MENTAL WORKLOAD INVESTIGATION AMONG EMPLOYEES IN A SELECTED OIL AND GAS COMPANY

CHRISTYNE SURINDAI C. MOOSOM

FACULTY OF ENGINEERING
UNIVERSITY OF MALAYA
KUALA LUMPUR

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RESEARCH REPORT SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SAFETY, HEALTH AND ENVIRONMENT ENGINEERING

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Field of Study: Ergonomics, Occupational Health

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MENTAL WORKLOAD INVESTIGATION AMONG EMPLOYEES IN A SELECTED OIL AND GAS COMPANY

ABSTRACT

In recent years, there has been a substantial amount of studies being conducted in mental workload and mental health but there is little research conducted in the Malaysian context especially in the oil and gas field. This gives rise to the need for researching the level of mental workload and mental health problems that will help the stakeholders to protect the wellbeing of their employees. This study aims to investigate the mental workload and level of depression, anxiety and stress scale of employees in a selected oil and gas company by using CarMen-Q and DASS-21 mental health assessment tools, finds the correlation between these parameters and propose recommendations to the company to improve the mental health of their employees. The mental workload statistical analysis revealed that the employees were highly burdened in performance demands (M=76.60) followed by cognitive demands (M=65.65), temporal demands (M=57.34) and emotional demands (M=48.78). 48.98% of employees were determined to have a normal score of depression., 63.27% has a normal score of stress and 18 (36.74%) has a normal score of anxiety. Significant findings reported that 12.24% have extremely severe depression and anxiety and 4.08% worker found to be extremely severe stressful working in the company. The level of depression, anxiety, stress and mental workload of the employees have significant correlations with each other of at least r=0.453. These findings have tailored the researcher to develop strategies for the company to curb mental health problems arising in the company based on the condition and nature of the business activities of the company.

Keywords: Mental workload, Mental health, Oil and gas industry, DASS-21, CarMen-Q

SIASATAN BEBANAN MENTAL TERHADAP PEKERJA-PEKERJA DI SYARIKAT MINYAK DAN GAS YANG TERPILIH

ABSTRAK

Sejak beberapa tahun lalu, terdapat banyak kajian penyelidikan yang telah dilakukan dalam bidang bebanan mental dan kesihatan mental tetapi penyelidikan di Malaysia bagi industri minyak dan gas adalah kurang. Hal ini mendorong kepada keperluan untuk menyiasat tahap bebanan mental dan kesihatan mental para pekerja bagi membantu pihak berkepentingan untuk memelihara kesihatan dan kesejahteraan pekerja mereka. Kajian ini bertujuan untuk menyiasat bebanan mental dan tahap kemurungan, kegelisahan dan stress yang dialami oleh pekerja yang bekerja di sebuah syarikat minyak dan gas yang terpilih menggunakan alat penilaian kesihatan mental iaitu CarMen-Q dan DASS-21, mengkaji korelasi antara parameter ini dan mencadangkan cara-cara untuk mengurangkan masalah kesihatan mental para pekerja. Analisis statistik bebanan mental melaporkan para pekerja adalah sangat terbeban bagi permintaan prestasi (M=76.60) diikuti denganpermintaan kognitif (M=65.65), permintaan temporal (M=57.34) dan permintaan emosi (M=48.78). 48.98% daripada keseluruhan pekerja berada dalam kelas normal bagi kemurungan., 63.27% normal bagi stres dan 36.74% adalah dalam kelas normal bagi kegelisahan. Dapatan signifikan menunjukkan 12.24% mempunyai kemurungan dan kegelisahan yang sangat teruk dan 4.08% pekerja menghadapi stres yang teruk bekerja di syarikat tersebut. Terdapat korelasi di antara tahap kemurungan, kegelisahan, stres dan bebanan mental sekurang-kurangnya r=0.453. Keputusan kajian ini telah membantu penyelidik untuk mencadangkan strategi kepada syarikat tersebut untuk mengekang isu kesihatan mental yang berlaku di syarikat berdasarkan keadaan dan aktiviti perniagaan syarikat tersebut.

Kata Kunci: Bebanan mental, Kesihatan mental, Industri minyak dan gas, DASS-21, CarMen-Q

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LIST OF SYMBOLS AND ABBREVIATIONS

BMI	:	Body Mass Index
CarMen-Q	:	Carga Mental Questionnaire
COVID-19	:	Coronavirus disease
DASS	:	Depression Anxiety Stress Scale
EIA	:	Energy Information Administration
HSE	:	Health Safety and Environmental
MWL	:	Mental Workload
NSF	:	National Sleep Foundation
NASA-TLX	:	National Aeronautics and Space Administration Task Load Index
PhilMCTQ	:	Philippines Munich Chronotype Questionnaire
SCM	:	Supply Chain Management
SPSS	:	Statistical Package for the Social Sciences

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Background

The oil and gas industry is one of the top industries that play a significant role in the economic development of Malaysia. Due to its nature of business, it demands a higher productivity of its human resources. Human resources have become the ultimate assets of the company to expand the quality of their services and products. As a result, the capacity of oil and gas' employees is highly maximized which very likely affects the quality of their productivity. This leads to the employee's excessive mental workload and dissatisfaction which will impinge on the business' productivity. Mental health is a subject that has been increasingly debated in today's setting. The need to investigate mental workload in top industry is increasingly important for occupational health and safety practitioners to improve employee productivity in the oil and gas industry.

In this study, the mental assessment tools that are utilized are CarMen-Q and DASS-21. Carmen-Q is a newly developed tool that is an easy, simple and useful tool to analyse and mitigate mental workload. In CarMen-Q, the confirmatory factor analysis that is used are cognitive, temporal and emotional demands and performance requirements. DASS-21 is utilized by measuring depression, anxiety and stress with good reliability and validity among clinical and non-clinical respondents. All employees from different kinds of scope of work such as engineers, executives, technicians and supervisors within the company are invited to complete these questionnaires and further recommendations were proposed to alleviate the results of risks raised in this study.

1.2 Scope of the study

This investigation focuses on employees who are working in a selected oil and gas company in Malaysia from the operation department, HSE department, tender and contracts department, finance department, costing department and human resource department with working hours of eight hours and various of age. This study emphasizes on mental health risk factors of these employees to determine their mental workload by applying CarMen-Q and DASS-21 mental health risk assessment tools.

1.3 Limitation

The boundary of this study limits to a selected oil and gas company in Malaysia with employees working at Kuala Lumpur, Terengganu, Sabah, Sarawak and Labuan Federal Territory offices. This research was conducted within six (6) months period according to the timeline given by the Faculty of Engineering, University of Malaya. The whole process of research was done by observing the precautionary measures that must be adhered to during the COVID-19 pandemic, hence discussions, surveys and interviews were conducted via online to limit face-to-face conversation.

1.4 Problem statement

The rapid progress of industrialization compels the industries to perform efficiently in their respective field which could impact the needs of their manpower to excel effectively in their roles and responsibilities. In the selected oil and gas organization particularly, the researcher observes that there are prevalent symptoms among the employees such as difficulties to sleep, emotional distress and constant feeling of restlessness leading to confusion, indecisiveness and poor self-confidence in making decisions in their project execution. There are also obvious cases among employees whereby they needed to work during non-working hours because of the enormous workload that induces them to miss rest.

Therefore, to ensure the sustainability of their business is preserved, it directly demands high involvement of the employees which leads to psychosocial issues such as poor job satisfaction and excessive mental workload. Consecutively, employee dissatisfaction and extreme mental workload lead to regression of their optimization to perform a work task. It is essential to investigate and assess the level of work stress and mental workload of these employees so that their talent and skills can be effectively optimized and boost without jeopardizing their mental health. Hence, by determining the level of mental workload of the employees, several recommendations can be explored and suggested to the oil and gas stakeholders to ensure the mental health of the employees are improved and protected while performing excellently in their work task.

1.5 Objectives

The following are the objectives of this study;

- To investigate the mental workload among employees in the selected oil and gas company.
- To identify the level of mental workload, depression, anxiety and stress among employees in the selected oil and gas company.
- To determine the relationship between the mental workload, depression, anxiety and stress among employees in the selected oil and gas company.
- To propose significant recommendations to improve the mental health of employees in oil and gas industry.

1.6 Significance of study

Many studies on mental workload have been done in other industries such as healthcare and academic lines but there are few studies conducted in the oil and gas business especially in a Malaysian setting. It is crucial to conduct this study to fill in the knowledge gap and further proposing recommendations to the industry to curb the

increase of mental health issues in the oil and gas industry especially. This would also help in contributing the third Sustainable Development Goals outlined by the United Nation; to ensure good health and well-being for all through optimum ergonomics approach by providing ideal design and assessment of work tasks, products, environments and organization to meet the demand, capabilities and limitations of people (J. R. Wilson & Sharples, 2015).

CHAPTER 2: LITERATURE REVIEW

2.1 Oil and gas industry market growth

The development of non-renewable energies has resulted in the makeover revolution of the oil and gas industry as a result of further research in more sustainable fossil fuel production. This progress has, in turn, led to greater challenges for oil and gas stakeholders in lowering costs, researching optimum production and environmentally friendly hydrocarbon exploration (El-bakry, 2017). The Energy Information Administration (EIA) classified Malaysia as Southeast Asia's third-highest oil producer of liquefied natural gas and second-highest oil and natural gas suppliers.

The growth of the oil and gas industry in Malaysia has increased by more than 7 percent since 2005, which has contributed more than 25 percent to the prediction of their government's annual revenue. However, in the year 2015-2016, economists witnessed a sharp decline of the world’s oil and gas prices which resulted in an immense reduction in the revenue of Malaysia’s government. Positive heightening of oil and gas prices started in the year 2016 when the oil and gas prices were slowly picking up again (Jategaonkar & Khalifa, 2015).

