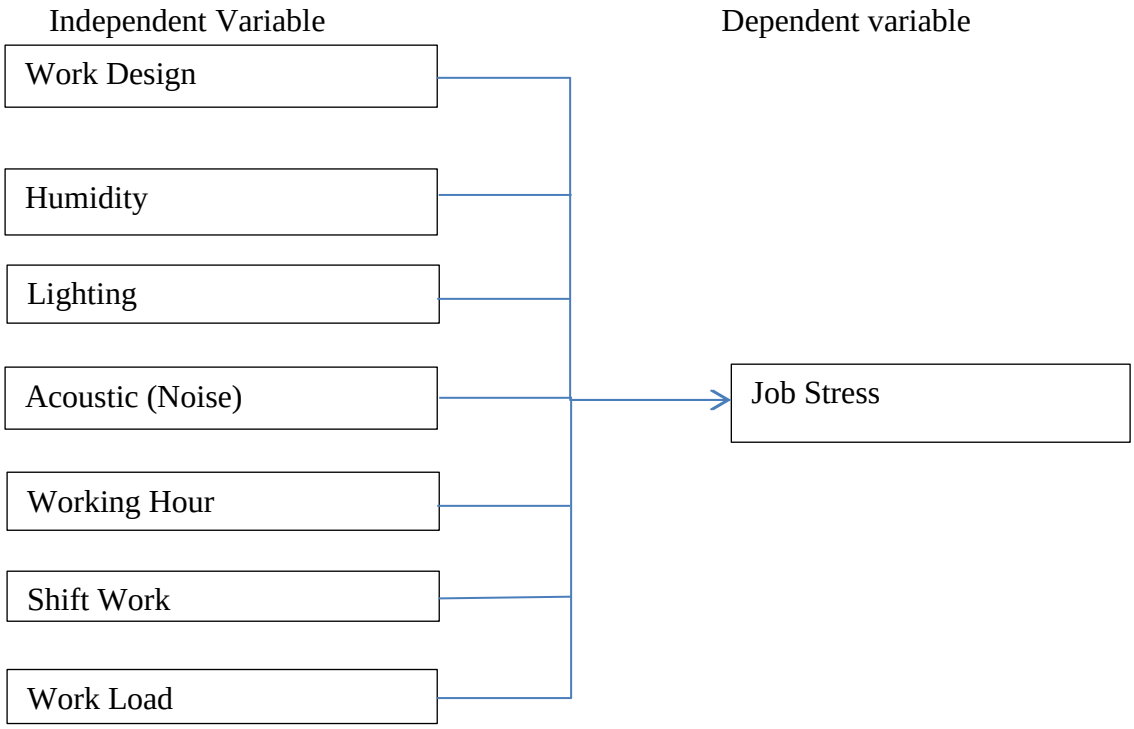

Figure 3.1: Research framework

Relationship between ergonomics Factor and job stress, this framework is adapted from Zarif and Durrishah (2009).

3.2 Research Design

Sekaran and Bougie (2010) stated that research design is to design the research and can be gathered and examined to attain to a solution. This research used cross-sectional studies. It is also called as one-shot which means that the data can be done through only one data collection in a period of time in order to answer a research question. In other words, research design is a market plan or model for conduction of a formal investigation (Sekaran & Bougie, 2010). It is a specification of methods and procedures for acquiring the information needed to solve any problems. It is also a strategy for a study and the plan by which the strategy is to be carried out and it

specifies the methods and procedures for the collection, measurement and analysis of data.

3.3 Definition of term

It is important to define the important terms in this study. This study is carried out to understand the relationship between ergonomics factor and job stress. The terms will be discussed in this research are job stress, ergonomics factor such as work design, humidity, lighting, acoustic, working hours, shift work, and work load.

Table 1

Definition of term

Variable	Definition	Sources
Stress	The non-specific response of the Body to any demand for change	Selye H (1936)
Work Design	Work design is the process of defining job task and work arrangement to accomplish them.	Schermerhorn (2005)
Humidity	Amount of water vapor in the air. Water vapor is the gaseous state of water and is Invisible.	Cole (1983)
Acoustic/ noise	Noise is an unwanted sound	McKeown (2008)
Lighting	Anything that illuminate such as lamp or candle. Inappropriate lighting is also a major contributor to vision such as eye strain, watery eyes ,	Blonna (2005)

Table 1 (Continued)

Variable	Definition	Sources
	headaches and the vision.	
Work Load	Work load is refer to the amount of work that is allocated to an employee to do.	M.Q.Imran (2013)
Working Hours	Working hours is an amount of time spent by an individual to carry out a job or task	Brett (2003)
Shift work	Shift work refer to a job schedule in which employee work hours other than the standard hours of 8.0am to 5.0pm or a schedule other than the standard workweek	Grosswald (2004)

3.4 Measurement of Variables or Instrumentation

The questionnaire was one of the main tools for collecting data from the respondents. The types and designs of questionnaires that were used depend on the studies that have been carried out. In this research, each variable measured by using questionnaires.

