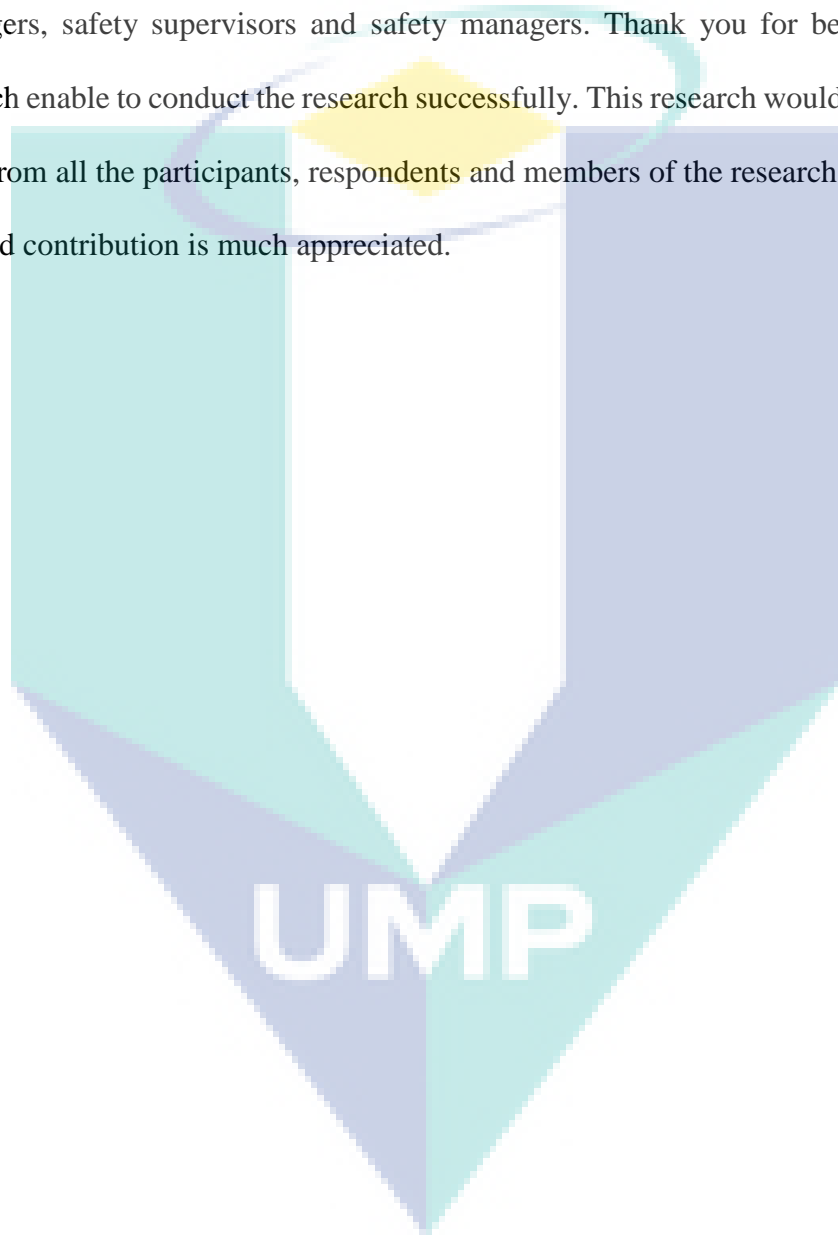


ACKNOWLEDGEMENTS

First and foremost, I am profoundly grateful to Allah S.W.T for everything by which without His blessing and mercy this project would not been successful. I would like to express my greatest gratitude towards UMP for granted this grant to conduct the research. Also, industrial personnel from manufacturing industry which include plant managers, safety supervisors and safety managers. Thank you for being helpful and being cooperative and which enable to conduct the research successfully. This research would be impossible without the aid and support from all the participants, respondents and members of the research involved in this study. Their cooperation and contribution is much appreciated.



ABSTRACT

With reference to the statistics by (DOSH Malaysia, 2015), accidents that caused non-permanent and permanent disabilities among workers were the highest in the manufacturing industry. Until February 2016, investigated numbers of death, non-permanent disability, and permanent disability in the manufacturing industry were 3, 324 and 13 of cases respectively (DOSH 2016). This two months statistics are alarming and elucidate the needs to conduct scientific research to find the best way to solve the problem.

In 2005, a total number of 51,829 industrial accidents had been reported to the Department of Safety and Health, Malaysia. Analysis shows, there will be 6.93 accidents that involve death in 100,000 workers and 5.16 accidents in 1000 workers. However, in 2015 numbers of reporting accident had been drop to 38,753 cases with 4.84 accidents involve death in 100, 00 workers and 2.81 numbers of accidents in 1000 workers. As a country that moving forward the rate of accidents and death should be further reduced (Pelan Induk Keselamatan dan Kesihatan Pekerjaan, Kementerian Sumber Manusia Jabatan Keselamatan dan Kesihatan Pekerjaan 2016).

In this study, taking at-risk behavior will be studied. It is reliable in determining the level of safety and health awareness since accidents in the manufacturing industry depend on various factors, such as the number of products being undertaken (Burton, S. 2012). Further to this, the most effective interventions employed known behavior modification principles, resulting in an intervention framework known as the behavioral safety approach (Geller 2001).

ABSTRAK

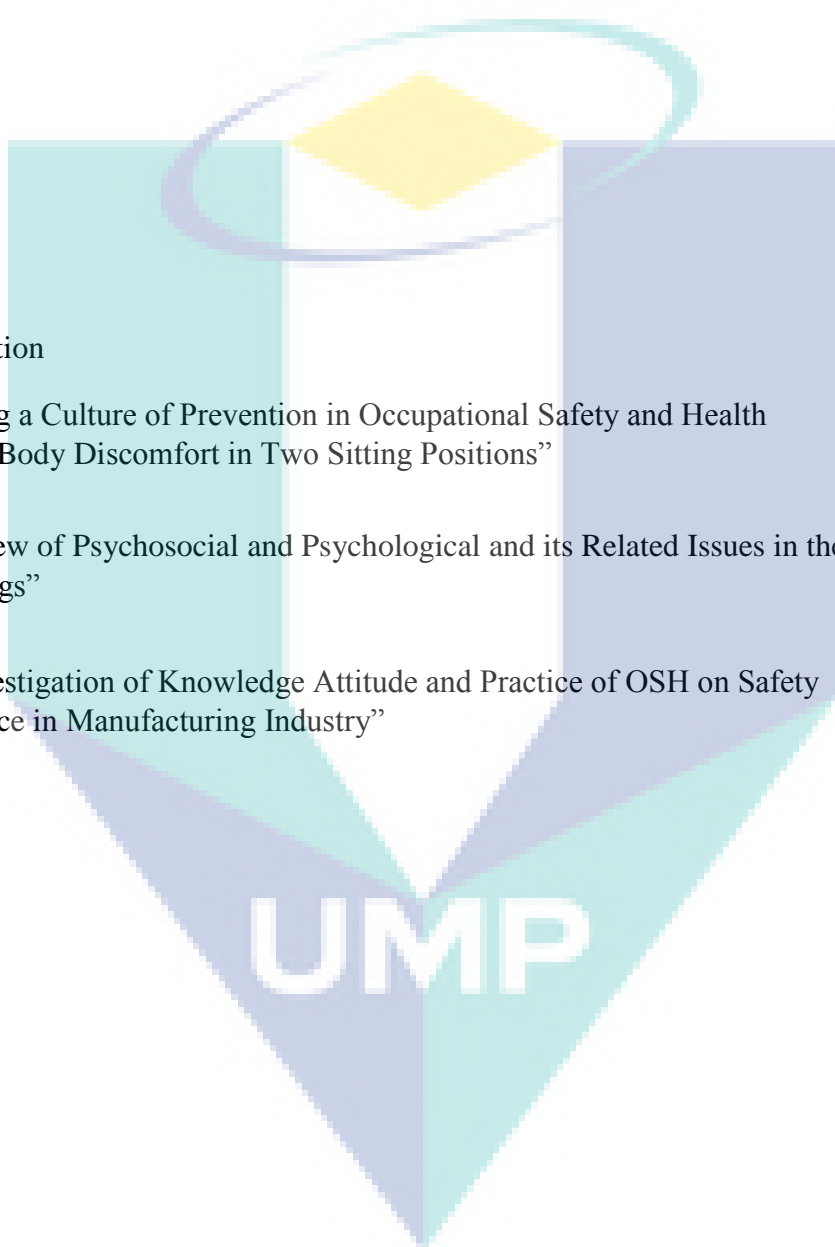
Dengan merujuk kepada statistik oleh (DOSH Malaysia, 2015), kemalangan yang menyebabkan ketidakupayaan tidak kekal dan kekal di kalangan pekerja adalah yang tertinggi dalam industri perkilangan. Sehingga Februari 2016, jumlah kematian, ketidakupayaan tidak kekal dan ketidakupayaan kekal dalam industri pembuatan masing-masing adalah 3, 324 dan 13 (DOSH 2016). Statistik dua bulan ini membimbangkan dan menjelaskan keperluan untuk menjalankan penyelidikan saintifik untuk mencari jalan terbaik untuk menyelesaikan masalah ini.

Pada tahun 2005, sejumlah 51,829 kemalangan industri telah dilaporkan kepada Jabatan Keselamatan dan Kesihatan Malaysia. Analisis menunjukkan, terdapat 6.93 kemalangan yang melibatkan kematian dalam 100,000 pekerja dan 5.16 kemalangan dalam 1000 pekerja. Walau bagaimanapun, pada tahun 2015 bilangan kemalangan yang dilaporkan telah menurun kepada 38,753 kes dengan 4.84 kemalangan melibatkan kematian dalam 100, 00 pekerja dan 2.81 bilangan kemalangan dalam 1000 pekerja. Sebagai sebuah negara yang bergerak maju kadar kemalangan dan kematian perlu dikurangkan lagi (Pelan Induk Keselamatan dan Kesihatan Pekerjaan, Kementerian Sumber Manusia Jabatan Keselamatan dan Kesihatan Pekerjaan 2016).

Dalam kajian ini, tingkah laku berisiko akan dikaji. Dalam menentukan tahap kesedaran keselamatan dan kesihatan, kemalangan dalam industri pembuatan bergantung kepada pelbagai faktor, seperti bilangan produk yang sedang dilaksanakan (Burton, S. 2012). Selanjutnya, intervensi yang paling berkesan menggunakan prinsip pengubahsuaian tingkah laku yang diketahui, menghasilkan rangka kerja intervensi yang dikenali sebagai pendekatan keselamatan tingkah laku (Geller 2001).