Then again, the recent Coronavirus pandemic has made an enormous contribution to another global financial crisis that has severely impacted most nations around the globe, including the oil and gas market. The consumption of natural gas decreases significantly, causing a huge fall in oil prices, though the Organization of the Petroleum Exporting Countries has prevented lower output by reducing the supply of production. The drilling activity in the East Asian region was also depressed owing to the quarantine and prohibition of national boundaries across several countries. Many forecasters had

previously anticipated a rise in global demand during the first phase of 2020, but now that the disease has become a global outbreak, oil prices are assumed to fall every day (Korea, 2020).

2.2 Oil and gas industry activities

The oil and gas field are divided into three upstream, midstream, and downstream sources. The upstream sector encompasses the exploration and production of hydrocarbons primarily focused on hydrocarbon build-up exploration, drilling wells, and hydrocarbon resource production. In the meantime, downstream activities centered mainly on the conversion of fossil fuels into a diverse product. Examples of the variety of activities include petroleum crude oil refining, natural gas processing and production of refined goods, such as gasoline, diesel, kerosene and lubricants.

The midstream business mainly encompasses the deliverables supply chain, distribution and transportation, inventory storage, and marketing. The products will be mobilized through pipelines, railways, tankers or lorries (El-bakry, 2017). In this industry, Contractors are usually employed for upstream and downstream business execution. They are defined as an individual or enterprise providing services to the operators who own the facilities.

The owner is also called an operator or customer who owns such facilities as platforms, chemical plants or rigs whereas the contractor offers skills, manpower and equipment for upstream facilities such as in construction, drilling and catering fields. On the other hand, in the downstream field, contractors will help to plan, build, service and maintain the facilities. Usually, the contract employees are employed based on their skills or requirement for jobs.

There are many reasons why individuals are choosing to work in the oil and gas sector such as high wages, healthy rotations of jobs, rapid career development and broader job opportunities abroad. These contract workers are employed to become the specialist for the facilities operator by providing knowledge in various areas such as refining, pipeline maintenance, drilling, well logging, laboratory analysis, food catering, safety, operating cranes and construction (Graham, n.d.).

2.3 Mental workload

Mental workload refers to the capacity of the brain to interpret information to accomplish a task that involves several types of information. This information includes cognitive, perceptual and neurophysiologic and is affected by the capabilities and skills of an individual, motivation carrying out the task, methods to complete the task and the physical and emotional state of the individual (Alfonso Brazález, et. al, 2018). Task demands, performance and capability of human beings are constantly debated topic in ergonomics since thirty years ago however the discussion is mainly encompassed in the aviation industry as there is a requirement to monitor the performance of pilots and air traffic control simultaneously.

Many theoretical models on mental workload assessment have started to materialize particularly among employees working in organizations due to the realization of increased psychological problems of professional drivers (Silva, 2014). This was also supported by Marinescu et al. in their study which reported mental workload is highly affecting human performance in performing a task (Marinescu et al., 2016). Mental workload has, therefore, become an important topic in the field of sciences and human factors engineering with modern technology which has transformed the workplace environment (Young et al., 2017).

Workload is characterized as the features of a task that impact the ability of individuals to perform a task according to the methods adopted by a person serving the task (Megan, 2005). Meanwhile, a workload requiring speed and rapidity refers to the demand for tasks. Task demand is the proportion of time needed to complete a task to the period available to accomplish that task (Wickens, 2008). Wickens also stated that the workload permutation consists of the obtainability of resources in the software system and the person's ability to comprehend the target of the task.

Researchers reported that a high mental workload can alter the capability of a person to perform at work. Besides that, intensifying task demand helps to speed up errors and increase errors based on the response time (Cox-Fuenzalida, 2007). Increase demand for tasks leads to excessive mental workload that steers mental health issues such as fear, anxiety, guilt, rage, depression, despair and boredom (Fraser, 1992). Examples of common signs that can be found in the workplace are headache, abdominal pain, forgetful, absent-minded, nervous, irritable and desperate (Hart & Staveland, 1988).

There are also behavioural transformations that are significant such as change of lifestyle. Some started to smoke, drink alcohol and isolating from the outside world (Prabaswari et al., 2020). These behavioural changes are affected by the burdening workload and tasks that are varied within their department. The inequality of workload distribution among employees although they are holding the same grade may be affected by the academic background, skills, competency and knowledge.

The model of equity states that unfairness occurs when an employee observing his workmate earning a paycheck bigger than him although both employees are holding the same rank and designation in the department (Inegbedion et al., 2020). Due to this event, estrangement takes place in the workplace. Unfairness of work task distribution among employees also impinges work stress levels among employees. Despite reduction or

addition of workload, both trigger work-related stress and performance at work (Ali & Farooqi, 2014).

2.4 Job stress

Stress is taken from a Latin word which means fatigue, pressure and lack of energy. Job stress is also referring to work-related stress that occurs when an employee is expected to exceed their performance capacity and existing resources which in return creates pressure on themselves. (Singh et al., 2019). This is also supported by Gross in his paper defining that stress is a result of a mismatch between the task demands and worker's abilities and knowledge that it challenges the worker's coping capability in handling pressures at work (Gross, 2017).

According to Bashir & Ramay, stress is termed as an undesirable reaction when an individual needs to overcome the pressure exerted on them due to expect to complete a demand assigned on them. It is related to the current behaviour of a person's mind that moves away from a common state of mind. This makes the common state of mind is distracted psychologically and emotionally. As a result of the distraction, the person's state of mind is not operating normally and optimal conditions (Bashir & Ramay, 2010).

Abundant studies have shown that stress at work influences job satisfaction and work efficiency of employees (Ahsan et al., 2009). Based on National Institute for Occupational Safety, task tension arises where the need for jobs and employees' expertise is not well-balanced with external parameters; less communication with the employee's ability and personal demands(Hosseini et al., 2016). Piko reported that stress is a type of feedback conveyed by an individual towards the environment (Ã, 2018).

An individual may be stressed out if he feels negatively in response to the environment of his workplace. The physical environment of the workplace could be related to the

temperature, lighting, space of the workspace and workstation (Sutton et al., 2014). In the meantime, stressed is described in a study by Mimura and Griffith as the situation in which the person faces a constant pressure that usually happens at work (Mimura & Griffiths, 2003).

2.5 Job stressors

Job stressors are environmental factors that allow stress to occur at work. Mimura and Griffith reported that stress at work is commonly caused by given limited notification and time constraints, negative health status, family problems and much more (Mimura & Griffiths, 2003). Job stressors are environmental factors that allow stress to occur at work. Mimura and Griffith reported that stress at work is commonly caused by given limited notification and time constraints, negative health status, family problems and much more (Stamper & Johlke, 2003).

Meanwhile, in the oil and gas setting, the laborers are often subjected to an unprecedented working environment as well as a broad source of stress. These include bad weather conditions, work overload, work shifts, night duties, noise, vibration and poorly ventilated work environment. Employees are also exposed to phycological distress such as social exclusion, inadequate support network, significant commitment, pressure on the workload, exhaustion and sleep deprivation (Pavi et al., 2019). This supports the various causes of work stress reported in previous research for instance task description, position uncertainty, task requirement and personal life and other colleagues' duties (Treven & Leonard, 2005).

2.5.1 Job type

Some jobs are more stressful than others, the study shows. For example, occupations such as firefighter, senior executive and surgeon are undergoing greater stress levels compared to accountant and actuary. This research was carried based on broad indicators

such as extra hours, cut-off date, productivity, physical needs, work environment, exposure to risks, resourcefulness, the required stamina, win-loss scenarios and public exposure (Cooper et. al, 2001). The country's president, firefighter, senior executive, surgeon, air traffic controller, public relations executive, stockbroker, pilot, architect, lawyer and physician are examples of the 250 most stressful occupations (Treven & Leonard, 2005).

2.5.2 Odds between work and personal life

Because of the advancements in technology and sophisticated community, married couples with children are working in an organization to share the responsibility of expenditures. Consequently, both partners find that there is a balancing act between work and family life that is prone to a type of stress called "role conflict". Another indication that may arise due to this conflict its demands that emerge between the spouses and employers (Treven & Leonard, 2005).

2.5.3 Role ambiguity

Because of the preference of organizations and department groups, the role of the job is diverse between individuals with the same position. Consequently, the characteristics for each field of work deviate from all organizations. Some people may find their volume of work exceeded what they are generally assigned that affecting them to blame their firm for the inconsistency of workload. When the inconsistency causes serious adverse effects for the individual, it underlines their psychological state by infringing the demand for work (Ford & Jin, 2015).

2.5.4 Time pressure

Time pressure refers to the frequency of compliance with an imposed time limit set for a task. The strict cut-off date is a presumed stressor to workload as the employee is obligated to finish the assignment within a deadline that may be undesirable to them. In

some scenarios, employees may have to work outside of their regular working hours, religiously skipping breaks, working around the clock or continuing to work outside of the office. As a side effect, an individual is obliged to modify this demand to their schedule, instead of fitting the request into their daily work schedule. Executives, journalists, health staff and the customer service are employees that are subject to high time pressure (Ford & Jin, 2015).

2.5.5 Role overload

Many work-related stresses are associated with a worker, who works way more than they can manage. Job overload can be divided into two different types; overload quantitative and overload qualitative. Quantitative overload applies to workers who are told to perform an unreasonable number of tasks over a given period of time. On the other hand, qualitative overload means the belief systems within the workers that they might not have the necessary skills to perform a task.