The researcher use research questionnaire is to help the researcher in extracting maximum data with the help of minimum questions from the respondents. The questionnaire thus acts as a standard guide for the interviewers who need to ask the questions in same way, as without this standardization the process can get haphazard. Questionnaires are a very important part of data collection methodology which ultimately facilitates the analysis. This questionnaire consists of three sections. Data collection process was done via questionnaire distributions. The questionnaires were

developed by altering several questionnaires related to ergonomic and work stress used in previous research to achieve the objectives of this research. Every item uses 5-point Likert scales i.e. (1) strictly disagree, (2) disagree, (3) not sure, (4) agree and (5) strictly agree. The questionnaire combines positive and negative items but during the coding process, the researchers did reverse coded on all positive items. Thus the new scale is read as (1) strictly agree, (2) agree, (3) not sure, (4) disagree and (5) strictly disagree.

Table 2

Measurement of Variables or Instrumentation

Sections	Sources	Measure	Type of Scale	No. of questions
Work Design	Karasek et al,(1998), Zafir and Durrishah (2009) and Wolfgang (1998)	1. My job need me frequently stand up 2. My job needs me to frequently carry heavy object. 3. My job needs me to stand up in a long period. 4. I do same movement in a long period. 5. I work in a discomfort body posture condition 6. I do repetitive task and frequent use arm, hand or finger In a minute 7. My job make my physically exhausted at the end of the day. 8. I always hunch to do my task	5-point Likert scale	8
Humidity	Zafir and Durrishah (2009)	1. Organization's internal temperature is too hot. 2. There is too little air movement in this organization. 3. The organization's is too dry. 4. There is unpleasant odor in the organization 5. My work station provide me a comfortable working area 6. My work area's environment is satisfactory	5-point Likert scale	6

Noise	Zafir and Durrishah (2009)	1. Noise level at my workplaces is satisfactory. 2. The work station environment does not face any noise problem. 3. Organization strives to minimize the noise level in my workstation. 4. Proper test has been done to measure noisy at workplaces.	5-point Likert scale	4
Lighting	Zafir and Durrishah (2009)	The illumination at my workplaces is satisfactory. 1. Organization provides flexible lighting system. 2. The bright lighting increases my job performance. 3. Organization always ensure to workers get sufficient lighting during work.	5-point Likert scale	4
Working hours	Zafir and Durrishah (2009)	1. The fixed working hours does not affect my personal life. 2. I feel satisfied with the working hours fixed by the organization. 3. I am given sufficient rest in a work hour period. 4. My work schedule often conflict with my family life. 5. The time i must devote to my job keeps me from participating equally in household responsibilities and activities	5-point Likert scale	5
Shift Work	Karasek et al,(1998), Zafir and Durrishah (2009) and Wolfgang (1998)	1. I like working in shift. 2. My shift schedule gives me sufficient rest. 3. I feel satisfy with the arrangements of shift schedule. 4. My social life was not affect by Shift work.	5-point Likert scale	4
Work load	Karasek et al,(1998), Zafir and Durrishah (2009) and Wolfgang (1998)	1. I have too much work. 2. I am able to have quiet and undisturbed time alone. 3. I have little support or network to solve work related problems. 4. I do have flexible working arrangement. 5. I am having too much to do and don't have enough time. 6. I find my work interfere with my leisure hours 7. There is constant pressure to work every minute with little opportunity to relax. 8. I get depress when I consider all task	5-point Likert scale	7

		need my attention. 9. find difficulty in finding enough time to relax. 10. I feel I have too much responsibility.		
Job stress	Karasek et al,(1998), Zafir and Durrishah (2009) and Wolfgang (1998)	1. Sometime I feel so tired 2. I feel easy to get frustrated or irate to my workplaces. 3. I lost my appetite due to work. 4. I do repetitive work and so bored. 5. Fatigue at work feels me depress and lazy to work. 6. I don't have strength to perform the task. 7. I easy get tired at workplaces	5-point Likert scale	6
Demographic data		Gender Age Income Education Level Working Experience Working status Shift Pattern Shift duration Shift trend Frequency changing shift in a week Working hours Overtime Others work	Nominal scale	13