TABLE OF CONTENTS

	Page
Title	
Acknowledgement	1
Abstract	2
List of Tables	5
List of Figures	6
List of Acronyms	7
List of Appendix	8
Chapter 1: Introduction	9
Chapter 2: “Creating a Culture of Prevention in Occupational Safety and Health Practice: perceived Body Discomfort in Two Sitting Positions”	12
Chapter 3: “A Review of Psychosocial and Psychological and its Related Issues in the Occupational Settings”	17
Chapter 4: “An Investigation of Knowledge Attitude and Practice of OSH on Safety Climate at Workplace in Manufacturing Industry”	28
Conclusion	39
References	40
Appendix	41



LIST OF TABLES

Tables

Chapter 2

- Table 1 The risk factors of occupational health problem due to sitting
- Table 2 Demographic Information of Respondents (n=30)
- Table 3 The Mean Difference of Borg Scores in Nine Body Regions

Chapter 3

- Table 1.0 Description of psychosocial risk with respective authors
- Table 2.0 Previous studies on psychosocial issues in workplace
- Table 3.0 Previous studies on psychosocial issues at the workplaces
- Table 4.0 Description of psychological health from several authors
- Table 5.0 Previous studies on psychological health issues in the workplace
- Table 6.0 Previous studies on psychological health issues at the workplace

Chapter 4

- Table 1 Alpha Value of Safety Climate Factors
- Table 2 Alpha Value of KAP
- Table 3 Demographic Information of the Respondents
- Table 4 Safety Climate and KAP Domains Correlation



UMP

LIST OF FIGURES

Figures

Chapter 2

Figure 1 (a) Upright sitting, (b) Slump sitting

Chapter 3

Figure 1.0 Flow chart on the selection of the articles of the reviews

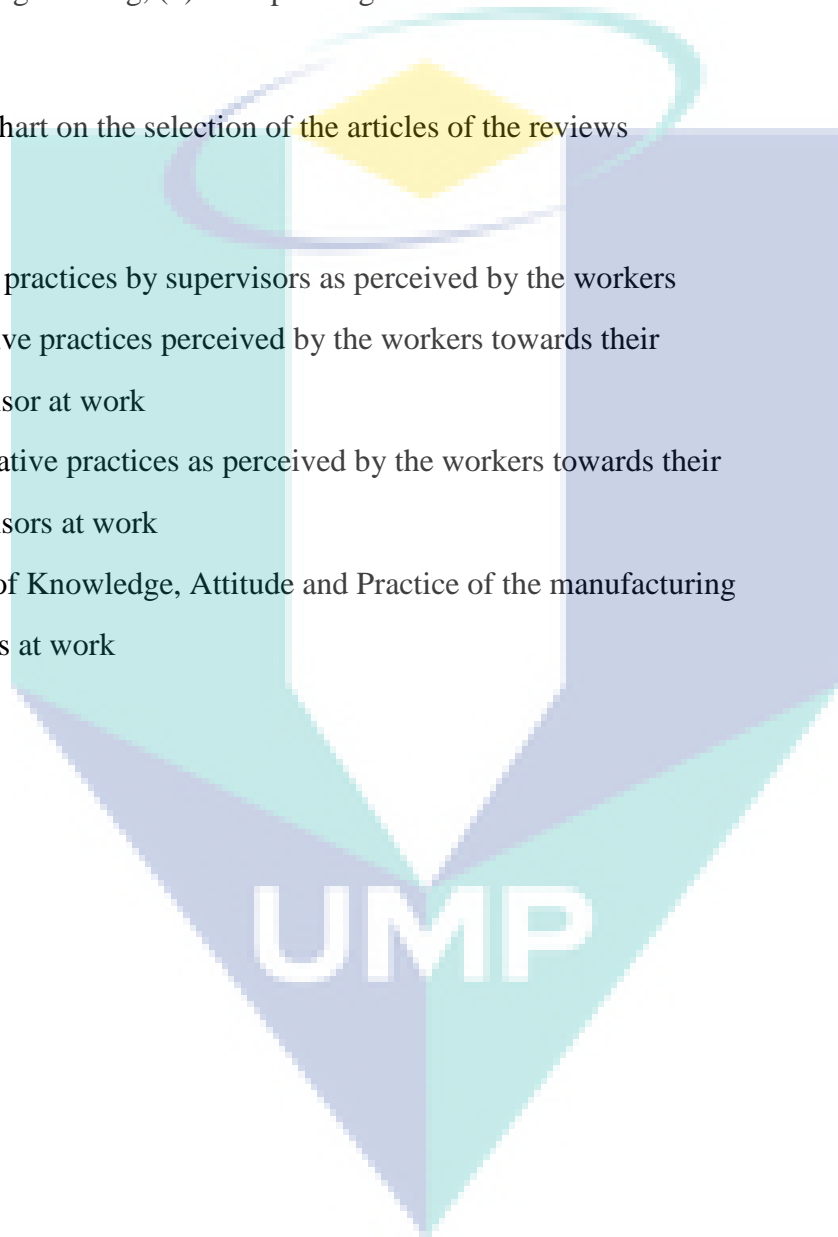
Chapter 4

Figure 1 Active practices by supervisors as perceived by the workers


Figure 2 Proactive practices perceived by the workers towards their supervisor at work

Figure 3 Declarative practices as perceived by the workers towards their supervisors at work

Figure 4 Mean of Knowledge, Attitude and Practice of the manufacturing workers at work



LIST OF ACRONYMS



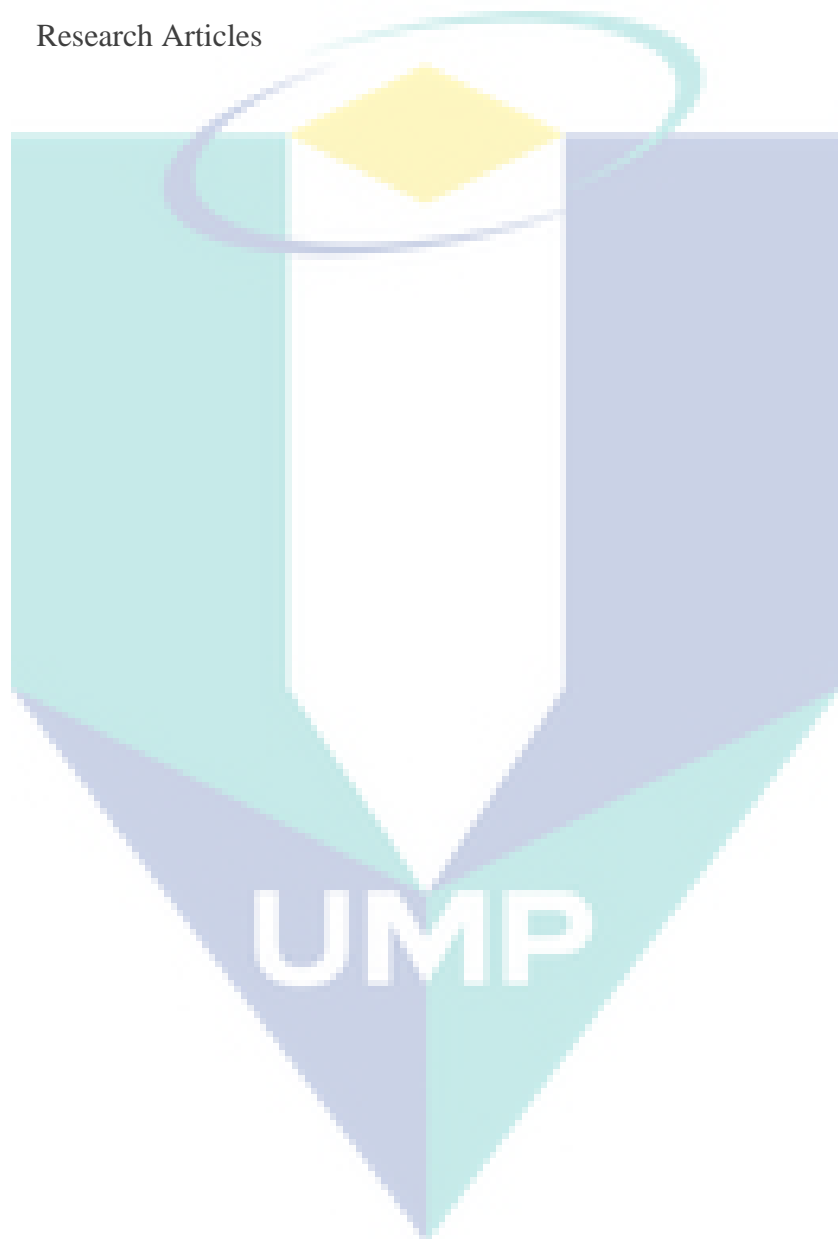
LBP	Low Back Pain
SOCSSO	Social Security Organization
MSDs	Musculoskeletal Diseases
SPSS	Statistical Package of Social Science
BMD	Benchmark Dose
OHSM	Occupational Health Safety Management
KAP	Knowledge Attitude and Practice
FMM	Federation of Malaysian Manufacturers
MSC	Multilevel Safety Climate
EFA	Exploratory Factor Analysis
SEM	Structural Equation Modelling
CFA	Confirmatory Factor Analysis

LIST OF APPENDIXES

Appendix A Data Collection at LYNAS

Appendix B Short Bulletin FTEK: UMP-KANEKA

Appendix C Research Articles



CHAPTER 1: INTRODUCTION

Behavior-based safety management is best seen as a continuous process. In essence, applied behavior analysis holds that behavior is under the control of environmental contingencies (Skinner, B.F., 1938). While these principles were developed initially through laboratory experiments with animals, they have been shown to have wide applicability to behavior change efforts in a variety of clinical and applied contexts (Kazdin, E.E., 1973; Nemeroff, C.J., Karoly, P., 1991). More recently, proponents of behavior-based approaches have argued that such programs can bring about more lasting effects, and perhaps actual shifts in the safety culture or climate of the organization (Saari, J., 1992; Zohar, D., 1980)

Wirth and Sigurdsson, 2008 stated that behavioural safety is an approach designed to improve safety performance directly through peer observations of safe behaviours, goal setting, performance feedback, and celebrations or incentives for reaching safety goals. De Pasquale and Geller (1999), using one-on-one interviews and focus-group meetings at 20 organizations that had implemented a behaviour-based safety (BBS) process in order to find reasons for program success or failure. Data were collected using focus group discussions and perception surveys. A total number of 31 focus groups gave 629 answers to six different questions. Each BBS process included interpersonal observation and feedback with a checklist of specific safe and at-risk behaviours. Results shows that, there are five variables contribute significantly to predictive of employee involvement in a BBS process: 1) perceptions that BBS training was effective; 2) trust in management abilities; 3) accountability for BBS through performance appraisals; 4) whether or not one had received an education in BBS; and 5) tenure with the organization.

Fung *et. al.* (2005) conducted a study to investigate behavior, attitudes, and perceptions of workers towards safety culture and explores the inter-correlation among associated factors. Those factors were including organizational commitment and communication, accident reporting and near-misses, line

management commitment, supervisor's role, personal role, workmates' influence, risk taking behavior, and obstacles to safe behavior. Finding shows that organizational commitment and communication is highly associated with accident reporting and near-misses, line management commitment, supervisor's role, personal role, respectively. Meanwhile, personal role is shown a negative correlation and statistically signification with obstacles to safe behavior and also a negative correlation with risk taking behavior. Workplace injury causation is frequently portrayed as a sequence of stages or levels (Andersson and Menckel, 1995; Heinrich et al., 1980). Taking at risk behaviour is very much related to a person internal and external factors. Those internal factors were including personalities, attitude, values and intentions. Whereas, for external factors it is refer to coaching, recognizing, complying, communicating, and actively caring (Geller, E. Scott 2001).

Objectives of the study

To investigate the risk taking behaviours among workers working in the manufacturing industry.

To identify significant factors that influence risk taking behaviour

To develop a model of risk taking behaviours in manufacturing industry

Study design

Study design for this research will be a cross sectional. This study design allowed researcher to study the entire population or a selected subset, and the process of data are collection will lead to answer research questions of interest.

Study location

This research was conducted at two manufacturing plant which are Kaneka (Malaysia) Sdn Bhd and Lynas Corporation at Gebeng, Kuantan.

Study sample

Workers working in the 2 type of manufacturing industry approximately 500 manufacturing workers were involved.