2.6 Symptoms of job stress

Singh et. al (Singh et al., 2019) has done a literature review associated with perceived symptoms of job stress by dividing the list of symptoms with the following:

Psychological symptoms. Psychological effects are closely related to mental and cognitive conditions induced by psychological disorders in the labor force. Psychological signs that are observable include hate, crowd loneliness, exhaustion, nervousness, frustration, and boredom. Symptoms of employee symptoms of this condition are hesitant, halting work and incapacitating to accomplish the goals of the mission (Amiri, 2018).

Physical symptoms. Physical signs are difficult to medically investigate because it is difficult to determine how the work situation causes the accidents or other diseases

altogether. However, earlier results from a research study revealed that there is a link between work stress and physical illness. For example, cardiovascular syndrome is the most common symptom of medical problems because of occupational stress (Singh et al., 2019).

Behavioural symptoms. There are a few types of behavioural symptoms. For example, certain symptoms are established within the owner's level while other symptoms are developed in the company due to unfavorable conditions. Some of the signs that workers can recognize include laziness in going to work, alcohol and substance misuse, inability to sleep, binge eating, contrasting attitudes against workmates and family members. Many other behavioral symptoms that occur are due to unhealthy working environments including absenteeism, unemployment, unproductivity and the presence of consequence management due to events involving work (Singh et al., 2019).

2.7 Health effects of job stress

Job stress causes poor health conditions and mental health illnesses, for instance, depression, nervousness and misery (Singh et al., 2019). A group of researchers also discovered that poor application of ergonomic principles at workplaces also leads to depression (Shikdar & Sawaqed, 2003). Another important finding revealed that an employee who has difficulty managing work due to extreme workload can affect his or her state of mind, leading to physical and behavioral problems (Mimura & Griffiths, 2003).

A study reported that between 50 percent and 75 percent are associated with poor mental health due to lack of focus, less exuberance and extreme tension over the 100 million working days period. These risk factors are found to be significant for these workers which exposes them to a higher level of disease stress (Treven & Leonard, 2005).

Other side effects of disease stress are fatigue, lack of energy, irritability, anxiousness, hypertension and lack of self- confidence.

Meanwhile, in developed countries, it was reported that 30 percent of workers are diagnosed with job stress and revealed that the stress level in developed countries is higher compared to underdeveloped countries (Hosseini et al., 2016). Concerning oil and gas offshore workers, about 19 percent of employees in this industry are impaired with psychological illnesses such as obsessional and phobic anxiety (Sutherland & Cooper, 1989). This finding is further expanded with finding in Norway, which 15 percent of oil and gas industry employees had various psychological distress such as anxiety, depression, nervousness and irritability (Pavi et al., 2019).

2.8 Relationship of mental workload, job stress and job burnout

Past literature review reported that there is a correlation between work overload and job performance of employees. The increase of workload deteriorates the employee's job performance that leads to job dissatisfaction within themselves (Ali & Farooqi, 2014). For example, a study on workload and burnout conducted on a group of Taiwanese reporters revealed that mental workload is closely linked with news burnout and job burnout. This finding suggests that job performance intervenes between burnout and turnover intention (Liu & Lo, 2018).

On the other hand, from the year 1995 to 2011, past literature review fulfilled by scientific researchers narrated that the workload level increases between this period and found there is a correlation between job satisfaction and the amount of workload (Lea et al., 2012). Many studies also registered that work stress is generally affected by excessive workload (Thian et al., 2015). However, Treven and Leonard emphasizes that stress is common for all employees across the organization regardless of their positions and

grades. They felt that stress has invaded the business target of the organization and the work performance of the employees (Treven & Leonard, 2005).

2.9 Mental health assessment tools

There are two types of categories for mental health assessment tools namely subjective measures and objective measures with both having pros and cons of administering it to a group of respondents. A subjective-based questionnaire provides rating scales for each question which offers less distraction in performing the survey and easier to organize. Nevertheless, since this technique consists of subjective elements, it has a large dependency on the respondent's memory and state of emotion whilst answering the questionnaire.

Meanwhile, the objective-based questionnaire involves parameters that are manipulated by a wide range of mental workload. In this method, the questions asked are created by putting an assumption that mental workload is indicated by the reduction of work performance. On top of that, the element of mental workload is also examined by introducing a secondary task to the respondents. If the secondary performance reduces when it was introduced on the respondent's primary task, it will be assessed as a reduction of mental workload. Therefore, there is a drawback of using an objective-based measures tool as it is found to be artificial and intrusive (Marinescu et al., 2016).

2.9.1 DASS-21

Depression Anxiety Stress-Scale (DASS) is a well-established tool applied among clinical and non-clinical samples of adults to assess the perceived severity associated with depressive, anxiety and stress symptoms (Lovibond & Lovibond, 1995). It is a type of self-administered questionnaire with twenty-one (21) questions consisting of seven (7) items per subscale which are depression, anxiety and stress. The original DASS by

Lovibond has forty-two (42) questions that were published in the year 1995 which was later simplified to twenty-one (21) questions.

Antony et al. (1998) revealed that the consistency of DASS is observed in DASS-21 and the concurrent validity of both DASS and DASS-21 is acceptable to excellent scale range. Numerous studies conducted by many researchers to validate the reliability and validity of DASS (Beaufort et al., 2017; Dreyer et al., 2019; Kaur et al., 2014; Oei et al., 2013) reported that DASS produces distinct characteristics of depression, physical arousal and psychological irritation.

2.9.2 CarMen-Q

CarMen-Q or also known as Carga Mental Questionnaire is a newly developed mental health assessment tool that was formulated according to the model of Mental Workload by Hart & Steveland. It was created by including the assessment of physical demands, mental demands, temporal demands, performance and emotional demands. CarMen-Q is proven to have high validity, simple to deploy and high reliability with high correlation with NASA-TLX (Chiorri et al., 2015). Although NASA-TLX is a well-known mental health assessment tool, there was one limitation found by a group of researchers in NASA-TLX. They reported that the performance measures are largely influenced by the physical load and emotional load exerted on the individual which is not practically relevant (DiDomenico & Nussbaum, 2011). Therefore, Rubio-Valdehita et al. (2017) constructed CarMen-Q by removing the physical load parameters that are affected by emotional demand to ensure there is actual and definite measures of mental workload.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The nature of the business of the selected oil and gas company in this study is providing service and expertise in pipeline and structural maintenance with a current population size of 60 employees. The office operating hours of the company is from 8.00 am to 5.00 pm from Monday to Friday. The selected organization has branch offices all over Malaysia with dedicated teams for operation and corporate office. There is a variant of departments involved in this study which are supply chain management, finance, costing, health, safety and environment, operation, administration, human resources and contracts and tender with multiracial population.

3.2 Research stage

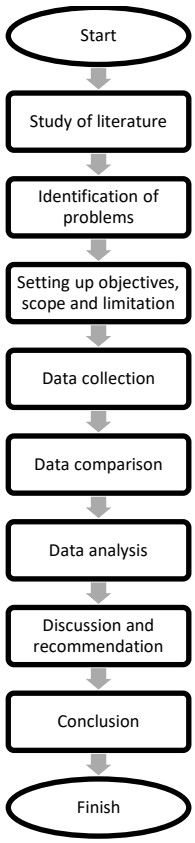


Figure 3-1: Flow chart of research method

3.3 Participants

There is a total of 49 employees partaken in this study with different departments and levels of position in the organizational structure of a selected oil and gas company. They are employees who are working in finance, human resource, administrative, supply chain, HSE, SCM, operation, costing and contracts departments in Terengganu, Kuala Lumpur, Sabah and Sarawak offices.

3.4 Instruments

In this research study, DASS-21 and CarMen-Q were utilized to identify the mental workload of the employees. Ethical approval was acquired from the research ethics committee of the University of Malaya with code UM.TNC2/UMREC-722. Both tools including the demographic data were run via Google online form to take account of the physical distancing measure during the COVID-19 outbreak.

3.4.1 CarMen-Q

CarMen-Q evaluates mental workload in a clear, accurate and reliable manner that comprises 29 items covering emotional demand, temporal demand, performance demand and cognitive demand. The response format for items is a Likert frequency scale of four options which means 0 never, 1 rarely, 2 often and 3 always(Rubio-Valdehita et al., 2017). The list of questionnaires is shown in Table 3-1.

Table 3-1: List of CarMen-Q

No.	Questions
1.	My job requires maintaining a high level of attention.
2.	My work involves the processing of complex information.
3.	My job requires thinking and choosing between different alternatives.
4.	I have to make difficult decisions.

5.	My job requires handling a lot of knowledge.
6.	I have to work constantly, I cannot take breaks beyond strict regulations.
7.	The pace of work is excessive, difficult to reach even by an experienced worker.
8.	I often work with annoying interruptions.
9.	I cannot stop my work when I need it.
10.	The pace of work is imposed on me.
11.	The accomplishment of my tasks demands a lot of speed.
12.	It is normal for me to accumulate the tasks.
13.	My job requires no mistakes.
14.	I have to give very precise responses.
15.	My mistakes can have serious consequences.
16.	My job requires dealing with information that is perceived with difficulty.
17.	I have trouble forgetting the problems of my job.
18.	My work makes me nervous.
19.	My work is affecting my personal relationships (family, friends...).
20.	My job involves a lot of responsibility.
21.	I feel very tired, physically fatigued.
22.	I have to deal with information that is not easily understood.
23.	My job requires a lot of information.
24.	My work affects me a lot emotionally.
25.	My job requires memorizing a high amount of data.
26.	My work is mentally intense.
27.	I have to do a great search and information gathering to carry out my tasks.
28.	When I finish my workday, I feel a lot of physical exhaustion.
29.	My work is affecting my health.