3.5. Sampling Techniques

According to Sekaran and Bougie (2010), sampling design and sampling size are very crucial. A proper sampling design and size helps the researcher to find the conclusions that would be generalized to the population of interest. The target populations in this research were all the production operator in manufacturing company. Sampling is a process used in statistical analysis in which a predetermined number of observations will be taken from the larger population. The method used to sample should be representative of the general population and will depend on to the type of analysis to be performed. The type of sampling normally divided into 3 categories sampling such as simple random sampling, systematic sampling and observation sampling. To get a

representative sample, the sample must be drawn randomly and encompass the entire population. Sampling refer to the process of selecting the individuals from a larger group of people and drawing conclusion that are "an accurate representation of how the larger group acts or what they believe" (Fraenkel & Wallen, 2006). The population of interest is typically a group of persons who possess a certain characteristic (or set of characteristic) (Fraenkel, J.R and Wallen, 2006). The researcher used simple random sampling.

3.5.1 Populations and sample size

A population is any complete group, for example, of people, store territories, or college student. Population can be referred to the entire group of people, the events and things that the researcher intent to investigate (Sekaran and Bougie 2010).

Sampling is a process of selecting an adequate number of elements from the population. In every case, a sample is selected because it is impossible, inconvenient, slow, or uneconomical to enumerate the entire population. Sampling is a method of collecting information which if properly carried out, can be convenient, fast, economical, and reliable (Tryfos, 2001). For this research, simple random sampling is applied. Simple random sampling is unrestricted and is the purest form of probability sampling. It is also considered as a special case in which each population element has a known and equal chance of selection. The population in this study is a worker from manufacturing companies, which mostly from two major production departments available here. The foreign workers are excluded from this study due to language

barrier. From the 240 workers from general categories, 50 workers are foreigner and 190 are locals, and about 15 are from office side, the rest are about 175 manufacturing operator is actual population from production area, handling most of the job including manual handling, reaching, bending and twisting jobs that can be the causes of the ergonomic at workplaces problems and job stress. According to Krejcic and Morgan (1970) sampling table, researcher required about 121 sampling from 175 populations in this study.

3.6 Data Collection Method

Data collection method discussing about the process of gathering and measuring information on targeted variables in an established systematic research. Approximately 175 sets of questionnaire are prepared for distribution. Respondent were given an ample time to complete the questionnaire and the questionnaire are collected back, either personally or helped by workers' facilitator. The questionnaire are collected back in one week time, this is to cater workers in entire shift.

3.7 Data Analysis Techniques

The data collected will be processed and statistically analyze by using SPSS software version 19.0 (Statistical Package for Social science). The instruments to be used is frequency, Pearson Correlation and Regression as to analyze the relationship between dependent and independent variables.

Data analysis process involves several stages. Among its rank is the process of filtering data. This is to determine the accuracy of data input, data loss problem, and solve the problem of reliability. Reliability is confident as the accuracy of the data and of the measurement instrument (Kerlinger, 1986). According to George and Mellery (2010), the greatest value of alfa Cronbace as below table:

Table 3

Ranges of alfa cronbach value

P	T
≥0.9	Best (highly Reliable)
0.7≤ α < 0.9	Good
0.6< α ≤ 0.7	can be accepted
0.5 – 0.6	Weak
< 0.5	Not Acceptable

Sources: George & Mallery (2010)

The second stage is to get the number of respondent profile, frequency and percentage used. The method of mean value and standard deviation were used to answer the objective of the study.

The third stage is hypothesis. In hypothesis, researcher used the correlation and regression analyses. The correlation method is intended to examine the relationship between dependent and independent variables. The correlation method also can determine the relationship or link between one another variable. Table below is Multi coefficient correlation Pearson (r) table. If the probability value (P-Value) is smaller than 0.05 ($p<0.05$), the result will be significant. Therefore, there is a relationship between dependent variable and independent variable. If the probability value (p-

value) is equal to 0.05 (p=0.05) or is greater than 0.05 (p>0.05), there is no relationship between dependent variable and independent variables.

Table 4

Range of correlation value

Coefficient Correlation	Power relations
0.91 to 1.00	very strong
0.71 to 0.90	Strong
0.51 to 0.70	Medium
0.31 to 0.50	Weak
0.1 to 0.30	Very weak
0.00	No correlation

Sources: Chua (2009)

For regression method, were used to determine the factor that most influence the powerful the variables used in this study. Multiple regression analysis is a correlation coefficient that shows the strength of the relationship between two variables. This analysis given ideas to the researcher to identify differences in the dependent variable that is explained when several independent variables thus influence it theoretically. Multiple regression analysis was also used to study the effect of simultaneous multiple independent variables on the dependent variable periodic interval (Sekaran, 2003).