Data collection techniques

i. Focus group discussion

A focus group discussion is a good way to gather together people from similar backgrounds or experiences to discuss a specific topic of interest. The group of participants is guided by a moderator who introduces topics for discussion and helps the group to participate in a lively and natural discussion.

ii. Review the safety report and related documentation

A series of documentation and record review will be conducted during the data collection. These records include those that required by the regular authorities, assist in the operation of safety and health and day to day operation business. Examples of record were including: Accident/incidents/ near misses, Audits and reviews, reporting of incidents and system failures, OSH committee minutes/toolbox meetings minutes, Training, Workers' compensation claims, Health surveillance and Work environment monitoring.

iii. Walkthrough observation

iv. Structured interview

v. Survey using questionnaires

The logo for UMP (University of Management and Pedagogy) is a large, stylized shield shape. It is composed of several overlapping geometric shapes in shades of teal, light blue, and yellow. The letters 'UMP' are prominently displayed in white, bold, sans-serif font across the bottom center of the shield.

UMP



CHAPTER 2

CREATING A CULTURE OF PREVENTION IN OCCUPATIONAL SAFETY AND HEALTH

PRACTICE: PERCEIVED BODY DISCOMFORT IN TWO SITTING POSITIONS

UMP

CREATING A CULTURE OF PREVENTION IN OCCUPATIONAL SAFETY AND HEALTH PRACTICE: PERCEIVED BODY DISCOMFORT IN TWO SITTING POSITIONS

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ABSTRACT

Prolonged sitting is one of the factors for back discomfort. Sitting in the same position for long periods of time is worse. This experimental based study was conducted to achieve three objectives. There were to 1) identify whether is there any differences between perceived body discomfort among respondents before and after upright sitting, 2) identify whether is there any differences between perceived body discomfort among respondents before and after slump sitting and 3) compare the level of perceived body discomfort among respondents after two sitting postures. Thirty young and healthy adults were recruited as study respondents. Each respondent was asked to sit in a posture either upright or slump for 30 minutes. Respondents were then rated their body discomfort using Borg CR-10 scale before and after sitting. Another sitting posture was carried out after one day interval. There is a significant difference between perceived body discomfort among respondents before and after upright and slump sitting. Body discomfort of upright sitting was shown significantly greater than slump sitting. Although, slump sitting caused less discomfort than upright, but it proven by previous studies did not provide benefit to occupational safety and health practice in preventing occupational health related disease.

Keywords: Upright sitting, slump sitting, back discomfort, safety and health, injury prevention.

INTRODUCTION

In this modern era with high advanced of technology, people spend a lot of their time in sitting while working or driving. Increases in sitting time signify that decrease in physical activities. In Malaysia, 14% of the population complained of musculoskeletal pain and 12% of the population had low back pain (LBP)¹. There is a sign that indicate the number of people suffering in LBP will increase in future². From the Social Security Organization (SOCISO) Malaysia database in 2012, there were 499 cases of Musculoskeletal Diseases (MSDs) reported and it showed an upward trend of MSDs cases as compared to previous years. Many researchers found that sitting itself is not an independent causative of MSDs^{3,4}. Sitting with combination of other factors will have the possibility of having MSDs⁵.

Sitting posture is an important factor to prevent future MSDs. When sitting is affected by an awkward body posture, the human musculoskeletal system is compromised⁶. A proper sitting posture can protect our lumbar spine from getting injury. A proper posture will also keep bones and joints to be in a correct alignment, decrease the abnormal wearing of joint surfaces, reduce stress on the ligaments, prevent fatigue and strain and also

prevent unnecessary pain. Signs of perceived discomfort such as tension, fatigue, pain, suffering or tremors, are the predictors of LBP⁷.

Although awkward posture while sitting were not been well investigated but it is believed that there is a strong association with the presence of LBP⁵. De Carvalho et al.⁸ emphasize that the sitting posture plays a role in generating low back pain. So in order to prevent getting MSDs from sitting, it is important to study the significant body part that generated pain by sitting posture. There are many different types of sitting posture, for example, upright sitting, forward leaning sitting and slump sitting. Among these different types of sitting, it is necessary to identify which what type of posture that lead to minimum lumbar spine load during sitting and perceive less discomfort. Different sitting postures will lead to different body discomfort. Table 1 shows previous studies about sitting and its combination factors that may put human at risk. The sitting postures that investigated in this study were upright and slump sitting.

Table 1- The risk factors of occupational health problem due to sitting

Author	Significant Factor	Non-significant Factor
Syazwan et al. ⁶	Sitting with whole body vibration or awkward posture or the combination of these two	Sitting solely
Chen et al. ⁹	Prolonged sitting at work	Sedentary Lifestyle
Roffey et al. ⁴	Sitting without appropriate movement for prolonged period	Sitting solely
Levanon et al. ¹⁰	Awkward postures	Sitting solely

According to O'Sullivan et al.¹¹, upright sitting involves rotation of the pelvis anteriorly in order to ensure lordosis in a neutral position, relaxation of the thorax, thoraco-lumbar spine extended and slightly retraction of shoulder blades. While slump sitting posture involves posterior rotation of the pelvis, the relaxation of thoraco-lumbar spine and eyes looking straight ahead. Figure 1 shows upright sitting posture (A) and slump sitting posture (B).

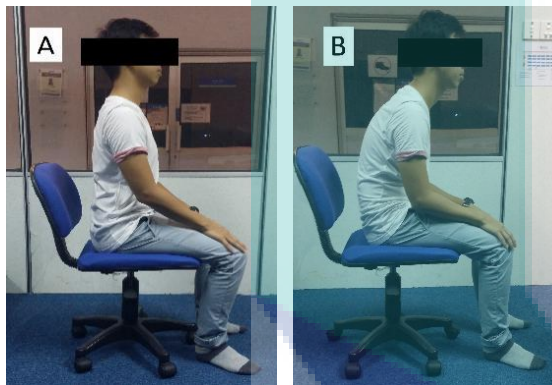


Figure 1 - (a) Upright sitting, (b) Slump sitting

This research was carried out in order to achieve two objectives, which were: (1) to identify whether is there any differences between perceived body discomfort among respondents before and after two types of sitting, upright and slump sitting, (2) to compare the level of perceived body discomfort among respondents after two sitting postures.

METHODS

Subjects

Thirty young and healthy adults in the range of age between 22 - 26 years old (mean = 22.20 and SD = 1.3) were recruited as respondent for this study. All respondents were ensure to fully understand of the procedures and objectives of the study and signed a consent form.

The respondents were selected based on the inclusion criteria such as healthy and asymptomatic of musculoskeletal disease. Respondent who had experience of severe musculoskeletal pain in the preceding 12 months, current or past history of known spinal disorders, signs of neurological deficit, osteoarthritis, rheumatoid arthritis, gout, kidney diseases, open wound or contusion at the buttocks or posterior thigh region and also pregnant will be excluded in this study.

In addition, candidate who has body mass index (BMI) less than 18.5 kg/m² or more than 23 kg/m², were also considered as unhealthy and excluded for this study. The results obtained then were analyzed using Statistical Package of Social Science (SPSS) software.

Questionnaire

Borg CR-10 scale was used to collect perceived body discomfort before and after sitting. This questionnaire aimed to determine each respondent's level body discomfort before and after upright and slump sittings. The Borg CR-scale was presented together with a body map so that respondent could indicate parts of their body experienced discomfort. There were a total of 19 body parts tested, which were head, neck, chest, waist, lower torso, upper back, mid back, lower back, left and right shoulders, left and right upper arms, left and right lower arms, left and right thighs, left and right lower legs and hip and level of discomfort felt was recorded.

Nordic Musculoskeletal Questionnaire was used to identify the prevalence of reported symptoms of pain and intensity of pain in the past 12 months. This procedure was carried out to fulfill the study criteria which excluded respondents that have neck and back injuries for the past 12 months. Those who experienced neck and back injuries in the preceding 12 months may affect the result.

Study Protocol

Each subject was required to sit in two sitting postures (upright and slump) on two separate days with at least one day interval after the first activity. The sequence of sitting posture was assigned randomly. During the experiment, respondents sat on the office chair with their hips and knees flexion 90°, arms were put on their lap and feet flat on the floor. The office chair was accommodated to each respondent as it is an adjustable.

During the sitting period, respondents were instructed to maintain the assigned sitting posture as much as possible and to avoid talking and laughing. The respondents were allowed to have subtle movement if they felt too much discomfort.

RESULTS AND DISCUSSION

The demographic information of the respondents were presented in Table 2. The mean difference of body discomfort scale for mid back, lower back, upper back, and left shoulder, right shoulder, left lower leg, right lower leg, neck and hip were recorded in Table 3.

Table 2 - Demographic Information of Respondents (n=30)

Characteristics	Mean (SD)
Age (year)	22.20 (1.30)
BMI (kg/m ²)	20.22 (1.59)
Gender	Number
Female	15
Male	15

In upright sitting, the p-value obtained for all body parts except left and right shoulder was less than 0.05. Thus, there is a significant evidence shows that there is a difference of perceived body discomfort before and after upright sitting. The result indicated that remain sitting for upright posture for thirty minutes is long enough to generate noticeable discomfort. For neck, upper back, mid back, lower back, left lower leg, right lower leg and hip, these parts have a p-value less than or equal to 0.001 ($p \leq 0.001$). Therefore, mentioned body parts have the greatest significant of body discomfort after thirty minutes upright sitting as compared to other body parts. By comparing differences between before and after sitting, it was found that the body discomfort at mid back was higher than at lower back and upper back. Whereas the body discomfort at lower back was higher than at upper back, and it followed by hip, neck and both lower legs.

Table 3 - The Mean Difference of Borg Scores in Nine Body Regions

Body Part	Mean Difference of Borg Scores	
	Upright	Slump
Mid Back	1.767***	1.450***
Lower Back	1.600***	1.450***
Upper Back	1.467***	1.317***
Hip	0.767***	0.767***
Left Shoulder	0.600	0.800***
Right Shoulder	0.583	0.883***
Neck	0.533***	0.533***
Left Lower Leg	0.350***	0.250
Right Lower Leg	0.350***	0.250

***Significant at p-value ≤ 0.001

In slump sitting, the p-value obtained for all body parts were less than 0.05. Thus, significant evidence shows that there is a difference of perceived body discomfort before and after slump sitting. Same as the upright sitting, the result signified that sitting for slump posture without changing posture for 30 minutes enough for body to generate noticeable discomfort. For neck, upper back, mid back, lower back, left shoulder, right shoulder, and hip, these parts have a p-value less than or equal to 0.001 ($p \leq 0.001$). Thus, for these body parts there have the greatest significant body discomfort after 30 minutes of slump sitting as compared to other body parts. By comparing differences of before and after sitting, it was found that the body discomfort at mid back is same as the body discomfort at the lower back. Both mid back and lower back discomfort was higher than upper back. While the body discomfort at the right shoulder was higher than at the left shoulder followed by hip and neck.

Mann Whitney U test indicated upright sitting was significantly greater than slump sitting, ($U=146$, $p=0.160$). Both u-value and p-value proved that there is significant evidence shows that the level of perceived body discomfort of upright posture is higher than in slump posture. The result of this research was concurred with a research conducted by Waongengarn, Rajaratnam, and Janwantanakul⁷. They also found that the body discomfort at the upper back, low back, neck,

shoulders, hip and both thighs ($p \leq 0.05$) after upright sitting were significantly greater than before sitting. Besides that, it also found that the body discomfort at the upper back, low back, neck, shoulders, hip and both thighs ($p \leq 0.05$) after slump sitting were significantly greater than before sitting. In the same research, they also concluded that upright sitting will be causing more body discomfort compared than slump sitting.