3.4.2 DASS-21

DASS-21 is a self-reporting questionnaire that has twenty-one (21) questions based on four-point rating scale; 0 did not apply to me at all, 1 applied to me to some degree, 2 applied to me to a considerable degree, 3 applied to me very much or most of the time. Respondents were asked to choose a rate of how many of each of the statements applied to them throughout working in the organization. Total scores of rating were sum up and multiplied by two (2) to calculate the final score and severity were analyzed based on the table of cut-off scores (Oei et al., 2013). The higher the rating, the higher the severity of mental distress.

Table 3-2: Scoring value of DASS-21

Class	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34

Table 3-3: DASS-21 Questionnaire

No.	Question
1.	I found it hard to wind down.
2.	I was aware of dryness of my mouth.
3.	I couldn't seem to experience any positive feeling at all.
4.	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)
5.	I found it difficult to work up the initiative to do things
6.	I tended to over-react to situations

7.	I experienced trembling (e.g. in the hands)
8.	I felt that I was using a lot of nervous energy.
9.	I was worried about situations in which I might panic and make a fool of myself
10.	I felt that I had nothing to look forward to.
11.	I found myself getting agitated.
12.	I found it difficult to relax.
13.	I felt down-hearted and blue.
14.	I was intolerant of anything that kept me from getting on with what I was doing.
15.	I felt I was close to panic.
16.	I was unable to become enthusiastic about anything.
17.	I felt I wasn't worth much as a person.
18.	I felt that I was rather touchy.
19.	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat).
20.	I felt scared without any good reason
21.	I felt that life was meaningless

3.5 Procedure

Prior data collection, the top management of the selected organization was reached out to seek consent of administering the survey across the company. After the request was authorized, the link to the survey was circulated to all employees via e-mail. In the online questionnaire, the participants were briefed about the purpose of the research study, anonymously data, privacy and confidentiality of data given, voluntary nature of their participation and. The online questionnaire was arranged into three sections; demographic data, DASS-21 and CarMen-Q. The demographic details of participant that was collected

are gender, age, type of work, daily physical activity, average sleep in a day, lifestyle, BMI and condition of workload (Kurata et al., 2015).

3.6 Statistical analysis

The analysis of questionnaires was done quantitatively by extracting the scoring values of respondents. All data collected was keyed in Microsoft Excel (2017) and was analyzed using IBM Statistical Product and Service Solutions (SPSS) version 20.0. Descriptive statistics of demographic data, DASS-21 and CarMen-Q were analyzed by taking account of the mean, frequency, standard deviation and correlation. To analyze the level of mental workload, the mean of scoring was calculated for questions categorized under performance demand, cognitive demand, temporal demand and emotional demand. The mean was analyzed as it represents the cumulative score of workloads for each demand. The comparison among all types of workload was presented by using a bar chart to simplify the data comparison.

To study the level of depression, anxiety and stress, the total scores for each respondent is multiplied by 2 and categorized according to the scoring values of DASS-2. The percentage of each scale is calculated to study the level of severity and presented in bar chart graph. $P < 0.05$ (two-tailed) was considered significant for DASS-21 and CarMen-Q. Pearson correlation was used to identify the relationship between CarMen-Q and DASS-21 scores with a 95% confidence interval (CI). Bar chart and data tabulation were also presented to present the comparison of data between age and gender of employees.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter is focusing on revealing the results of the data analysis of the survey through graphical and tabulation of data. In this section, the demographic data of 49 employees were tabulated and analyzed descriptively. The level of mental workload, depression, anxiety and stress scale was also illustrated in bar chart form to illustrate the data and draw out distinct comparison especially for gender-based and age-based analysis. The final part of this section discusses the relationship between MWL and depression, anxiety and stress scale by using SPSS through the Pearson correlation approach.

4.2 Descriptive analysis of employees' demographic and lifestyle data

In this section, the demographic data of employees who participated are presented and discussed. A total of 49 employees participated in the survey with demographic data tabulated below;

Table 4-1: Descriptive analysis of employees' demographic and lifestyle data

Demographics	Frequency	Percentage (%)
Gender		
Female	15	30.61
Male	34	69.39
Age		
18-22	1	2.04
23-27	18	36.73
28-32	12	24.49
33-37	8	16.33
38-42	6	12.24
43-47	3	6.12
48-52	1	2.04

Daily Physical Activity		
Extremely active	1	2.04
Vigorously active	3	6.12
Moderately active	22	44.90
Sedentary	23	46.94
Average Sleep (hours/day)		
0-2	1	2.04
3-5	21	42.86
6-8	27	55.10
Smoking		
Yes	14	28.57
No	35	71.4
Drinking alcohol		
Yes	13	26.53
No	36	73.47
BMI		
Underweight	3	6.12
Normal	20	40.82
Overweight	19	38.78
Obese	6	12.24
Extremely obese	1	2.04
Condition of Workload		
Underload	5	10.20
Quantitative workload	38	77.55
Qualitative workload	6	12.24

Out of 40 workers, there is a total of 34 females and 15 males participated in the survey. The largest participants were within the 23-27 years group. From the survey, about 46.94% spent most of the time sitting and having a sedentary routine which could be related to less than half of them are not having normal body mass index (BMI). The demographic data also tells us that not many employees smoke and drink alcohol. About 76% feel that they have a lot of work to do that cannot be accomplished comfortably. This

could imply that the employees in the company do not necessarily smoke or drink alcohol to relieve stress.

4.3 Level of mental workload of employees by using CarMen-Q

In this section, data analysis using CarMen-Q is presented to report the result of the mental workload of the study subjects. Based on Table 4-2 and Figure 4-1, the respondents were highly burdened in performance demands followed by cognitive demands, temporal demands and emotional demands. This finding shows that the employees in the selected oil and gas company feel that their performance acquires high demand by their superiors in comparison with other demands. It also indicates that many of the employees feel hampered with numerous roles and responsibilities and at the same time called to accomplish it excellently or within a short notice deadline.

Table 4-2: Analysis of mental workload

Demands	Performance	Cognitive	Temporal	Emotional
Mean	76.60	65.65	57.34	48.78
N	49	49	49	49
Standard Deviation	19.58	20.84	21.84	26.43

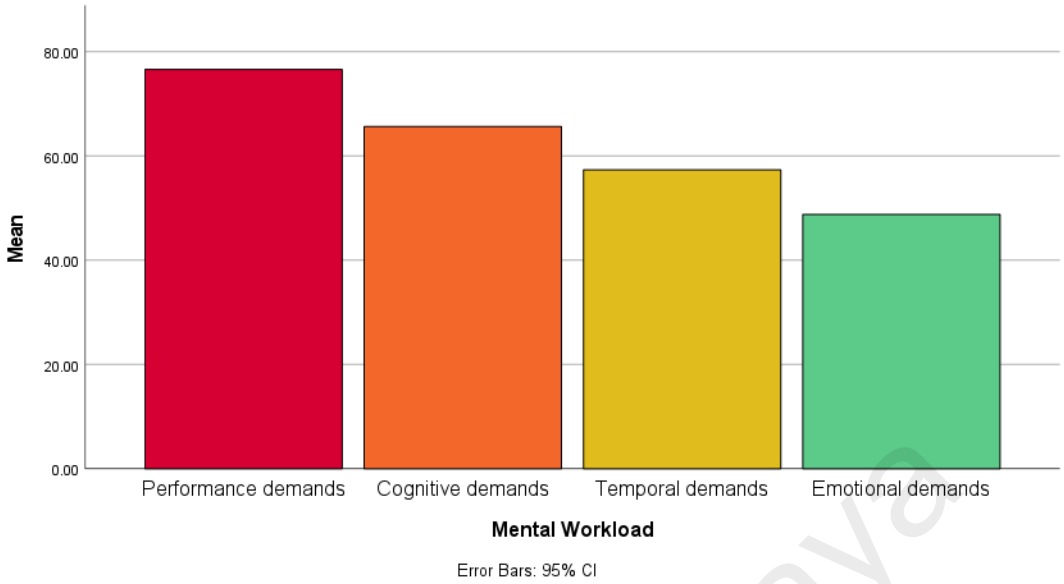


Figure 4-1: Level of mental workload of employees

Table 4-3 shows that male employees are highly burdened compared to female employees in all types of demands with the following descending order; performance demands (M=80.20, SD=18.09), cognitive demands (M=70.69, SD=20.28), temporal demands (M=60.7838, SD=20.81) and emotional demands (M=52.24, SD=26.67). Similarly to male workers, females also largely burdened by performance demands followed by cognitive demands, temporal demands and emotional demands.