Cohen (1998) in the writing of Paul and Colin book (2010) has classified the strength of the correlation coefficient and the coefficient of determination as table below.

Table 5

Table of correlation coefficient and coefficient of determination

Absolute value	R squared	Effect size
$0.1 \leq r < 0.30$	$0.01 \leq r^2 < 0.09$	Small
$.30 \leq r < .50$	$0.09 \leq r2 < 0.25$	Medium
$r \leq .50$	$R^2 \geq 0.25$	Big

Source: Paul & Collin (2010)

3.8 Conclusion

This chapter discuss on the theoretical framework which is adapted from Zafir and Durraishah (2009), research design, definition of term, and data collection measurement. Data collection measurements consist of measurement variables, which are by questionnaire, sampling technique, populations, sample size and unit of analysis, data collection method and data analysis technique. The respondent for this project paper is workers from one manufacturing company located in Kampong Janda Baik, Bentong, Pahang.

CHAPTER FOUR

FINDINGS

4.0 Introduction

This chapter discusses about the result that has been generated from the study based on the analysis done on the data collected from respondents. The discussion of the research findings are according to the research objectives that have been outlined and it will answer the research questions in Chapter 2.

4.1 Respond rate

Questionnaire was distributed to all production workers at two production department of manufacturing company, excluding foreigner, due to language barrier. Clerical and administrative staff also excluded from this study due to different job nature. From the 175 set of questionnaire distributed, 122 questionnaire were returned (70%) return rate.

All 122 returned questionnaire are being use for data analysis, apart from some demographic elements which were not answered.

4.1.1 Section A: Demographic information

Demographic section requested the respondents to provide information on the gender, age, monthly gross salary, highest qualification, years of experience, working status, shift schedule, year of service in shift pattern, shift pattern, frequencies of shift changes. Also, how many hours in a week, average of overtime and other job that are

done in a week. The following tables will explain the detail of demographic profile of respondents.

Table 6

Respondents' Demographic Information

	Frequency	%
Gender		
Male	86	70.5
Female	36	29.5
Age		
< 20 years old	2	1.6
20 – 30 years old	56	45.5
31 – 40 years old	51	41.5
41 – 50 years old	10	8.1
> 50 years old	2	0.8
Education Attainment		
SPM	111	91
STPM	8	6.6
Diploma	2	1.6
Degree	1	0.8
Monthly gross salary		
< RM1000	18	14.6
RM1000 – RM1500	58	47.2
RM1501 – RM2000	32	26
RM2001 – RM2500	10	8.1
>RM2500	4	3.3
Work Situation		
Full time permanent	118	84.2
Temporary full time	2	1.6
Permanent half time	1	0.8
Others	1	0.8
Shiftwork schedule		
8 hours rotation	91	74
Day shift permanent	22	17.9
Night shift permanents	1	0.8
Other	8	6.5
Year of experience in shift pattern		
< One year	3	2.4
1-5 year	13	10.6

Table 6 (Continued)

	Frequency	%
6-10 year	34	27.6
10-15 year	22	17.9
15-20	14	11.4
>20 year	2	1.6
Rotation shift pattern		
8 hours, morning to afternoon	27	22
8 hours, night to afternoon to morning	72	58.5
8hours, pattern not specify	8	6.5
12 hours, day to night	1	0.8
12 hours, pattern not specify	2	1.6
Shift change pattern in one week		
None	54	43.9
2 Time	15	12.2
>2time	10	8.1
On call	1	0.8
Non Standard	20	16.3
Others	16	13
Year of experience		
< One year	3	2.4
1-5 year	24	19.5
6-10 year	37	30.1
10-15 year	29	23.6
>15 year	28	22.8
Total of working hour per week		
40 hours	42	34.1
44 hours	7	5.7
48hours	47	38.2
Others	25	20.3
Total overtime hour per week		
0 hours	70	56.9
< 8 hours	24	19.5
8- 16 hours	22	17.9
16-32 hours	3	2.4
>32 hours	1	0.8
Extra job		
0 hour	98	79.7
< 8 hours	16	13
8-16 hours	4	3.3
16-32 hours	1	0.8
>32 hours	1	0.8

From the figure in table 6, it shows that there were 69.9% are male respondent and another 29.3% are female respondents. The majority of respondents were male workers, due to the factor that manufacturing company is different from electronic company.

About 45.5% respondents are from age between 20 year to 30 year old, and 41.5% are from age between 31 year old to 40 year old. These two ranges already cover about 87% from the population.

Mainly workers receive income from RM 1000 to RM2000 which is represents about 69.2% of the respondent and for the qualification of respondent, 111 respondents (90.2%) had SPM, 8 respondents (5.5%) had STPM, and 2 respondent (1.6%) had degree.