The reason for upright sitting generated more body discomfort may because of upright sitting position associated with increased postural muscle activity and activation of muscle lead to muscle fatigue and tension, thus it induced body discomfort easily

¹¹. Upright sitting was associated with high level of muscles activation, particularly of muscles such as thoracic erector spinae, iliocostalis longissimus pars thoracis and external oblique^{12,13}. As a result, upright sitting caused greater fatigue and discomfort¹⁴. During upright sitting, human body requires much support from back muscle to maintain the lumbar spine in straight position. While in slump sitting, less muscle needed to support the lumbar spine, therefore slump sitting is more comfortable than upright sitting. This explained why many people tend to choose slumped sitting position instead of upright sitting¹⁵. In a book by Mckeown¹⁶, it stated that maintaining an upright posture is particularly fatiguing, so people opted to slump sitting to feel relax. The result of this research clarifies that behavior of people in choosing slump sitting posture.

However, as compared to upright sitting, slump sitting tends to decrease postural muscle activity and increased lumbar flexion. When postural muscle activity decreases, the lumbo-pelvic region becomes dependent on its passive structures to maintain the position against gravity⁷. This phenomenon makes the spine susceptible to injury. Moreover, increased lumbar flexion in sitting is considered problematic since it increases LBP symptoms¹⁷. While upright sitting involved lumbar lordosis, thus this posture is suggested by many of the physiotherapists in choosing the best ideal sitting posture¹⁴. Although, slump sitting caused less discomfort than upright, but it does not provide benefit to human musculoskeletal system. Despite lack of evidence of clear superiority of upright sitting over other sitting posture, but there are still many researchers suggest that upright sitting was appropriate than slump sitting for long hour sitting^{7,18,19}.

I. CONCLUSION

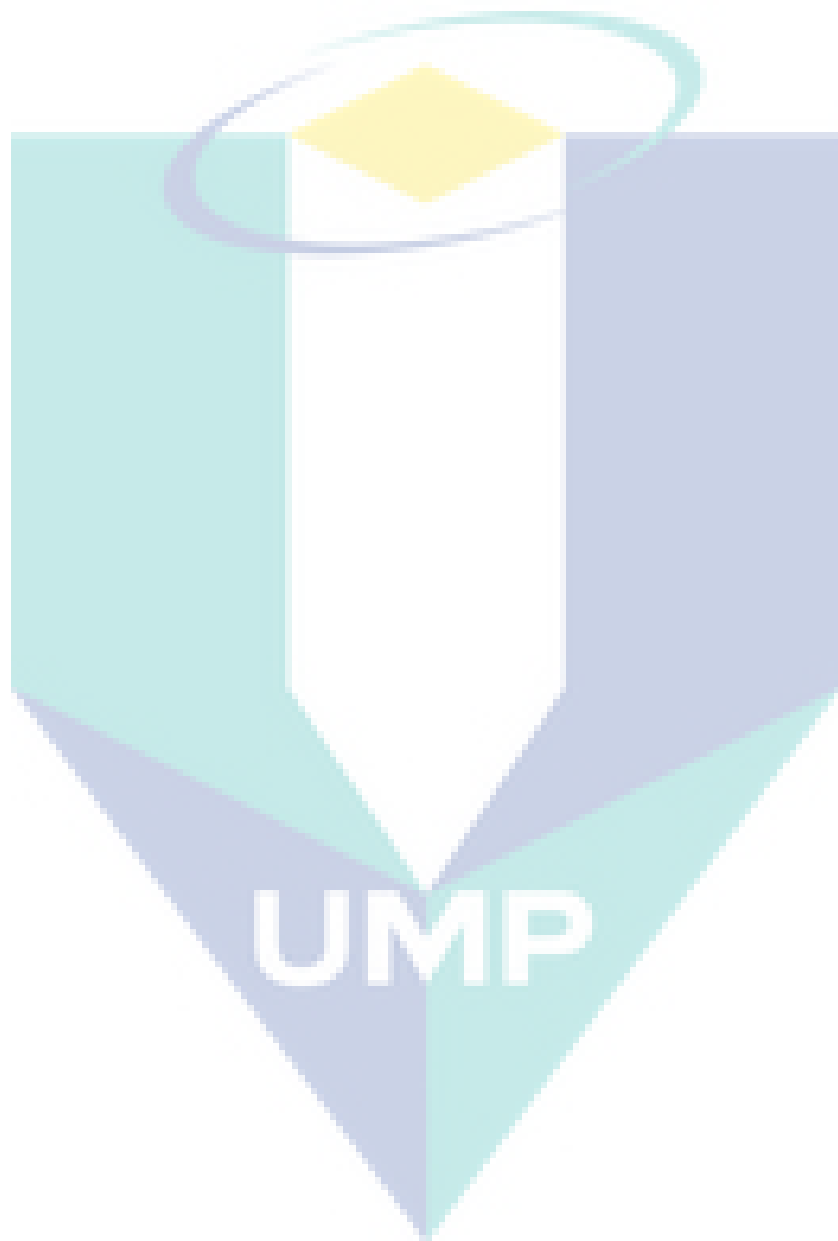
The result showed that there was a significant difference after thirty minutes of sitting as compared to before sitting for all nineteen body parts. After comparing the level of perceived body discomfort among respondents after upright and slump sitting, the result indicated that upright sitting posed a higher body discomfort than slump sitting. It showed that prolonged sitting in the same position may cause discomfort although the sitting posture is correct. So, to keep our body move is important to prevent any occupational safety and health related problems. However, this study still can be improved by looking at different sitting posture also such as forward learning posture and sitting without back support.

II. ACKNOWLEDGEMENTS

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CHAPTER 3

**A REVIEW OF PSYCHOSOCIAL AND PSYCHOLOGICAL AND ITS RELATED ISSUES IN THE
OCCUPATIONAL SETTINGS**

UMP

A Review of Psychosocial and Psychological and its Related Issues in the Occupational Settings

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Abstract—Psychosocial risk and psychological risk were different from each other although they were associated to the term of mental health. Both are related to a condition of a person mental health that they are not physically visible specifically in the workplace. The study regarding mental health at the workplace has been conducted long time ago by many researchers, thus psychosocial and psychological issues in the workplace were quite familiar due to the emergence of new types of hazards and associated risks in the workplace settings. In respect to that, no one should be harm by their work nature had driven more studies on these invisible aspects. To avoid more confusion between these terms, proper understanding must be developed in order to use any of these terms in research. This paper draws a clear distinction between these two terms (psychosocial risk and psychological health) and the related issues in the workplace settings.

Keywords—*Psychosocial risk; psychological health; mental health*

1. INTRODUCTION

The study on mental health at the workplace was not very prominent among safety and health researchers, this might be due to their nature as the unseen hazards compared to other types of occupational hazards. But, those unseen were not remaining the same since the adverse effect on workers can be physically visible. It was said that France Telecom suicide that occurs between 2008 and 2009 had dramatically projected the reality of mental health adverse effect to the front stage [1]. This issue shows the psychological and physical health of a person can be affected by psychosocial work environment [2-3] if the emergence risk were not managed properly. Since then, the study on mental health of workers to manage psychosocial risk at the workplace [4-6] had been developed to enhance the work environment conditions and the well-being of the workers at the workplace. However, in Malaysia, the scenario of psychosocial issues was neglected and little is being done in the aspect of occupational safety and health generally [7].

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2. OBJECTIVES

The aim of this paper is to :

- 1) To define literally psychosocial risk and psychological health risk.
- 2) To explore scientific literature on psychosocial risk factors and psychological health.

3. METHODOLOGY

A. Study Design

The systematic review was conducted from various scientific publications using electronic databases such as Science Direct, Web of Science, Cochrane Library, Google Scholar, and Scopus to find the definition of psychosocial and psychological respectively.

B. Search Strategy

The keywords were used to find the articles includes, psychosocial hazards, the psychosocial risk at workplace/industries, occupational psychology, mental health, psychological health, mental health at work and combinations of the search terms using Boolean operator “AND” to narrow down the search restricted on the title. The databases of Science Direct, Web of Science, Cochrane Library, Google Scholar, and Scopus were assessed from late August until early November 2017.

C. Inclusion Criteria for the Articles Searched

Figure 1.0 shows the outline of selection of articles from electronic databases. There are 93 articles that have been selected roughly from the keywords that were searched through the electronic databases. In the screening process, the abstract and title were examined, and duplicated articles were removed, left with 73 articles. After reading the full text and applying the inclusion criteria, only 29 articles were considered eligible to the focused topic. The inclusion criteria that were applied to the articles include articles that are in Malay or English, published from 1990 until 2017 and were addressed with psychosocial risk and psychological health at work.

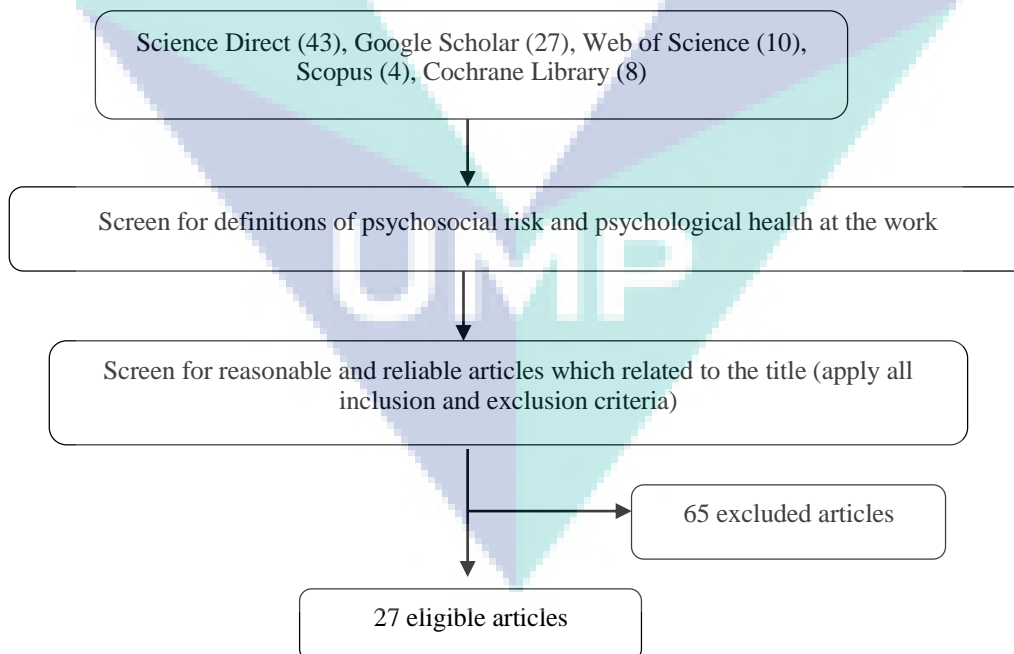


Figure 1.0: Flow chart on the selection of the articles of the reviews.