Table 4-3: Gender-based comparison of mental workload by using CarMen-Q

Gender / Demands		Performance	Cognitive	Temporal	Emotional
Female	Mean	68.45	54.22	49.52	40.95
	N	15.00	15.00	15.00	15.00
	Std. Deviation	21.00	17.84	22.82	24.99
Male	Mean	80.20	70.69	60.78	52.24
	N	34.00	34.00	34.00	34.00
	Std. Deviation	18.09	20.28	20.81	26.67

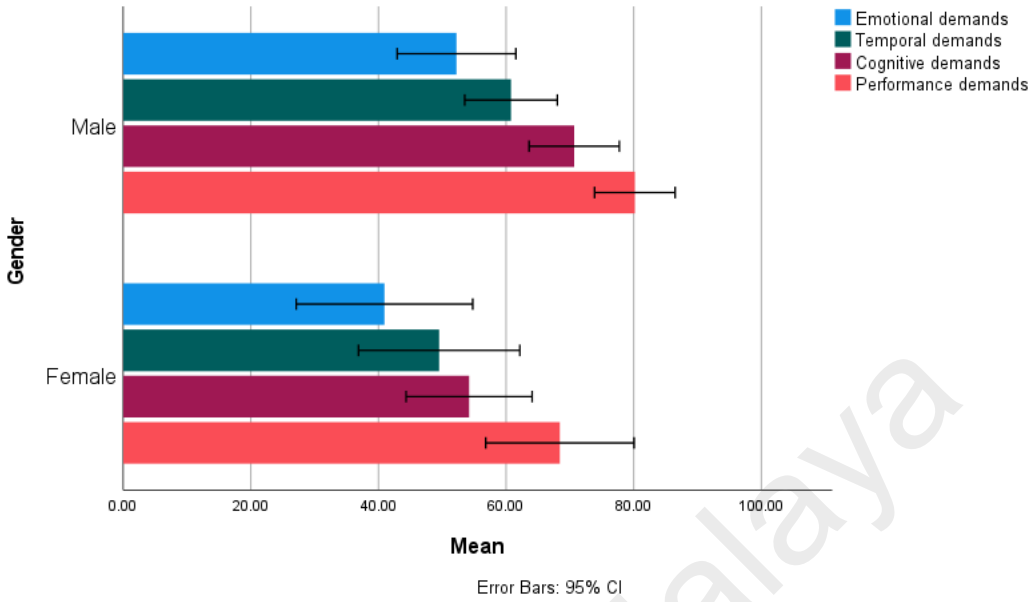


Figure 4-2: Comparison of mental workload against gender

This finding also summarized that male workers have greater burdened compared to female workers which is illustrated in the figure below.

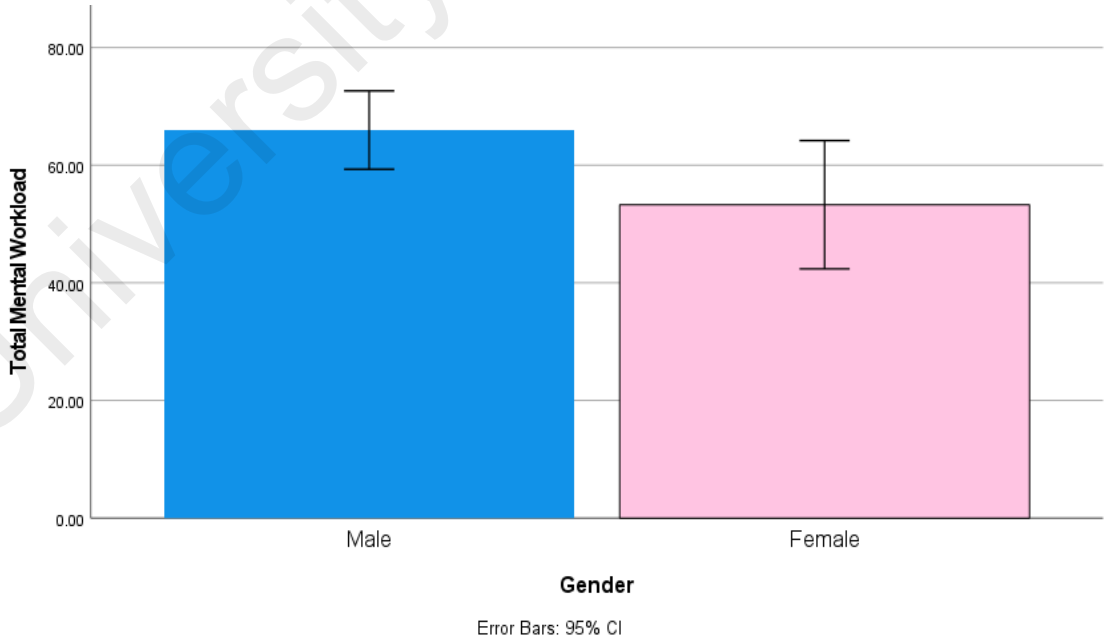


Figure 4-3: Total mental workload against gender

In terms of age range, an employee who is 18-22 years old has the highest mental workload (M=86.31), followed by the age group of 43-47 years old (M=76.75) and 38-42 years old (M=66.00). Statistical analysis reveals that employees who are 33-37 years old are least burdened among all age groups.

Table 4-4: Age-based comparison of mental workload by using CarMen-Q

Age	Mean	N	Std. Deviation
18 - 22 years old	86.31	1.00	-
23 - 27 years old	62.35	18.00	18.70
28 - 32 years old	63.91	12.00	24.82
33 - 37 years old	50.91	8.00	17.06
38 - 42 years old	65.99	6.00	8.61
43 - 47 years old	76.75	3.00	20.25

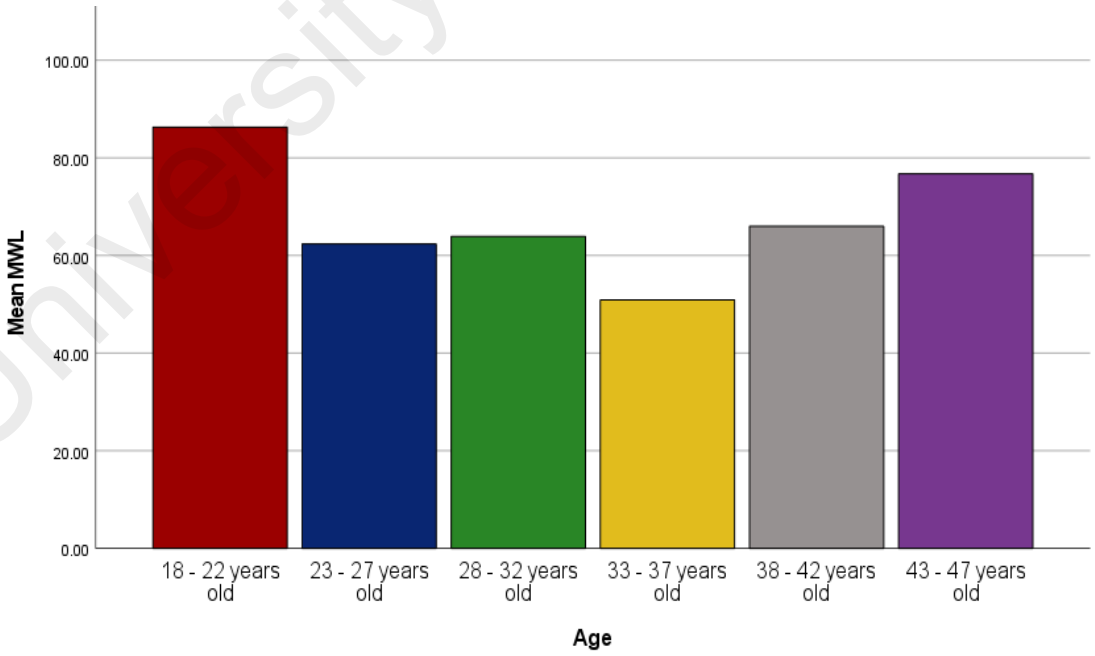


Figure 4-4: Comparison of mental workload against age group

4.4 Level of depression, anxiety and stress of employees by using DASS-21

Most 24 (48.98%) of employees were determined to have a normal score of depression. Similarly, a majority of 31 (63.27%) of the study subjects have a normal score of stress and 18 (36.74%) have a normal score of anxiety. The data in Table 4-5 revealed 12.24% have extremely severe depression and anxiety and only 2 workers found to be extremely severe stressful working in the company. Although the data shows a major portion falls under the normal score of depression, anxiety and stress, the cumulative number of at least having symptoms of depression and anxiety is higher than the normal score which is depicted in Table 4-6.

Table 4-5: Level of depression, anxiety and stress

Symptoms	Depression		Anxiety		Stress	
Subscale	Total	(%)	Total	(%)	Total	(%)
Normal	24	48.98	18	36.74	31	63.27
Mild	8	16.33	2	4.08	6	12.24
Moderate	8	16.33	13	26.53	9	18.37
Severe	3	6.12	10	20.41	1	2.04
Extremely severe	6	12.24	6	12.24	2	4.08