Most respondent are from senior workers, which indicated service more than five years representing about 76.5 % of the populations. The highest rank is six to 10 years of service, shows 37 % of populations. The highest service is from five to ten years' service, representing 27.6 %, followed by ten to fifteen year of service, representing 17.9%.

Also from the result, showing the 8 hours rotation shift is the majority group of respondent. The shift rotation of eight hours, are from night to morning is the majority with 58.5% of shift pattern followed by workers. About 44% respondents have not changed their shift in one week. Mainly for workers working 48 hours in a week, with about 38.2% working for 48 hours and about 34.1% are working for about 40 hours.

More than half respondent were not working overtime with 56.9% and those who are doing overtime for less than 8 hours are about 19.5%. Some workers have extra job which they do after working time. But most of the respondent did not have second job after work with 79.7%, and the rest have their extra job.

4.1.2 Section B: Reliability on Independent and dependent variable.

Reliability is the degree to which measure are free from error and therefore yield consistent results. According to George and Mallery (2010), the closer the reliability coefficient gets to 1.0, the better it is, and all values over 0.90 are considered as best. Those values in the 0.70 to 0.90 are considered as good, value between 0.60 to 0.70 are considered can be accepted and the reliability less than 0.60 are considered to be weak. Table 7 summarizes the reliability test of the variables. The reliability of all the measures was comfortable above 0.60, ranging from 0.675 to 0.882 for all items.

Table 7
Reliability analysis- scale alpha

Variable	Items	α
1. Work Design		0.869
	1. My job need me frequently stand up 2. My job needs me to frequently carry heavy object. 3. My job needs me to stand up in a long period. 4. I do same movement in a long period. 5. I work in a discomfort body posture condition 6. I do repetitive task and frequent use arm, hand or finger In a minute 7. My job make my physically exhausted at the end of the day. 8. I always hunch to do my task	
2. Humidity		0.783
	1. Organization's internal temperature is too hot. 2. There is too little air movement in this organization. 3. The organization's is too dry. 4. There is unpleasant odor in the organization 5. My work station provide me a comfortable working area** 6. My work area's environment is satisfactory**	
3. Noise		0.758
	1. Noise level at my workplaces is satisfactory.** 2. The work station environment does not face any noise problem.**	

Table 7 (continued)

Variable	Items	α
	3. Organization strives to minimize the noise level in my workstation.**	
	4. Proper test has been done to measure noisy at workplaces.**	
4. Lighting		0.675
	1. The illumination at my workplaces is satisfactory.**	
	2. Organization provides flexible lighting system.**	
	3. The bright lighting increases my job performance.**	
	4. Organization always ensure to workers get sufficient lighting during work.**	
5 Working hours		0.786
	1. The fixed working hours does not affect my personal life.**	
	2. I feel satisfied with the working hours fixed by the organization.**	
	3. I am given sufficient rest in a work hour period.**	
	4. My work schedule often conflict with my family life.	
	5. The time i must devote to my job keeps me from participating equally in household responsibilities and activities	
6 Shift Work		0.768
	1. I like working in shift.**	
	2. My shift schedule gives me sufficient rest.**	
	3. I feel satisfy with the arrangements of shift schedule.**	
	4. My social life was not affect by Shift work.**	
7. Work load		0.841
	1. I have too much work.	
	2. I am able to have quiet and undisturbed time alone.**	
	3. I have little support or network to solve work related problems.	
	4. I do have flexible working arrangement.**	
	5. I am having too much to do and don't have enough time.	
	6. I find my work interfere with my leisure hours	
	7. There is constant pressure to work every minute with little opportunity to relax.	
	7 I get depress when I consider all task need my attention.	
	9. I find difficulty in finding enough time to relax.	
	10. I feel I have too much responsibility.	
8 Job stress		0.882
	1. Sometime I feel so tired	
	2. I feel easy to get frustrated or irate to my workplaces.	
	3. I lost my appetite due to work.	
	4. I do repetitive work and so bored.	
	5. Fatigue at work feels me depress and lazy to work.	
	6. I don't have strength to perform the task.	
	7. I easy get tired at workplaces	

Cronbach's alpha for these 8 items is 0.768 which is consider good according to George and Mallery (2010)

4.2 Correlation

In this research that includes 8 variables, beyond knowing the mean and standard deviations of the dependent and independent variables, researcher would often intended to know how a variable relates to other variables (Sekaran, 2003). By using Pearson Correlation matrix, information can be obtained, which matrix indicates the direction, strength and significant of the bivariate relationship of all variables in this study. Seven independent variables were tested at five percent level (0.50) of significant.