4. RESULT AND DISCUSSION

A. Psychosocial Risk Definition

The term psychosocial in general is the combination of the word ‘psycho’ and ‘social’. The word ‘psycho’ originated from the word *psykho* in Greek which means mental. ‘Psycho’ means relating to the mind or mental processes, [8] whereas the word ‘social’ originated from the word *socius* in Latin which means friend. Other than that, the word social is defined as relating to society or organizations [9]. Therefore, psychosocial is defined as the correlation between 3 factors which are social factors, individual thought and behaviour [10]. In the context of workplace setting, psychosocial is consider as the aspect of both psychological and mental aspect relationship with the work environment factors. It will become a problem if these psychosocial issues become a risk to the workers. Psychosocial aspect in the workplace sometimes considered as issues pertaining to work organization [1]. Thus, it is important to understand what the psychosocial risk is about. Table 1.0 shows the definition of psychosocial risk from various literature. In short, to understand the psychosocial risk both reference [1] stated that it is risk-related with the way work is designed, coordinated and managed. While [11] defined psychosocial risk as potential psychosocial hazards to cause harm. Authors [4-5] [12-13] highlighted psychosocial risk as the work organizational context that can cause psychological and physical harm to the workers. Conclusively, the psychosocial risk is defined as organizational characteristics and working environment that causes harm such as role ambiguity and work overload. These aspects of the workplace can be optimized to maintain a healthy work environment and promote productivity and development in terms of job task of the workers.

Table 1.0: Description of psychosocial risk with respective authors

Author	Description of psychosocial risk
Leka, Wassenhove and Jain [1]	Risk-related with the way work is designed, coordinated and managed.
Tecco et al. [11]	The potential of psychosocial hazards to cause harm such as consensus in terms of their incidence and prevalence in the work environment, the particular groups they affect, and the measures taken to prevent them or alleviate their impact.
Johnstone [14] and Pejtersen [15]	Related to a variety of job and organizational characteristics and working environments. Range from bullying and harassment to an array of organizational risks such as work overload, lack of social support, role ambiguity, and demand control or effort balance.
Leka and Cox [4], Leka and Jain [5], Bergh et al., [12] and Cox and Griffiths [13]	Work design, work management, work organizational context and social factors at work that are likely causing physical and psychological harm other than affect organizational performance.

B. Summary of Literature Review on Psychosocial Risk

Data extraction was applied to the selected articles and put into table systematically which includes title, authors, study population, methods used in the study, and the result of the study. This data extraction intended to review the study methodologies used other than to find literature that supports the study. Psychosocial risks are the risks associated with the aspect of work organization, other than work design and work management [1][12]. Psychosocial risks are dimensions that possibly associate with psychological occurrences to the social environment and to pathophysiological alteration of a person [16]. Other than that, these studies also agreed that work organization settings have potentials for causing psychological and physical harm, at the end will cause harm to the workers [4-5][12][17]. These studies inferred that organizational work environment did affect both physical and mental health of the workers in a certain way which it might be seen as trivial to the organization and unaware of the consequences. Based on the previous studies in Table 2.0 and 3.0, psychosocial risk issues quite popular within services industries in the European countries; and prominent method used to conduct the studies were using questionnaires [14][18-19]. Some studies indicated that psychosocial management, policies, and preventive programs lead to positive consequences in terms of psychosocial performance among the workers [1][19-21]. For example, a study conducted by [19] found that, psychosocial intervention by implementing policy in the work organization results in a decrease in the report regarding psychosocial issues and helps to improve the management of work-related stress. In addition, with appropriate training and resources to manage psychosocial issues, it was predicted to potentially help the interventions of psychosocial risk at the workplace by the inspectorate officers [21]. A study conducted by [1], to enhance the effectiveness of

psychosocial risk prevention management, there are needs to draw a clear distinction between psychosocial factors and work organizational issues. This is due to the misunderstanding between these two aspects of psychosocial issues at the workplace remains dormant and causing problems to the worker's performance and development at the workplace. In contrast, a study conducted by [22], despite having proper safety and health management systems it does not give assurance that the psychosocial risks are controlled in an intended manner. Thus, recent studies which help to improve the management of psychosocial interventions include psychosocial risk performance indicator [12] other than using the modelling technique to identify the critical exposure level of psychosocial risk [23]. The need to manage psychosocial risks at the workplace is vital to ensure the well-being of the workers. Health impact of this risk includes mental disorders and cardiovascular disease was detected among the exposed workers [24- 26].

Table 2.0: Previous studies on psychosocial issues in workplace

No.	Authors	Sample	Methods				Results	Industry	Country
			Q	R	I	O			
1	Ribeiro et al., [27]	13		x			Negative association between stress and quality of life among university students.	Education	Brazil
2	Bergh et al., [28]	1812	x				The analysis showed a convincing correlation of job resources, job demands and work-related stress symptoms. There are also differences in terms of psychosocial risk factors and work-related stress symptoms both at offshore and onshore.	Oil and gas	Norway
3	Guadix et al., [20]	36000	x			x	The improvement of psychosocial performance in European countries by implementation of management systems and preventive activities in the company.	Manufacturing	Spain
4	Rus and Galbeaza [18]	75	x				70% of the respondents think that the salary is more important than safety.	Management and service	Romania
5	Bergh et al., [12]	730	x			x	The practice of psychosocial risk performance indicator in the organization help the psychosocial risk management.	Oil and gas	Norway
6	Kyaw-myint et al., [23]	N/A				x	Benchmark Dose (BMD) Modelling can be used to identify critical exposure level for psychosocial risk.	N/A	Australia
7	Hohnen et al., [22]	N/A				x	OHSM systems certified do not assure the management of psychosocial risk were regulated as expected by the standard.	N/A	Denmark
8	Callejón-ferre et al., [29]	548	x				Psychosocial health risks (cognitive load, temporal autonomy, job description, supervision-participation, role definition, worker interest, and personal relationships) encountered by the workers are acceptable.	Agriculture	Spain

*N/A : Not available or not applicable *Q : Questionnaire or Survey *R: Review *I : Instrumentation *O: Others

Table 3.0: Previous studies on psychosocial issues at the workplaces

No.	Authors	Sample	Methods				Results	Industry	Country
			Q	R	I	O			
9	Di Tecco et al., [19]	2984	x				Policy level intervention decrease reported concern on psychosocial risks over time and improve work-related stress management.	Management	Europe
10	Jia et al.,[30]	216	x		x		Heat illness at construction site is a consequence of environmental hazards, personal physiological conditions, and organizationally enabled individual autonomous adaptation	Construction	China
11	Leka et al., [1]	N/A				x	By making distinction between issues related to work organization and psychosocial risk factors, the risk prevention is more effective.	N/A	Europe
12	Weissbrodt and Giaouque [21]	N/A		x			Appropriate training and sufficient resources have potential positive outcomes of inspectorate intervention on psychosocial risk other supportive settings.	Management	Europe
13	Neylon et al., [24]	N/A		x		x	Psychological stress factors are related to a wide range of adverse health outcomes in patients with cardiovascular disease.	N/A	Europe
14	Cheng and Cheng, [25]	349	x				There are higher prevalence of minor mental disorders among healthcare workers compared to other general workers.	Healthcare	Taiwan
15	Johnstone et al., [14]	125				x	Despite, initiatives by Australian jurisdictions, psychosocial hazards remain a marginal area of Inspectorate activity.	Management	Australia
16	Boschman et al., [26]	1500	x				The workers under studied were having positive symptoms of common mental disorders.	Construction	Netherland

*N/A : Not available or not applicable

*Q : Questionnaire or Survey

*R: Review

*I: Instrumentation

*O: Others

C. Psychological Health Definitions

The term psychological is derived from the word psychology. It is the combination of the word psychology(y) and the prefix –ical which is used to form adjectives. Literally, psychological means mental or something that related to psychology. Basically, psychology is a combination of ‘psycho’ and ‘-logy’. ‘Psycho’ was originated from the Greek word which means mental while ‘-logy’ means science or study of. It was originated from Greek word *logos*. Psychological is something related to the mind and feelings [31] and also can be defined as related to the mental and emotional state of a person [32]. In relation to the psychological meaning, the psychological state of a worker does become a major concern because it can affect work performance in the workplace. In workplace settings, psychological aspect is interpreted as the state of mental health or emotional well-being of workers. The psychological health term is used to determine the mental state of the workers mainly in the workplace settings. Other than that, psychological health at the workplace also associated with the way people interact with each other, work settings and the way organizational practices are implemented other than the process of decision making are made and communicated [6]. Therefore, the understanding of psychological health at the workplace is vital to ensure the safety and well-being of workers. Table 4.0 shows the description of psychological health at the workplace. In sum, psychological health define by [33] is the potential of an individual to function normally and cope with normal stresses of life. While [34], define psychological health as the underlying issues at the workplace other than [35] it can be expressed as performing dysfunction and ill-being in the workplace.

Table 4.0 Description of psychological health from several authors.

Authors	Descriptions
WHO [33]	A well-being of a person to aware their potential, able to cope with common stresses of life, able to work productively also afford to make contribution to society.
Uzman [35]	Expresses performing effective dysfunction and of ill being.
Kunyk [34]	The hidden issues at work which outdo with other workplace health issues and causing bigger problem unconsciously.

D. Summary of Literature Review on Psychological Health

Psychological health or often recognized as mental health is also known as the well-being of the workers in the workplace. Psychological injuries are the hardest to manage compared to other types of hazards. They have the least recognition, are often neglected or even misunderstood with, and had the least support whereby nobody ever wants to deal with; unless an intervention has to be forced [34]. The aspect of psychological issues in the workplace which often considered intangible would cause latent adverse health effects among employees. Due to the exposure for a certain period of time, eventually, the risk of getting mental disorder become prominent and affect the workers’ productivity in work. Internationally, most developed countries such as European countries have recognized the negative effect of mental illness on the countries’ economy. For this specific purpose, there is a need to conduct more studies regarding this issue, especially in Malaysia. This lead to the focus on a variety of initiatives to manage this issues throughout most of the industrialized world globally [36]. The research found that mental health issues are prominent in the working adults and were related to significant disability among employees [37]. Based on previous studies in Table 5.0 and 6.0 regarding psychological health in the workplace, most of the studies were conducted by the researchers in the European countries [38-45]. This shows the awareness of European countries on the issues of psychological health at work. Furthermore, most of the studies conducted in healthcare industries were among medical professionals such as doctors and pharmacists [40][42][45-46]. The most common methods used to conduct the study was by reviewing scientific articles [38-39][41-43]. Managing psychological health in the workplace is mainly the employers and work management responsibilities. But many employers misrecognized and ignored the psychological health aspects in the workplace [40]. These issues lead to the adverse health effect to the workers due to the long period of exposure and latent or inactive prevention of work organizations. The healthcare industries highlighted the work environment affects the mental health, and well-being of the workers [46], and are also prominent psychological distress among these workers compared to the general population [45]. A study conducted by [42] on the presence of violence among healthcare professionals causing physical, psychological, and emotional has adverse effect on the worker. Correspondingly, among the initiatives suggested, senior workers or the management are supposed to promote conducive work settings, and systematic policies and practices in order to intervene and prevent others. Rather than managing psychosocial risks, causing psychological health adverse effects [47].