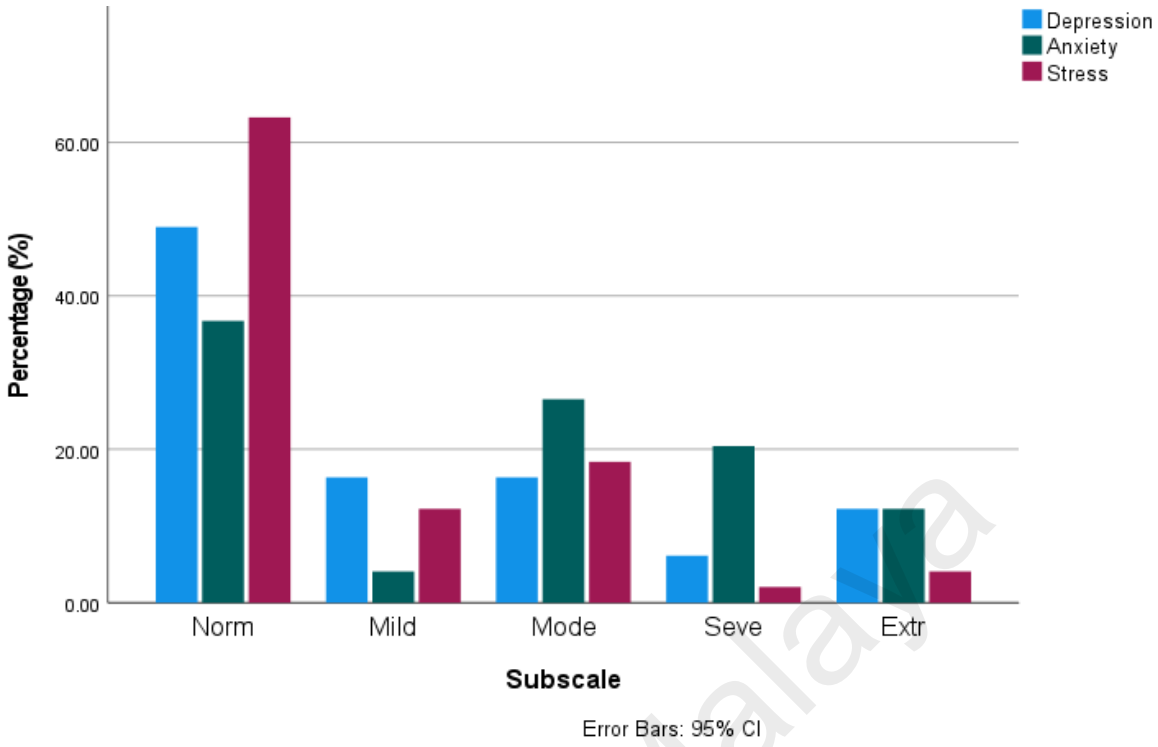


Figure 4-5 Bar chart comparison of the level of depression, anxiety and stress

From Table 4-6, it tells us that more than 50% of employees are having depressive and anxiety symptoms. Less workers have a positive score of stress subscale with only 36.73% showing symptoms of stress.

Table 4-6: Cumulative data of normal score and at least having symptoms

Symptoms	Depression		Anxiety		Stress	
Subscale	Total	(%)	Total	(%)	Total	(%)
Normal	24	48.98	18	36.74	31	63.27
Having symptoms	25	51.02	31	63.26	18	36.73

Table 4-7: Gender-based comparison of depression, anxiety and stress by using DASS-21

Gender		Depression	Anxiety	Stress
Female	Mean	10.27	12.40	13.33
	N	15	15	15
	Std. Deviation	9.10	7.10	8.44
	Std. Error of Mean	2.35	1.83	2.18
Male	Mean	13.06	10.94	12.94
	N	34	34	34
	Std. Deviation	12.22	10.47	10.60
	Std. Error of Mean	2.10	1.80	1.82
Total	Mean	12.20	11.39	13.06
	N	49	49	49
	Std. Deviation	11.34	9.51	9.90
	Std. Error of Mean	1.62	1.36	1.41

Data comparison was also run by comparing the level of depression, anxiety and stress with the gender of employees. Female workers who have participated in the research were found to be comparatively more anxious and stressed than male workers with statistical confirmation shown in Table 4-7. Meanwhile, in Table 4-8, employees belonging to the 23-27 years age group have the highest depressive symptoms compared to other age groups. It also revealed that employees who are between the age of 43-47 years old are more anxious and stressed working in the company than the rest of the age groups.

Table 4-8: Age-based comparison of depression, anxiety and stress by using DASS-21

Age		Depression	Anxiety	Stress
18 - 22 years old	Mean	12.00	12.00	12.00
	N	1	1	1
	Std. Deviation	.	.	.
23 - 27 years old	Mean	14.78	13.56	13.89
	N	18	18	18
	Std. Deviation	13.51	10.51	11.30
28 - 32 years old	Mean	9.83	9.00	11.33
	N	12	12	12
	Std. Deviation	7.31	7.31	7.92
33 - 37 years old	Mean	11.75	9.50	14.50
	N	8	8	8
	Std. Deviation	9.59	8.19	8.73
38 - 42 years old	Mean	9.00	11.00	11.00
	N	6	6	6
	Std. Deviation	8.92	6.90	6.54
43 - 47 years old	Mean	14.00	15.33	18.67
	N	3	3	3
	Std. Deviation	24.25	21.39	20.82
48 - 52 years old	Mean	12.00	6.00	4.00
	N	1	1	1
	Std. Deviation	.	.	.

4.5 Relationship between level of depression, anxiety, stress and mental workload among employees

Table 4-9: Pearson Correlation between the level of depression, anxiety, stress and mental workload

		MWL	Depression	Anxiety	Stress
MWL	Pearson Correlation	1	.576**	.453**	.486**
	Sig. (2-tailed)		.000	.001	.000
	N	49	49	49	49
Depression	Pearson Correlation	.576**	1	.774**	.857**
	Sig. (2-tailed)	.000		.000	.000
	N	49	49	49	49
Anxiety	Pearson Correlation	.453**	.774**	1	.858**
	Sig. (2-tailed)	.001	.000		.000
	N	49	49	49	49
Stress	Pearson Correlation	.486**	.857**	.858**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	49	49	49	49
**. Correlation is significant at the 0.01 level (2-tailed).					

The experimental results in Table 4-9 shows that the level of depression, anxiety, stress and mental workload of the employees have significant correlations with each other of at least r=0.453. For correlations between depression, anxiety and stress with mental workload, the strongest correlations were found between mental workload and depression factor (r=0.576). The correlations between depression and stress are also strong at r=0.857. Another significant correlation is also found between stress and anxiety with r=0.858.

CHAPTER 5: DISCUSSION

5.1 Introduction

The purpose of this chapter is to interpret the findings reported in Chapter 4. This chapter begins by reiterating the objectives of the research study, interpreting the potential reasons for the data reported and suggesting significant recommendations to the organization to improve the mental health of their employees. The purpose and objectives of the research paper were answered albeit the limited duration given to complete this research.

5.2 Demographic data analysis

Table 5-1 indicates that a total of 49 respondents participated in this research study who are all working in the selected oil and gas company. More male workers have participated with a number of 34 (69.39%) whereas female workers come with a total of 15 (30.61%). Both male and female workers come from different departments across the organization such as human resources, HSE, operation, finance, SCM, costing and accounts departments. This data indicates that the company is a male-dominated organization which could also report that the oil and gas industry is controlled mainly by men.

Table 5-1: Descriptive analysis of employees' demographic and lifestyle data

Demographics	Frequency	Percentage (%)
Gender		
Female	15	30.61
Male	34	69.39
Age		
18-22	1	2.04
23-27	18	36.73

28-32	12	24.49
33-37	8	16.33
38-42	6	12.24
43-47	3	6.12
48-52	1	2.04
Daily Physical Activity		
Extremely active	1	2.04
Vigorously active	3	6.12
Moderately active	22	44.90
Sedentary	23	46.94
Average Sleep (hours/day)		
0-2	1	2.04
3-5	21	42.86
6-8	27	55.10
Smoking		
Yes	14	28.57
No	35	71.4
Drinking alcohol		
Yes	13	26.53
No	36	73.47
BMI		
Underweight	3	6.12
Normal	20	40.82
Overweight	19	38.78
Obese	6	12.24
Extremely obese	1	2.04
Condition of Workload		
Underload	5	10.20
Quantitative workload	38	77.55
Qualitative workload	6	12.24

Based on the statistical analysis of age, the highest number of respondents belonging to 23-27 years old at 36.73%. The next highest respondents are from 28-32 years group which stands at 24.49%. Both data indicate that half of the employees in the organization are mostly in the early 20s to early 30s. An assumption made from the researcher from

this data by claiming that most respondents are at least a diploma or degree holder. Less than 20% of respondents come from the age group of 18-22 years old (2.04%), 33-37 years old (16.33%), 38-42 years old (12.24%), 43-47 years old (6.12%) and 48-52 years old (2.04%). For employees at the age of 33 years old and above, it is most likely that these employees are holding the senior management designations hence the number of respondents is lower compared to other age groups. One respondent reported for age group 18-22 years old who might be holding a trainee position in the company.

With regards to the daily physical activity routine of the employees, the maximal percentage portion can be seen for sedentary activity with a percentage of 46.94%. 22 respondents (44.90%) reported moderately active in their daily physical activity. Only 3 persons (6.12%) feel that they are vigorously active and 1 person for extremely active (2.04%). From this finding, almost half of the employees spend most of their time sitting and not practicing an active lifestyle. However, this data is also comparable to employees who practice a moderately active routine by having outdoor activities or gym activities at least two or three times a week.

In terms of average sleep in a day, 27 employees (55.10%) sleep at least 6-8 hours per day, 21 employees (42.86%) sleep at least 3-5 hours per day and 1 employee (2.04%) sleep 0-2 hours per day. A study revealed by the National Sleep Foundation (NSF) recommends that adults should have an average sleep of 7-9 hours per day to have healthy sleeping hours (Luckhaupt et al., 2010). Based on this recommendation, almost half of the study subjects are not having a healthy sleeping duration which can be associated with their roles in the organization. Past studies agreed to this factor in which the quantity and quality of sleep have a high correlation with long working hours, shift work and job stress (Kumar, 2008; Luckhaupt et al., 2010; Patel, 2007) that can be escalated by their lifestyle and stress at home.