Table 8

Correlation between dependent variable and independent variable

		1	2	3	4	5	6	7	8
1	Stress	1							
2	Work Design	0.412**	1						
3	humidity	0.460**	0.370*	1					
4	Acoustic	0.188*	-0.71	0.258**	1				
5	Lighting	0.051	-0.186*	0,034	0.433**	1			
6	Working Hours	0.464**	0.369**	0.335**	0,193*	0.134	1		
7	Shift Work	0.327**	0.220*	0.248**	0.248**	0.172	0.573**	1	
8	Work Load	0.498**	0.486**	0.375**	-0.045	0.010	0.670**	0.349**	1

** Correlation is significant at the 0.01 level (2 tailed)
* Correlation is significant at the 0.05 level (2 tailed)

Table 8 shows the ergonomics factor had significant relationship with job stress outcomes ($p<0.01$). Among the factor, work load had the strongest relationship with the stress outcomes at the workplaces with correlation value (r) is 0.498. It was follow by working hours (r=0.464), humidity (0.460), work design (0.412), shift work (0.327), and acoustic (0.88).Only lighting indicates there is no relationship with job stress with correlation value (r) is 0.051.

4.3 Multiple Regressions

Multiple Regression analysis is a procedure to analyze associate relationships between dependent variable and one or more independent variables. This analysis was used in this study to determine whether the independent variables explain a significant variation in the dependent variable. The general purpose of multiple regressions (the term was first used by Pearson, 1908) is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable.

Table 9
Result of multiple regression in evaluating the relationship of Work Design, Humidity, Noise, work process design, working hour, shift work, lighting with job stress.

Standardized Beta Coefficients	**β**	**t**	**significant**
Work Design	0.159	1.667	0.099
Humidity	0.222	2.346	0.017
Acoustic (Noise)	0.054	0.597	0.552
Lighting	0.061	0.711	0.479
Working Hour	0.067	0.591	0.556
Shift Work	0.078	0.831	0.408
Work Load	0.386	3.637	0.000
Coefficient of Determination	**Model 1**		
R	0.702		
R Square	0.492		
Adjusted R Square	0.452		
Significant value	0.000		
F	12.334		

Table 9, shows the result of entering seven independent variables in the regression model and has obtained the correlation of all independent variables', work design, humidity, acoustic, lighting, working hours, shift work, and work load with the dependent variable, job stress was obtained. The result is R is 0.702, R square is at 0.452 and adjusted R square is at 0.452. The significant value is at 0.000 while F value is 12.334. The table also shows that independent variable of work load and humidity are significant statistic with 0.000 and 0.017 and shows that work load and humidity are essential in this study. The table shows that the independent variables of work load and the humidity have the biggest value. Based on analysis of this study, two hypotheses were supported; humidity and work load were found to have a significant influence on job stress in manufacturing company workplaces.

4.4 Summary of the result

Seven independent variables were tested at a five percent (5%) level (0.5) of significant. Result from hypothesis shows ergonomic factor has a relationship with job stress.

Hypothesis 1 (work design), hypothesis 2 (humidity), hypothesis 3 (acoustic/noise), hypothesis 5 (working hours), hypothesis 6 (work shift) and hypothesis 7 (work load), shows positive relationship between ergonomics factor and job stress. Only hypothesis 4 (lighting) show no relationship to job stress from this study.

From the study only two independent factors i.e., work load and humidity have a significant relationship towards the outcomes of job stress. Based on the analysis, only

work load and humidity level were found to have a significant influence on the stress outcome compared to other 5 variables, for this study at manufacturing company.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.0 Introduction

This chapter will discuss the result of the study, based on the answer reply by respondent and from the previous researchers. This chapter also will look for limitation and suggestion for future research. The conclusion will be at the end of this report.

5.1 Summary of the result

Table 10 shows that 49.2 percent of changes in the stress outcomes at the workplace were due to its relationship with work design, humidity, lighting, acoustic, shiftwork, working hour and work load factors. The remaining 50.8 percent was caused by others factor.

Table 10

Multiple correlation coefficient R

Model	R	R-Square	Adjusted square	Std. error of the estimate
1	0.702(a)	0.492	0.452	4.58476

(a) Predictor (constant) work design, humidity, acoustic, lighting, shift work, working time and work load.

Result from Multiple Regression analysis (table 11) shows that job stress among manufacturing company workers are caused significantly by work load and humidity factor. These two factors are the most significant factors that contribute to job stress

instead of others factors which are work design, lighting, noise, working hours and shift work. Work load factor gives Beta value, 0.386 with significant 0.000 and humidity factor gives value 0.222 with significant of 0.017 compared to other five factors.