Table 5.0: Previous studies on psychological health issues in the workplace

No.	Authors	Sample	Methods				Results	Industry	Country
			Q	R	I	O			
1.	Memish et al., [38]	20		x			Due to lack of focus on intervention of the risk, the rating systems of the guidelines are low. The recommendation provided were not include instruction to implement and individual focus.	N/A	Europe
2.	Schindeler and Reynald [39]	N/A		x			Alternative approaches including the application of guardianship and related principles from the routine activity approach, which are well-established strategies for prevention of victimization in a range of contexts.	N/A	Europe
3.	Braedley et al., [40]	87				x	Most employees and workers misrecognized and ignored the psychological health and safety hazards at the workplace.	Healthcare	Canada
4.	Kim et al.,[48]	9986				x	Attaining and maintaining higher physical activity level related with psychological well-being independently.	N/A	Europe
5.	Nguyen et al., [47]	274	x				These factors should take into consideration by company to prevent psychosocial hazards. There are positive work condition and effective systems of policies, procedures and practices.	Public sector	Vietnam

*N/A : Not available or not applicable *Q : Questionnaire or Survey *R: Review *I: Instrumentation *O: Others

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Table 6.0: Previous studies on psychological health issues at the workplace

No.	Authors	Sample	Methods				Results	Industry	Country
			Q	R	I	O			
6.	Corbière et al., [41]	N/A		x			1/3 of studies used a combination of individual, groups, and organization level interventions. Most often supported by psychosocial intervention or participatory research. These components brought positive and significant results with regard to work and mental health outcomes towards workers.	Service	Europe
7.	Lanctôt and Guay, [42]	N/A		x			The studies identified seven categories of consequences of workplace violence which are physical, psychological, emotional, work functioning, and relationship with patients or quality of care, social or general, and financial.	Healthcare	Canada
8.	Lloyd and Campion, [43]	N/A		x			Veterinary nurses with a clearer understanding of the detrimental effects it can potentially have on an individual's well-being if they are unable to utilize the appropriate style of coping mechanisms.	Veterinary	Ireland
9.	Milner et al.,[44]	N/A				x	Work and non-work factors were often interrelated pressures prior to death.	Construction	Australia
10.	Picco et al., [46]	62	x				Workplace environment is prime factor to the occurrence of mental health problems and affect well-being of workers.	Healthcare	Singapore
11.	Pan, Fan and Owen, [45]	1900	x				There are higher prevalence of psychological distress with 63% to 80% compared to general workers.	Healthcare	Australia

*N/A : Not available or not applicable

*Q : Questionnaire or Survey

*R: Review

*I: Instrumentation

*O: Others

CONCLUSION

In conclusion, a psychosocial risk is the association of mental and organizational work environment that causes harm to the workers. While psychological health is a mental or emotional state of the workers. Scientific pieces of literature on psychosocial risk factors determined that it can affect the psychological well-being of the workers. In this review, there are 27 scientific articles that were selected and applied the inclusion criteria as to study the psychosocial risk and psychological health among working populations. As psychosocial risk and psychological health are related to each other, psychosocial aspects eventually will affect the psychological health aspect of the workers. In this review, psychosocial risk and psychological health are defined literally from various studies to draw a clear distinction between them and the association of the two aspects in the workplace. It is found that the psychosocial risk factors such as work overload could lead to adverse health effect of the workers which over a period of time can become visible by the psychological health indicators such as workers performance and productivity. Hence, it is important to conduct psychosocial studies in Malaysia as to ensure the safety and well-being of the employees in the workplace.

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The logo of Universiti Malaysia Pahang (UMPA) is a large, downward-pointing arrow shape. It is composed of four colored triangular sections: a light blue section on the top left, a light purple section on the top right, a light blue section on the bottom left, and a light purple section on the bottom right. The letters "UMPA" are written in white, bold, sans-serif font across the center of the arrow.

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CHAPTER 4

AN INVESTIGATION OF KNOWLEDGE ATTITUDE AND PRACTICE OF OSH ON
SAFETY CLIMATE AT WORKPLACE IN MANUFACTURING INDUSTRY

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AN INVESTIGATION OF KNOWLEDGE ATTITUDE AND PRACTICE OF OSH ON SAFETY CLIMATE AT WORKPLACE IN MANUFACTURING INDUSTRY

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ABSTRACT

Purpose: To investigate the safety climate and knowledge, attitude and practice (KAP) in the manufacturing industry, also to determine the association between safety climate factors and KAP of safety among manufacturing worker. **Methods:** A cross-sectional study was conducted among 59 respondents from two manufacturing plants located in Gebeng, Kuantan, Pahang. Most of the respondents were Malay (91.5%) and male (96.6%). Participants were administered a set of questionnaires (Cronbach alpha=0.674) that measured the safety climate as perceived by the workers towards their supervisor and KAP of the workers regarding safety-related matters at the workplace. Self-administered questionnaires consisted of 5 points Likert scale used to measure each of the items of safety climate and KAP. The scales for safety climate and KAP were probed using 16 items and 17 items in the questionnaires, respectively. The results were analysed using a non-parametric test, which is Spearman's rho correlations and descriptive statistics. **Result:** Bivariate analysis was performed. There was a moderate positive correlation between safety climate and KAP domains (Spearman's rho: 0.581, $p < 0.01$). **Conclusion:** Safety climate in the manufacturing plant is associated with KAP of the workers, thus KAP could affect the safety climate in the manufacturing plants.

Keywords: Safety climate, Knowledge, Attitude and Practice, manufacturing worker.

INTRODUCTION

Manufacturing industry can be defined as the industry that processed the transformation of raw materials to form a product by means of automation, machinery or labour force at the manufacturing plant. In Malaysia, the manufacturing industry has been revolutionized to meet industrial demand as well as the nation's goals. As a result, the manufacturing sector has created huge employment and skill enhancement opportunities in Malaysia (Chew, 2005). For the past few years, this industry has contributed to the economic growth and development of Malaysia (Azer et al., 2016). In most developing countries including Malaysia, the manufacturing plants are equipped with mechanized process and systems to enhance productivity and efficiency of the plants. Despite that, according to the Federation of Malaysian Manufacturers (FMM, 2017), the industrial accidents in manufacturing industries have become a major concern. Manufacturing plant work environment posed possible emerging types of hazards and risks towards the workers at the workplace. Based on the statistics of occupational accidents by sectors released by Department of Occupational Safety and Health (2018), manufacturing industries have the highest number of workers suffered from non-permanent

disability and permanent disability with 825 and 54 workers, respectively, as well as placed the second with highest workers death after construction industry. Globally, one of the prime factors of disability and mortality cases is due to the hazards at the workplace (Onowhakpor et al., 2017). This was emphasized by World Health Organization (1997), which occupational health risk was ranked as the 10th leading cause of fatality and injuries from all over the world. These work-related issues rise concern to study more on the safety and health aspect focused on the manufacturing industries in Malaysia.

Knowledge, attitude and practice (KAP) towards safety and health at the workplace among manufacturing workers

Occupationally related accidents that cause injuries to the workers always raise concerns as one of the major issues in most countries (Li et al., 2010). Exploring KAP of workers towards OSH on daily basis can be used to aid in evidence-based intervention, which can improve work situation or even target behaviour (Goh & Chua, 2016). In the manufacturing industry, workers are exposed to various types of hazards especially in the production process. Due to machinery processes, workers have to deal with the machines and monitor the systems. During the process, manufacturing workers exposed themselves towards physical hazards, operational hazards and mechanical hazards that have the potential to cause substantial injuries to the workers such as crushing, falling and even explosion. On the other hand, workers with adequate knowledge of safety at the workplace would enable them to perform their assigned tasks safely. Having knowledge on safety at work induced personal responsibility to ensure safety is in place at work. The attitude that implies safety includes being positive about any safety-related activities at work such as safety training or comply with safety policies and regulations at work. The practice of safety at work is considered an action that can prevent any accident from occurring. The knowledge, attitude and safety practices of workers are paramount for the mitigation and control of hazards and risk to ensure safety and health at work at the most optimum level (Onowhakpor et al., 2017).

Safety climate at the workplace

At the workplace settings, safety climate is considered as the embodiment of safety culture in workers behaviour and expressed attitude in work organization (Cox & Flin, 1998). While other study described it as the current state of perception on underlying safety culture (Mearns, Whitaker & Flin, 2003). Zohar (2003) claimed that safety climate showed the perceived safety in the work settings. Later, safety climate explains as the perceptions refer to the element of policy and practice that demonstrated through the priority of safety (Zohar & Luria, 2005). In general, safety climate can be viewed as the collection of perceived safety that applied through procedures and policies, which implies the behaviour of workers and the current work environment. Safety climate can be a robust predictor of safety outcomes and a solid paradigm in the process to enhance safety at work (Zohar, 2010). It can also determine hidden conditions leading to major accidents, which in turn prevent the root causes of future accidents from happening (Kvalheim, Antonsen, & Haugen, 2016). Safety climate studies become a leading indicator of safety shortcomings in any work organization other than to forecast future problem that would arise. These safety leading indicators have established a more proactive way to

identify the current safety performance of work organization thus, correcting the impaired area in safety efficiently (O'Connor, O'Dea, Kennedy, & Buttrey, 2011). There are quite limited consensus on the number and elements of safety climate factors (Hon, Chan, & Yam, 2014). This present study included only 3 factors of safety climate, which were caring, coaching and compliance, adapted from several research studies since there is no specific study that specifies the numbers of dimensions of safety climate. Compliance toward safety regulations stated as task performance in Griffin and Neal (2000) study. It describes the fundamental of safety enforcement that should be implemented in order to ensure safety is in place at work. Examples included complying to lock out and tag out procedures implemented at the workplace. Next, coaching domains of safety climate were adapted from Alruqi, Hallowell and Techera (2018). They discussed coaching as a safety education and instruction that workers received from supervisors during their work while caring domains were adapted from (Zohar & Luria, 2005). KAP of workers were explained specifically to this study. Perception of workers towards their management for three safety climate domains (coaching, caring and compliance) was also investigated. This research also studied the safety climate among manufacturing workers based on their perception towards management of the plants. This is due to employee perceptions are the fundamentals of the measurement in safety climate study (Griffin and Neal, 2000).

METHODOLOGY

Questionnaire

The survey questions were adopted and adapted from the several research studies related to the safety climate and KAP study. Safety climate questionnaire was adopted from the Multilevel Safety Climate (MSC) Scale by Zohar and Luria (2005). MSC Scale consists of items with a range of indicators that measure the interaction modes between supervisors and workers either supervisors can prioritize safety or company goals such as production speed or schedules. While KAP questionnaire were adapted from the study conducted by Goh & Chua (2016) among civil and structural engineers. Pilot study was conducted prior to the actual data collection and the instrument were found to be reliable. The questionnaire consisted of 3 main parts which were A, B and C. Each part of the questionnaire was designed to determine different variables. Part A comprised of questions related to the demographic data, which were gender, age, working period, department, education level, nationality and mode of work. Part B consisted of the questions related to the safety climate of that particular company. There were 16 questions in this part, each question was divided into 3 main domains of safety climate included coaching, caring and compliance. Examples of the item were "Supervisors frequently remind us about work hazards" (caring), "Supervisors use explanations (not just compliance) to get us to act safely" (coaching) and "Supervisors frequently check to see if we are all obeying the safety rules" (compliance). Part C consisted of 17 questions associated with KAP that related to the safety among the workers. Examples of the items included "Risk is a situation that involves exposure towards hazards" (knowledge), "I am aware that protective equipment is important at work" (attitude) and "I conduct my work safely" (practice). All items in both scales were rated based on 5 points Likert-type scale ranging from 1, which indicated strongly disagree to 5 indicated strongly agree.

RESULT AND ANALYSIS

Reliability analysis of the instrument

In this study, the questionnaire that have administered had total of 6 factors for both parts. To determine the internal consistency of the questionnaire, reliability test was performed on each of the 6 factors in the questionnaire. Table 1 shows the Cronbach alpha values for safety climate; active, proactive and declarative practices were 0.801, 0.806 and 0.846, respectively. These high values indicated the reliability of the questionnaire was good.