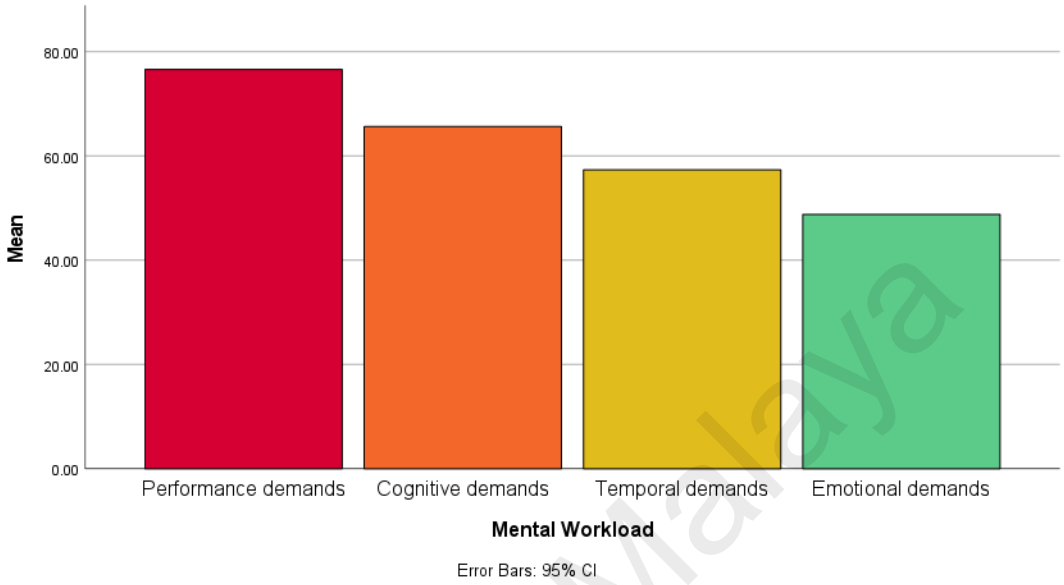
Another significant finding that can be seen from the demographic analysis is at least 70% are not drinking alcohol and smoking. However, in terms of body mass index (BMI) only 40.82% are having normal body mass indexes and the rest of them are either underweight, overweight, obese or extremely obese. This can conclude that their body mass index is not affected by their alcohol consumption and smoking lifestyle but might be influenced by their daily physical activity where 46.94% spend a lot of their time sitting and not practicing an active lifestyle. Moreover, this finding also does not agree to past studies that revealed alcohol consumption and smoking lifestyle are associated with the increase of prevalence short sleep duration (Patel, 2007; Vgontzas & Bixler, 2008). In this research study, the researcher suggests that risk behaviors such as smoking and drinking alcohol do not contribute to the cause of short sleep duration as at least 70% do not smoke and consume alcohol but 42.86% is not practicing healthy sleep duration. Therefore, the researcher concludes that there is no correlation between these two determinants.

In terms of the employees' condition of workload, an outstanding figure revealed for quantitative workload compared to underload and qualitative workload. 38 employees (77.55%) feel that they have a lot of tasks that cannot be accomplished comfortably. Whereas there is quite a similar number of employees reported to have qualitative workload and underload which 6 (12.24%) persons reported to have qualitative workload and 5 persons (10.20%) feel that they are under load. The discussion in the following subsection will reveal the validation of this data by discussing the statistical analysis of the mental workload of the employees.

5.3 Level of mental workload

Findings reported in Chapter 4 indicate that all respondents are highly burdened with at least 49-77% mental workload for all four-dimensional model of CarMen-Q. This

includes all task demands related to (cognitive, temporal and performance demands) and subject experience (emotional demands).



According to Figure 4-1 as shown above, the sequence order of mental workload shows that performance demand resulted in the top task demand among all task demands with M=80.20 (SD=18.09). Rubio-Valdehita in her paper stated that performance demands refer to the need to perform and the measure of the individual's responsibilities (Rubio-Valdehita et al., 2017) wherein this research context, this could be referred to the multifarious of task distribution and the employee is overly burdened with numerous tasks.

It is very likely that performance demands attributed to 76.76% due to multiple tasks that needed to be accomplished (Rogelberg, 2017) by the employees which was also suggested by Rogelberg in his study. From an observational study on the organization, more than half of the employees are having an enormous scope of work such as overseeing all activities in several regions. For example, less than five costing engineers who are based at the headquarter office are required to prepare a cost impact for all projects that are executed in five regions simultaneously. Besides that, the organization

also owns eight (8) subsidiaries companies that a couple of departments are extremely maximized with multiple accountability and responsibility to oversee business activities in all subsidiaries companies.

This finding also supports the research study made by Wickens that task demand is also contributed by the dual-task requirement. The degree of task demand attributes to the individual's mental workload by predicting the measure of performance failure when overload has been reached (Wickens, 2008). In this case, an assumption can be drawn out by the result of the performance demands analysis that there may be an occurrence of performance deterioration among the employees without them realizing it.

Cognitive demand stands on the second-highest task demand with M=65.65 that reflects most of the employees are required to do compounded information processing and attentional decision-making process (Rubio-Valdehita et al., 2017). On this finding, the researcher claims one factor that could attribute to this is the complexity of the project execution stages as a lot of critical decision-making needed to be done to accomplish the requirement by the authorities and to fulfill the expectation of the owner of the facilities where the projects will be executed. In this organizational context, the owner of the facilities is the high-profile stakeholders of oil and gas operators in Malaysia. Besides that, the projects also include high-risk activities as it exposes human beings to many types of hazards such as physical hazards, biological hazards and chemical hazards.

From the mental workload analysis, we can also see that although temporal and emotional demands are the last two highest demands among the task demands that were investigated, both still showing pertinent figures with M=57.34 and M=48.78 respectively. According to Rubio-Valdehita, the dimension of the temporal demand refers to the speed to complete the task while emotional demands are the demands that are linked

to the measure by which the task makes the employee feels nervous, anxious and stressed (Rubio-Valdehita et al., 2017).

The figure reflected by temporal demands based on the mental workload analysis indicates that at least half of the study subject requires to have quick response and swiftness to accomplish their task. This can be associated with increasing demand by the end user by demanding responses or end product in a short notice. Moreover, the accumulation of cognitive demands and temporal demand may also be linked to the emotional demands faced by the employees as some employees reported that there is nervousness in deciding as they are afraid that decisions made in a quick period will jeopardize the success and smoothness of the project execution. This finding supports the past studies that the increase of emotional strain is escalated by the cognitive dimension of a task (Cain, 2007).

The findings of this research also showed a prevalence comparison of mental workload between male workers and female workers. Based on Table 5-2, it can be deduced that male workers have higher mental workload compared to female workers as male shows at least mental workload with M=52.24 to M=80.20 whereas female shows M=40.95 to M=68.45 task demands for all dimensional. There is a distinct difference in mental workload for each dimensional between male and female that can be due to excessive or irregular work task, lack of control, role ambiguity and lack of job enrichment (Standing et al., 2004) among male workers compared to female workers.

Table 5-2: Gender-based comparison of mental workload by using CarMen-Q

Gender / Demands		Performance	Cognitive	Temporal	Emotional
Female	Mean	68.45	54.22	49.52	40.95
	N	15.00	15.00	15.00	15.00
	Std. Deviation	21.00	17.84	22.82	24.99
Male	Mean	80.20	70.69	60.78	52.24
	N	34.00	34.00	34.00	34.00
	Std. Deviation	18.09	20.28	20.81	26.67

In terms of age group, the results revealed that worker belonging to the age group of 18-22 years old is facing the highest mental workload with M=86.31 followed by 43-47 years old (M=76.75), 38-42 years old (M=65.99), 28-32 years old (M=63.91), 23-27 years old (M=62.35) and 33-37 years old (M=50.91). Similarly to an experimental study by Zoer et al., they also reported higher mental workload for youngest workers with the age of at least 22 years old that can be due to weak emotional support from their colleagues (Zoer et al., 2011).

Table 5-3: Age-based comparison of mental workload by using CarMen-Q

Age	Mean	N	Std. Deviation
18 - 22 years old	86.31	1.00	-
23 - 27 years old	62.35	18.00	18.70
28 - 32 years old	63.91	12.00	24.82
33 - 37 years old	50.91	8.00	17.06
38 - 42 years old	65.99	6.00	8.61
43 - 47 years old	76.75	3.00	20.25

An observational study by the researcher suggested that the significant risk factors for employees belonging to the group aged 30-45 years old to have a higher mental workload due to multifaceted decision-making processes and numerous responsibilities in the position they are taking on. Moreover, their emotional demand can also be mounted up by poor social support from their supervisors. This was further elaborated by finding in past studies claiming that inadequate social support from their supervisors which is linked to poor employee-supervisor relationship and declining capability to work as an employee ages (Ilmarinen et al., 1997).

5.4 Level of depression, anxiety and stress scale

From the statistical analysis in Chapter 4, anxiety holds the highest percentage (63.26%) of employees who are at least having anxiety symptoms with the highest number of employees having moderate symptoms (26.53%) followed by severe (20.43%), extremely severe (12.24%) and mild (4.08%) subscales. This figure is a double fold of percentage of employees having stress symptoms. Past research studies claim that some anxiety disorder is normal and even moderate anxiety levels able to enhance worker's performance, however severe anxiety hinders the cognitive ability of the individual's work performance (Bomble & Lhungdim, 2020; Ghawadra et al., 2019; Standing et al., 2004).

In this organization context, severe anxiousness among the employees may impede their ability to process complex information and project plans that may contribute to poor time planning of a project, ineffective work instructions between engineers and supervisors that may result in loss of confidence by the clients. In fact, an observational study by the researcher also revealed that there are continuous feelings of sweating and muscular tension by employees in the office that are aggravated by discomfort to express it to their colleagues and supervisors to seek social support.