According to Chua (2009), if the probability value (p-value) of multiple regression is more than 0.05 (p>0.05), the result will be not significant. Work design, noise, lighting, working hours and shift work variable, p-value is between 0.099 to 0.556 which is bigger than 0.05, shows not significant relationship between these five independent variable with job stress outcome.

Table 11
Result of Hypothesis

Model	**β**	**t**	**Significant**	**Relationship with Job Stress**
Work Design	0.159	1.667	0.099	Not significant
Humidity	0.222	2.346	0.017	**Significant**
Noise	0.054	0.597	0.552	Not significant
Lighting	0.061	0.711	0.479	Not significant
Working hour	0.067	0.591	0.556	Not significant
Shift Work	0.078	0.831	0.408	Not significant
Work load	0.386	3.637	0000	**Significant**

Based on Pearson Correlation analysis, for humidity factor, there is a positive relationship between humidity and job stress. The correlation value between humidity and job stress variable is 0.460. According to E.M. Sterling (1985), mentioned level of humidity that is either too high or too low may detract from human health and comfort. High relative humidity prevents effective evaporative cooling of the body during exposure to high temperatures and may lead to heat exhaustion or heat stroke and possible death (Cole 1983). According to Czubaj (2002), Indoor air quality has a

direct impact on health problems and leads to uncomfortable workplaces environments. At the place of study, one of the processes is using oven to curing the goods after coated with chemicals and solvents. The oven temperature is within range of 500 to 600 degree Celsius and more than hundred machines using similar type of oven. Temperature inside the workplaces is normally high at certain area and time, and also influenced with surrounding climate.

Work load has influenced on job stress among workers of manufacturing company, Beta value equal to 0.386, (the R values indicate that the influence variable) indicates that work load is the most independent variable that influences job stress. From Pearson correlation value is 0.498 compare to other independent variables. Al-Ameri AS, (2003) has stated in his studies that one of the six factors of occupational stress is pressure originating from workload. Workers might not express the disagreement against the management as many of them were not from high education background. They may not know their right to voice out for their right. The other factor is workers are mainly from nearby surrounding area, which is thinking twice to quit the job or to move to other industrial area. Many of them have been with organization more than fifteen years, and have a family to support and facing difficulty to move.

5.2 Limitations

A few limitations were realized in this study. The scope of the study was only in one manufacturing company and the result may not significantly applicable to other organization. This study also only focus on production workers, consist of two major production, other departments excluded because they do not have similar task, like Quality Department, which their main task is to check the quality of product between

processes and the final product. Office workers, which main job is administration, and certain support department, which have quite different task and only a few similarities, if included in this study may influence the result. This study also excluded the ergonomics factor to workers, in Logistic and Shipment department, due to the most of the workers were foreigners. Language was the main barrier for the foreigners, because some of them did not understand either Malay or English. The study will become more accurate if all local employees can contribute to this research.

Other factor might be the unwillingness of the workers to answer all the questions given, because they have to prioritize the production process rather than other commitment.

5.3 Recommendation to the company

For future research, it is suggested to do research at other department, such as office or administrative workers and those who have the most impact on ergonomic issue such as Logistic and Shipment Department. The most influence factor for administrative workers are sitting at work, video display unit (VDU), repetitive movement which can cause Carpal Tunnel Syndrome and other MSD hazards.

Besides that, for Logistic and Shipment Department, the most influence factor in ergonomic is handling heavy load, repetitive movements, awkward posture while working and manual handling issues. This study would become beneficial if extended to this section with different approach, to evaluate significant ergonomic factor to job stress at manufacturing company. The questionnaire for this section can be translated to foreign workers mother tangue language, because workers in this department are

mostly foreigner from Myanmar and Nepal. If the questionnaires are fully understood, than more accurate result will be obtained. The management could also administer detail survey on ergonomic issue in the organization, the data gathered could be used as a database to handl ergonomic issue in the future.

The number of question or item used to measure in variable should be limited to certain number, because too many questions could lead to wrong result, due to will loss of concentration or focus of the respondents.

5.4 Conclusion

In overall, the result of this study indicated that there was a positive correlation between work designs, humidity, working hour, noise, shift work, work load and job stress. Although this study was an extended study from the past researches, this research focused on the ergonomic factor and their relationship with job stress at one organization which is one manufacturing company.

The purpose of this study was to examine the variables that may affect job stress such as work design, humidity, noise, lighting, working hour, shift work and work load. The results shows a relationship between six independent variables, which are work design, humidity, noise, shift work, working hour and work load. Among these six variables that have the relationship with job stress, work load and humidity contributes the most significant factor that contributes to job stress among the employees. In a developing country such as Malaysia, ergonomics helps to improve productivity and enhance workplaces Occupational Safety and Health (OSH). It is essential to promote ergonomic concepts and practice by disseminating the

applications to various industries so that both employers and employees will gain benefits and become aware of design concepts and work methods that can help to improve workplace conditions as well as enhancing workers' OSH.