Table 1: Alpha Value of Safety Climate Factors

Factors	No of questions	Cronbach alpha value
Active practices (caring)	5	0.801
Proactive practices (coaching)	5	0.806
Declarative practices (compliance)	6	0.846

In Table 2, Cronbach alpha values for 3 factors of KAP were 0.682, 0.693 and 0.621 for knowledge, attitude and practice, respectively. Alpha scores between 0.60 and 0.70 could be considered at borderline, but in general, they did not consider poor (George & Paul Mallery, 2003). The possible reason for the low alpha value is due to the low number of factors for each of the KAP scale, so it is considered within the tolerable limit (Kvalheim et al., 2016).

Table 2: Alpha Value of KAP

Domains	No of questions	Cronbach alpha value
Knowledge	5	0.682
Attitude	7	0.693
Practice	5	0.621

Respondents

This study involved a total of 59 respondents from 2 manufacturing companies located in Kuantan. From the survey conducted, out of 59 of the respondents, there are 57 male workers with 96.6% and only 2 female workers involved in this study with 3.4%. Both age range of 16-25 and 26-35 had the highest percentage with 30.5% respectively. The oldest age range 46-65 make up with 22%. The age range of 36-45 has the lowest percentage with 17%. The respondents participated in this study majority consist of Malaysian with 91.5% and only 8.5% comprises of others nationality. For the educational level, high school certificate holder has the highest percentage with 49.1% followed by diploma holder with 30.5% and middle school certificate with 13.6%. Bachelor degree holder has the lowest percentage out of all educational level of the respondents with 5.1%. Majority of the respondent that participated in this study forms the maintenance department (42.4%), followed by the production department with the second highest percentage 40.7%. Both personnel and safety health environment department

have the same percentage with 5.1% respectively while marketing and research and development has the lowest percentage of participation with 1.7%. Based on table 3 most of the workers having less than 5 years of working experience in the company with 57.6% followed by 6-15 years of working experience with 25.4%. While workers with more than 16 years of working experience are the least participated in the survey with 17%.

Table 3: Demographic Information of the Respondents

	Items	Frequency	%
Gender	Female	2	3.4
	Male	57	96.6
Age	16-25	18	30.5
	26-35	18	30.5
	36-45	10	17
	46-65	13	22
Nationality	Malaysian	54	91.5
	Others	5	8.5
Education level	Middle School Certificate	8	13.6
	High School Certificate	29	49.1
	Diploma	18	30.5
	Bachelor degree	3	5.1
Department	Production	24	40.7
	Personnel	3	5.1
	Maintenance	25	42.4
	Research & Development	1	1.7
	Project engineering	2	3.4
	Safety, Health and Environment	3	5.1
	Marketing	1	1.7
Years of work	0-5	34	57.6
	6-15	15	25.4
	16-25	10	17

Descriptive analysis on safety climate domains

Active Practices

There are 5 items is to measure active practices factor which are “my direct supervisors makes sure we receive all the equipment needed to do the job safely”, “my direct supervisors emphasizes safety procedures when we are working under pressure”, my direct supervisors frequently tells us about the hazards in our work”, my direct supervisors reminds workers who need reminders to work safely” and “my direct supervisors says a “good word” to workers who pay special attention to safety”. Based on the Fig. 1 below shows the percentage of disagreement and agreement of workers towards their supervisors on active practices at work. Most workers with 63.05% strongly agree that their supervisors conduct active practices of safety climate factors. While, 27.80% agree and 5.08% being neutral. In contrast, 3.73% disagree and 0.37% strongly disagree that the supervisors conduct active practices at work.

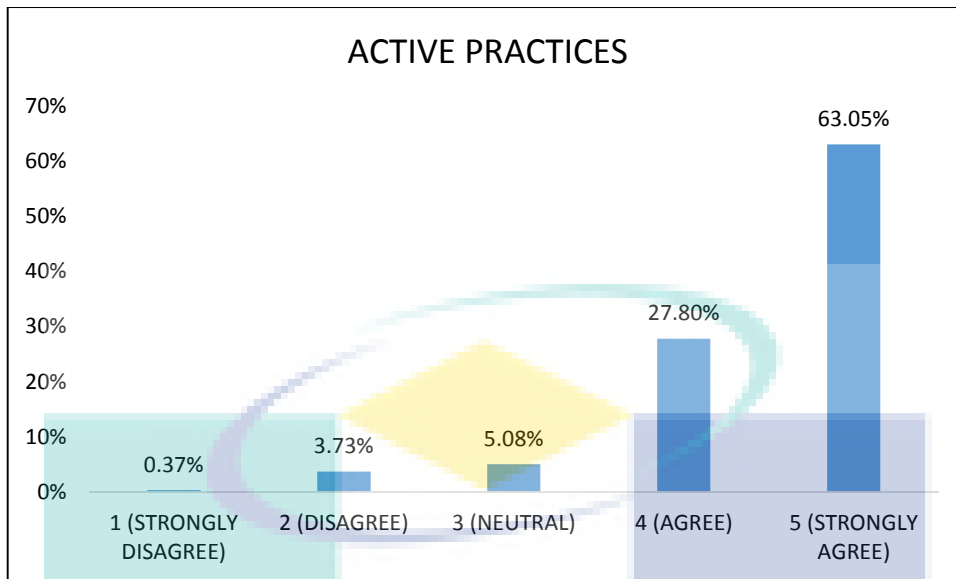


Figure 1: Active practices by supervisors as perceived by the workers

Proactive Practices

Items included in proactive practices factors are “my direct supervisors discusses how to improve safety with us”, “my direct supervisors uses explanations (not just compliance) to get us to act safely”, “my direct supervisors refuses to ignore safety rules when work falls behind schedule”, “my direct supervisors spends times helping us learn to see problems before they arise” and “my direct supervisors frequently talks about safety issues throughout the work week”. The Fig. 2 below shows the workers’ perception towards the supervisors relating to the coaching of safety issues at work. According to the Fig. 2, strongly agree take a huge portion which is 54.92%, then followed by agree with 28.81% and neutral which is 8.81%. Both strongly disagree and disagree make up the least percentage which are 3.73%. In general, most of the workers strongly agreed with the prepared questions which indicate that the management train the workers to work safely.

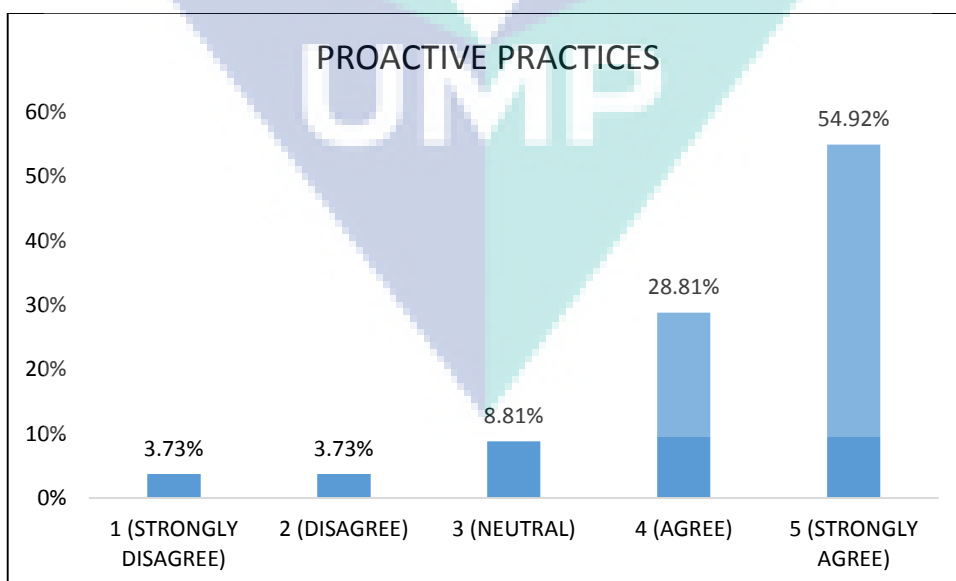


Figure 2: Proactive practices perceived by the workers towards their supervisor at work

Declarative Practices

6 items in the declarative practice factor are “my direct supervisors frequently checks to see if we are all obeying the safety rules”, “my direct supervisors is strict about working safely when we are tired or stressed”, “my direct supervisors makes sure we follow all the safety rules (not just the important ones)”, “my direct supervisors insists that we obey safety rules when fixing equipment or machines”, “my direct supervisors is strict about safety at the end of the shift, when we want to go home” and “my direct supervisor insists we wear our protective equipment even if it is uncomfortable”. Fig. 3 below shows the percentage of the workers’ responses on how they perceived the supervisors regarding compliancy towards safety policies and procedure at work. From the figure 3 below indicated that the perception of the workers towards the supervisors on the compliancy of safety policies and procedures. Strongly agree had the most percentage with 59.04% which indicate that the supervisors compliance with the safety regulations at work. Agree and neutral make up 29.40% and 6.78% respectively. In contrast, disagree and strongly disagree had the lowest percentage with 3.40% and 1.41% respectively.

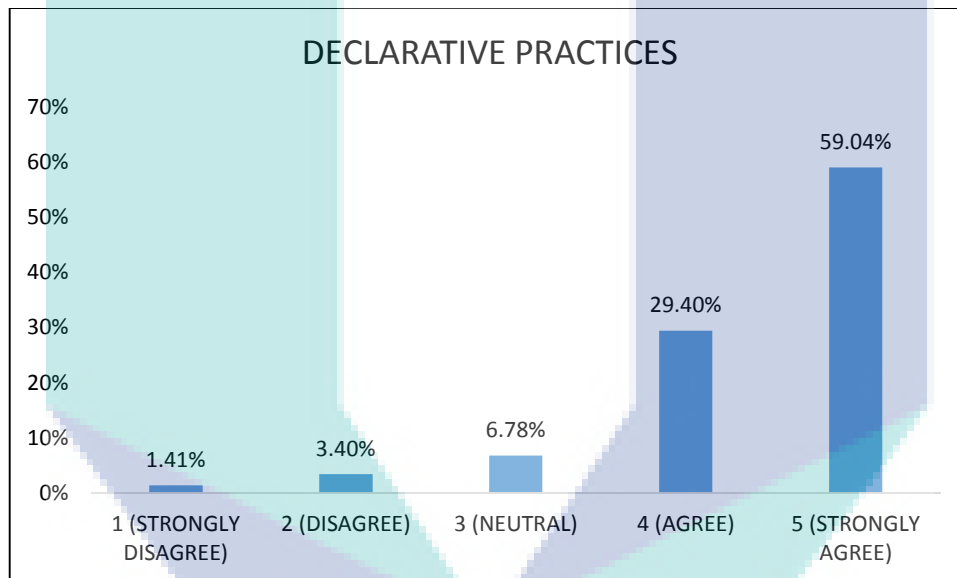


Figure 3: Declarative practices as perceived by the workers towards their supervisors at work

Descriptive analysis of KAP of workers towards safety at the workplace

From the result obtained, all of the workers showed excellent knowledge on safety at the workplace and also very good attitude towards safety at the workplace. For practice factor, there were 96% of the workers acquired high practice of safety at work and only 3.4% of the workers acquired low practice of safety at work. Overall, the workers in both manufacturing plants were having adequate level of knowledge, attitude and practice of safety at the workplace. Fig. 4 shows the mean of knowledge, attitude and practice of the workers towards safety matters at the workplace. The results showed that the workers have the highest mean on knowledge of safety at the workplace with mean 4.17, followed by the attitude towards safety with mean 4.16 and the lowest in practice of safety with mean 4.05. The mean values were ranked based on 5 point Likert scale as 1 indicated the lowest through 5 as the highest.

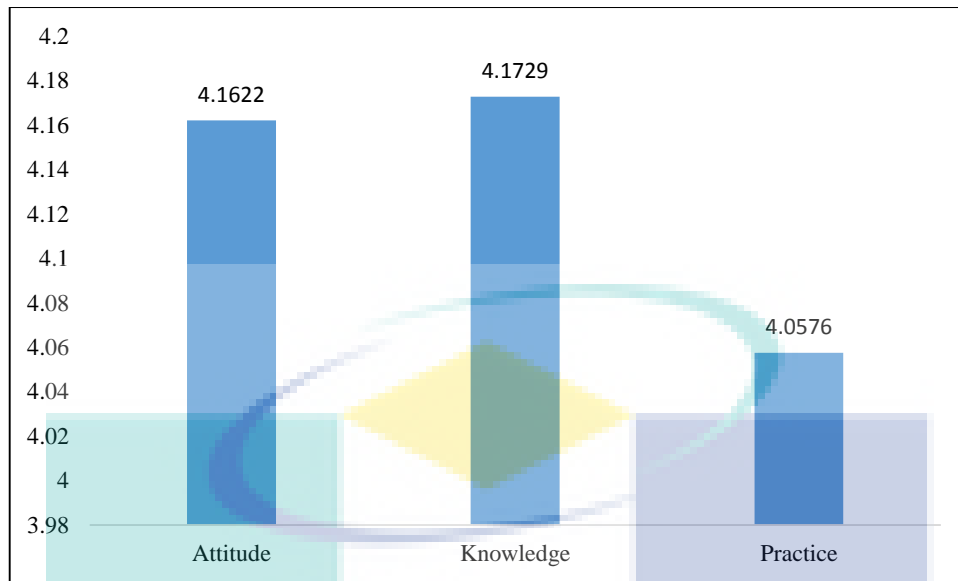


Figure 4: Mean of Knowledge, Attitude and Practice of the manufacturing workers at work

Correlation analysis

Table 4 shows correlation coefficients analysis using non-parametric test Spearman's rho correlation of safety climate factors and KAP factors. The bivariate analysis results showed a positive significant correlation between any safety climate factors and KAP factors. This result also indicated that high safety climate value was associated with high KAP value. Knowledge and proactive practices factors showed positive moderate correlation ($r_s = 0.559$, $n=59$, $p<0.01$) as well as knowledge and active practices factors ($r_s = 0.499$, $n=59$, $p<0.01$), but knowledge and declarative practices factors have a strong positive correlation ($r_s = 0.617$, $n=59$, $p<0.01$). This can be interpreted as, if the knowledge of workers about safety is high, the workers perception towards supervisor's commitment in relation to comply with safety and health regulation is also high. This is also followed by the proactive practices and declarative factors. Next, the attitude and proactive practices factors have a strong positive correlation ($r_s = 0.640$, $n=59$, $p<0.01$) as well as attitude and declarative practices factors (0.616). Only, attitude and active practices factors have a moderate positive correlation ($r_s = 0.496$, $n=59$, $p<0.01$). The attitude on safety at the workplace highly indicated that the perception of workers towards supervisors declarative practices and proactive practices factors were almost the same. But workers with high attitude, have rather low perception on active practices yet still significant. The practice factor and proactive practices factor have a positive moderate correlation ($r_s = 0.464$, $n=59$, $p<0.01$), practice factor and active practices factor also have a positive moderate correlation ($r_s = 0.433$, $n=59$, $p<0.01$) as well as practice factor and declarative practices factor ($r_s = 0.524$, $n=59$, $p<0.01$). For the workers that acquired good practice of safety at the workplace, increased in the aspect of practicing safety would directly increase the perception of workers on supervisor declarative practices on the safety and health policies implemented at work. This situation also applied towards proactive practices and active practices factors.

Table 4: Safety Climate and KAP Domains Correlation

Sample size, n=59

		Correlation coefficient		
		Safety climate		
		Proactive practices	Active practices	Declarative practices
KAP	Knowledge	0.559**	0.499**	0.617**
	Attitude	0.640**	0.496**	0.616**
	Practice	0.464**	0.433**	0.524**

** Significant at the 0.01 level (2 tailed)

There are some studies revealed that there was a significant positive relationship between safety climate and safety behaviour, which also included declarative practices at various sectors such as constructions and repair, maintenance, addition and alteration also manufacturing and mining (Chan et al., 2017; Lyu et al., 2018; Hon, Chan, & Yam, 2014; Griffin & Neal, 2000). The current study supported these findings by demonstrated a very strong positive correlation between safety climate and declarative practices (Spearman's rho: 0.948, $p < 0.001$).

CONCLUSION

This present study has demonstrated the safety condition of a workplace based on the safety climate surveys. Safety climate was used as a leading indicator to determine several surface safety-related issues of work organization and possible shortcomings in a manufacturing plant. Subsequently, it can help the future work management to improve the shortcomings and impairment of safety. This study highlighted there are significant relationship between KAP and safety climate factors. This means, if the workers have appropriate knowledge attitude and practice towards safety so relatively the workers will also perceived the supervisors declarative, proactive and active practices of safety engagement at work positively. Finally, this study proved that knowledge on safety, attitude related to safety and safety practice (KAP) at the workplace is a useful indicator to create a good safety climate in the manufacturing plant.

ACKNOWLEDGEMENTS

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CONCLUSIONS

In sum, this research has demonstrated the issues and risk factors that occur in manufacturing industries in terms of mental health, behaviour and well-being of the workers. Working environment in manufacturing plant can induced occupational stress and even risk taking behaviour. From this study it is found that, safety climate in manufacturing industry is related to the knowledge attitude and practice of the workers. Shows that, workers with high level of knowledge regarding safe work conduct at workplace will significantly contribute to the good safety climate in the plant. Safety climate was used as a leading indicator to determine several surface safety-related issues of work organization and possible shortcomings in a manufacturing plant. Subsequently, it can help the future work management to improve the shortcomings and impairment of safety. Besides that, after conducting Exploratory Factor Analysis (EFA), the construct measure to determine the safety climate factors in Malaysia manufacturing industry and the construct measure of significant psychosocial risk factors that affect the manufacturing industry workers were determined. Factor analysis enable this research enhance the validity of the instrument used. For future research, this study can be used to develop a model of risk taking behaviours in manufacturing industry in Malaysia other than model of psychosocial risk factors and work performance specifying in the manufacturing industry using Structural Equation Modelling (SEM). Lastly, this study also can be utilized to conduct Confirmatory Factor Analysis (CFA) which to test how well the measured variables represent the number of constructs in the study.

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APPENDIX A
DATA COLLECTION AT LYNAS



APPENDIX B

SHORT BULLETIN UMP-KANEKA

Reach-out: Behavior Based Safety (BBS), from classroom to multi-national chemical plant.

Two Ftek staffs (Dr Ezrin Hani Sukadarin and Miss Junaidah Zakaria) were involved in the Behavioral Safety Observation Program (BSOP) that was held at the chemical manufacturing plant (KANEKA MALAYSIA GROUP OF COMPANIES) in Gebeng on 8 January 2019 (Picture 1). This is a collaborative program among Universiti Malaysia Pahang, Universiti Malaya and Kaneka Malaysia Group of Companies. This project was started at the early of 2018 which was at first, focusing on the Safety Culture Assessment. After a year of data collection and discussion, it was came into conclusion that the BSOP program need to be integrated and implemented into the existing behaviour program as to further improve safety practices and positive mind-set among workers.



Picture 1: Dr Ezrin Hani Sukadarin and Miss Junaidah Zakaria are delivering BSOP module in the Kaneka Malaysia

BSOP consists of four modules (Module 1: Management commitment; Module 2: Development of BBS checklist; Module 3: Train the observer; Module 4: intervention of identified at-risk behaviour). To date, 2 modules had been completed and had been rated as excellent by the industrial partners.



Picture 2: Zakaria Abdul Razak showing high interest and actively participate throughout the module delivery.

Zakaria Abdul Razak, (Head of Kaneka Apical Malaysia and Kaneka Eperan Malaysia Solution Vehicle) said: "As overall, the BSOP is a very good and structured program aims to improve safe behavior and positive mind-set among workers in all industries. Provide easy and quantitative assessment which resulted in the ability to compare achievement before and after as well as clear direction of what to be improved. Teach the observer the skill to assess target behavior and further analyze the at-risk behavior and safe behavior."

APPENDIX C

RESEARCH ARTICLE

Submitted to the 4th International Conference on Ergonomics (ICE 2019) and 2nd International Conference on Industrial Engineering (ICIE 2019)

Evaluating Exploratory Factor Analysis of Psychosocial Study and Work Performance In Manufacturing Industry

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Keywords: Exploratory Factor Analysis, Psychosocial, Work Performance and Manufacturing industry.

Abstract. The purpose of this study is to focus on the exploratory factors of psychosocial and work performance in manufacturing industry in Malaysia. A cross-sectional study was conducted among 258 respondents from manufacturing plant. The validity and reliability of a set questionnaire adapted and adopted from Copenhagen Psychosocial Questionnaire (COPSOQ III), NIOSH Generic Job Stress Questionnaire and Individual Work Performance Questionnaire (IWPQ 1.0) instruments were tested using Exploratory Factor Analysis (EFA) and reliability analysis. Forty-five items from psychosocial risk factors which are an interpersonal relationship at work, job demands, job control, career development, environment and equipment, job content and role in the organization and eighteen items from work performance which are task performance, contextual performance, and counterproductive work behavior, were designated for the initial instrument. The results showed that, the originated 10 construct measure of psychosocial risk factors and work performance are reduce into 8 construct measure under study after conducting factor analysis by Principal Component Analysis as dimensional reduction method. EFA statistical method enabled this study to increase the reliability of the scale by analyzing items in the instrument to be removed other than increase dimensional construct assessed relationship between the factors in the study. This current study is essential to explore the presence of psychosocial risk factors that underly in manufacturing industry which it might affect the worker performance and well-being. Also, future research purposes this study can be utilized to develop a model of psychosocial risk factors and work performance in manufacturing using Structural Equation Modelling so the validated construct can be used and tested in the industry.

RESEARCH ARTICLE

Submitted to the 4th International Conference on Ergonomics (ICE 2019) and 2nd International Conference on Industrial Engineering (ICIE 2019)

Safety Climate Factors at Manufacturing Plant Using Exploratory Factor Analysis

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Abstract.

The study aimed to explore safety climate dimensions using two sets of questionnaire survey in manufacturing setting. Zohar Safety Climate Questionnaire and Safety Climate Assessment Toolkit were translated and tested on a sample of 309 manufacturing workers. Results from the first instruments revealed that, three dimensions explaining workers perception of the priority an organization places on safety namely active practices (monitoring-controlling), proactive practices (instructing-guiding) and declarative practices (declaring-informing). Findings replicate study conducted by Zohar & Luria in 2005. Perceived safety climate level among respondents showed that 63% agree that their company have a good safety climate level. Whereas, results from the second instrument showed that the lowest total mean score was for personal appreciation of risk (M=5.41, SD=1.03) followed by a supportive environment (M=6.61, SD=0.82) and physical work environment (M=6.74 SD=1.24). Exploratory factor analysis revealed that from nine elements, only eight formed to be significant to the current safety climate measure which including management commitment and communication, personal priorities and needs for safety, work environment, supportive environment, safety rules and procedures, personal appreciation of risk, involvement and priority of safety. It can be highlighted that management commitment and communication elements seemed to be viewed as the same construct among Malaysian sample. Results affirmed that safety climate factors in the manufacturing industry in Malaysia can be assessed using these two

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