REFERENCES

H.S Loo and Stanley Richdarson (2012), *Journal of Social Science, Volume 1*, page 61-65.

Syou Maki, Yasutaka Ogawa, Hiroki Itoh, Rui-Sheng Wang, Zuquan Weng, Hiroyuki Saito, Nobuhiko Miura, Huizen Shang, Yougong Su, Qian Niu, Masaya Takahasi (2015): *Oxidative stress level among workers in two shift work system at stainless steel plants: Journal of Occupational Safety and Health,* Vol 12, No. 2: 7-14.

Grade AH, Hansen AM, Hansen J.(2009) *Sleep length and quality, sleepiness and urinary melatonin among healthy Danish nurses within shift work and leisure time*, Occup Environ Health; 82:1219-28.

Sharifah L.S.Y.(2009). *Effect of Work Shift on Occupational Fatigue, Job Stress and Sleep Quality among Firefighter in Malaysia*. Journal of Occupational safety and Health June, Vol. 6 No 1, Page 15-22.

Zafir Mohamed Makhbul, and Fazilah Mohamad Hasun (2008), *Ergonomics Workstation Design*. Journal Occupational Safety and Health 5:7-17.

Zafir Mohamed Makhbul, Durrisah Idrus, Mat Rebi Abdul Rani (2008). *"The importance of ergonomic workstations to the health of a multinational organization in Malaysia".* IJMS 15(2), pp 205-226.

Karasek, R.A (1979*),"Job Demands, Job Decision latitude, and Mental Strain: Implication for Job redesign".* Administrative Science Quarterly, Vol. 24, No.2, pp. 285-308.

Krejic, R. Morgan D (1970), *"Determining Sample Size for Research Activities"*. Educational & Physiological Measurement, 30, pp.607-610.

Alireza Choobineh, Sayed Hamidireza Tabatabaei, Abbas Mokhtarzadeh and Maryam Salleh (2007) *"Musculoskeletal Problem among workers of an Irian Rubber factory*". J. Occupational Health , 49, pp 418-423.

Selye, H (1950). *"Stress and the general adaptation syndrome"*. Br. Med. J. 1 (4667): 1383–92. doi:10.1136/bmj.1.4667.1383.PMC 2038162. PMID 15426759.

Hagberg, M., Vilhemsson, R., Wigaeus Tornqvist, E., Toomingas, A.(2007) *incident of self-reported reduced productivity owing to musculoskeletal symptom: association with workplace and individual factor among computer users,* Ergonomics, 50, 11, 1820-1834.

Cannon, W. (1939). *The Wisdom of the Body*, 2nd ed., NY: Norton Pubs.

Palmer S, Cooper C and Thomas K, '*Model of organisational stress for use within an occupational health education/promotion or wellbeing programme – A short communication*', Health Education Journal, Vol. 60 No.4, _001.

Evans, Gary W, Cornell U, *dept of Design & Environmental Analysis, Ithaca, NY, US*. Journal of Applied Psychology, Vol 85(5). Pp.779-783.

Rummell, C. M. (2015, November 2). *An Exploratory Study of Psychology Graduate Student Workload, Health, and Program Satisfaction*. Professional Psychology: Research and Practice. Advance online publication.

Vanworterghem K (1996): *Work related musculoskeletal problems: some ergonomics consideration.* J Hum Ergol 25, 5-13.

Fraenkel, J.R and Wallen, N.E .(2006) *How to design and evaluate research in education*. New York: Mc Graw-Hill.

Creative research system (2007). The survey system <http://www. Surveysystem.com/sdesign.htm

www. Hse.gov.uk/stress/standards/demands.htm.

www.cdc.gov/niosh/wp.

L.Edward and P.Torcellini*."A literature Review of the Effect of Natural Light On Building Occupants".* NREL/Technical Report-550-30769.

Zafir Mohamed Makhbul, Durrishah Idrus (2009*)"Work Stress Issues in Malaysia"*. Malaysia Labour Review Vol.3. No 2, 13-26.

E.M Sterling, A. Arundel, T.D Sterling (1985*),"Criteria for Human Exposure to Humidity in Occupied Building"* ASHRAE Transactions, Vol.91, part 1.

Randall B.Dunham (1977*)." Shift work: A review and the theoretical analysis".* Academic of Management Review.

A Shift work and vascular events: Systematic review and meta-analysis. BMJ 2012.