Based on the result in Table 5-4 as shown below, it shows that 25 respondents (51.02%) are having depressive symptoms with the highest portion for mild (16.33%) and moderate (16.33%) subscales respectively followed by extremely severe (12.24%) and severe (6.12%) subscale. Although a higher number of employees fall in the normal depression scale (48.98%) compared with other subscales, the cumulative portion of at least having symptoms is higher than the normal subscale. This suggests that more than half of the participants in the organization are depressed but differing in severity.

Table 5-4: Level of depression, anxiety and stress

Symptoms	Depression		Anxiety		Stress	
Subscale	Total	(%)	Total	(%)	Total	(%)
Normal	24	48.98	18	36.74	31	63.27
Mild	8	16.33	2	4.08	6	12.24
Moderate	8	16.33	13	26.53	9	18.37
Severe	3	6.12	10	20.41	1	2.04
Extremely severe	6	12.24	6	12.24	2	4.08

This result differs from a study in India by Rao & Ramesh (2015) for industrial workers. Rao & Ramesh revealed that there is a prevalence rate of at least 18-36% for anxiety and stress amongst employees in the factory. When compared with this research study, a least 37-63% of the research samples are having positive anxiety and stress. This figure is double fold of positive rate for industrial workers in India which may suggest that oil and gas employees are more prone to suffer from mental health illness compared with industrial workers.

Depression is often associated with mood disorders (Standing et al., 2004). Since the respondents of the survey conducted among employees who are working in the office, the

number of having depressive symptoms is consistent with findings by (Cohidon et al., 2010; Stansfeld & Candy, 2006) which suggested that unfavourable social setting in the office leads to higher depressive symptoms that are also attributed by determinants such as performance pay, lack of control over the work process, insufficient materials to produce quality work and difficulties to build cooperation at work.

Time pressure is also associated with this significant finding as the company is obliged to meet a tight deadline that is set by their clients while at the same time having to complete other tasks requested by their supervisors. This finding is supported in the research study by Cohidon et. al suggesting that depressive symptoms are elevated by repetitive demand to meet tight deadlines, simultaneous completion of several tasks and constant interruption while accomplishing a task. These risk factors are very much consistent with the high mental workload for performance task demand and cognitive task demands which were reported in the previous subsection.

Unlike with depression and anxiety symptoms, only 36.73% of the employees show stress symptoms. This figure is surprisingly lowest than other symptoms although the percentage of employees possessing depressive and anxiousness is comparatively high. The occurrence of stress is the combination of reactions such as emotional, cognitive, behavioural, and physical due to the inability of coping and high levels of arousals in facing extreme adverse conditions (Standing et al., 2004). From this data, the researcher suggests that 36.73% of the study subject have several tasks that acquires strong demand of their capabilities that stresses them to meet with the requirement by the end-user.

Concerning gender-based comparison, female workers are more anxious and stressed than male workers. This could be influenced by their male-dominated working environment (Gardiner & Tiggemann, 1999) where the ratio of males compared to females is 3:7 according to the statistical analysis. The researcher suggested that their

anxiousness and stress happen due to the realization of being a minority that they feel the need to perform greater than male workers. Another reason that could be a risk factor to this finding is their role conflict which supports finding by past studies (Treven & Leonard, 2005). As a women, the extra roles that they have to play at home as a working mother and expectation of carrying out domestic roles attributes to their difficulties to find a balance between work and family roles (McLaren et al., 2020; Treven & Leonard, 2005) which may lead to hardships in meeting expectations by their superiors.

Table 5-5: Gender-based comparison of depression, anxiety and stress by using DASS-21

Gender		Depression	Anxiety	Stress
Female	Mean	10.27	12.40	13.33
	N	15	15	15
	Std. Deviation	9.10	7.10	8.44
	Std. Error of Mean	2.35	1.83	2.18
Male	Mean	13.06	10.94	12.94
	N	34	34	34
	Std. Deviation	12.22	10.47	10.60
	Std. Error of Mean	2.10	1.80	1.82
Total	Mean	12.20	11.39	13.06
	N	49	49	49
	Std. Deviation	11.34	9.51	9.90
	Std. Error of Mean	1.62	1.36	1.41

5.5 Relationship between depression, anxiety, stress and mental workload

Based on the correlation analysis, it can be concluded that there is a significant correlation between mental workload, depression, anxiety and stress symptoms among

employees in the selected oil and gas company. This supports the past studies that revealed there is a profound magnitude of mental health issues with the increase of task demand (Cox-Fuenzalida, 2007; DiDomenico & Nussbaum, 2008; Silva, 2014). The risk factors that lead to this significant result may also have strong impacts to the correlation as the researcher feels that the cause for all risk factors are interconnected.

For instance, the temporal task demand required by the employees to increase their speed to complete a task is closely associated with their anxiety and stress to produce the outcome in a tight deadline. Besides that, employees' overloaded role that is presented by the result of performance task demand data also influences depressive disorders among employees. It leads to fatigue, loss of interest in working and lack of energy due to sleep deprivation for having to meet the demand of their numerous tasks. This finding is also supported Standing et. al stating that different mental health illnesses often happen together and are closely associated with chronic pain and musculoskeletal pain. For instance, an individual with anxiety is also consistently depressed (Kumar, 2008; Standing et al., 2004).

Other multifaceted factors lead to this finding in the organization context. Due to recent retrenchment in the company, many executives across the regional offices are overloaded with a lot of tasks which is proved by high performance and cognitive demands in the mental workload statistical analyses. As a result, there is a perception among the employees that the workplace is not equitable and lack of fairness in task distribution which leads to depression and stress. There is also demotivation that is occurring among the employees due to salary reduction as part of initiatives taken by the top management to sustain the business of the company. Hence, this deteriorates the interpersonal relationships between the top management and lower level of management hampering the existing risk factors of unhealthy work content.

5.6 Recommendations to improve the mental health of employees

To improve the mental health problems occurring among the employees in the company, the researcher suggested several recommendations that are discussed in the following paragraphs.

5.6.1 Health assessment

The demographic analysis shows that more than half of the employees (59.18%) do not have an ideal body mass index. Past studies reported that the brain capacity to process information is largely influenced by the condition of the body. This calls for a need to carry out a health assessment (Kurata et al., 2015) quarterly to monitor the health status of the employees. This health assessment should be done by incorporating consultation with the therapist to include the evaluation of perceived mental illness symptoms and at the same time giving social support to employees who are extremely emotionally affected. It is also advisable for the employees to have weekly blood pressure checking in the office by engaging with the Health, Safety and Environmental Department to provide blood pressure checking device. By recording and monitoring the blood pressure of all employees, alarming results of blood pressure measurement can be detected and risk factors such as fatigue and lack of rest can be immediately informed to the employee to get further medical assessment.

5.6.2 Chronotype assessment

Chronotype assessment is a type of assessment to apprehend the circadian rhythm of an individual. Circadian rhythm refers to the functions and processes of the body that is controlled by an internal body mechanism. This assessment studies the biological clocks of the body by adjusting the circadian pacemaker through exposure to light through the day-night cycle. By implementing this assessment, the organization will be able to assess the physiological determinants for example optimal sleep hours and patterns since there

is quite a large number of employees who are not practicing optimal healthy sleeping hours. With this assessment, the organization can help to intervene in their sleeping routines so that their potential can be maximized and work productivity can be boosted by allocating proper sleeping hours. Kurata et. al recommends this procedure by answering the online Philippine Munich Chronotype Questionnaire (PhilMCTQ) section which the feedback received after completion can be utilized for the identification of the best schedule that is fit to employer's needs.

5.6.3 Stress management training and consultation

Stress management training aims at improving positive attitudes, optimism and coping skills to the employees (Thian et al., 2015). This can be done by collaborating with medical practitioners to organize workshops or classes focusing on relaxation, time management and ways to deal with work stress (Gross, 2017). The researcher suggested that this training be done outside of office building on an annual basis and making it compulsory for all employees to attend. Pre-test of assessment of mental illness and post-test should be conducted during the workshop to review the change of attitude before and after the session and scoring of the program's objectives. The effectiveness of this program can be sustained within the company by monitoring mental health and providing immediate specialist care to the employees.

5.6.4 Putting in workplace mental health policy

Addressing mental health problems in the organization can be strengthened by the development of mental health policy and implementing the commitments promised by the company as stated in the policy. This policy should clearly state the target and vision of the organization in enhancing the mental health of their workforce and demonstrating the target actions. Non-existent of policy does not provide transparent coordination and direction by the top management that will diminish the impact of strategy and initiatives

of tackling mental health problems (Standing et al., 2004). The essential elements that must be presented in the policy are an acknowledgment by the employer to curb mental health problems in the company, principles and objectives of the policy and strategies to protect the mental health of the employees.

5.6.5 Rewards

The researcher suggests that self-regulated work management can be improved by motivating the employees to achieve their work goals. This can be done by two methods which are promotion-focused or prevention-focused (Thian et al., 2015). Promotion-focused individuals are stimulated by growth, development and upgrade over losses whereas prevention-focused individuals are responsive to the needs and prevention of loss. The employees are encouraged to set their professional goals and share them with their supervisors and strive to work together to achieve the agreed goals. Achievement of the goals will be offered rewards by the top management which will raise the employee's motivation and reinforce employee-supervisor relationships.

CHAPTER 6: CONCLUSION

This study was able to highlight that there are perceived symptoms of depression, anxiety, stress and high mental workload faced by the employees in the organization. The statistical analysis and thorough questionnaires provided findings about the employees' reactions working in the company and indirectly revealed how it affected their performance, capabilities and emotional health. This study also provided the opportunity for the employees to voice out to their supervisors and superiors about their hidden mental health issues and their task demands which has impeded their psychological state.

Not only that, the findings also urging a call for the company to carry out an action plan to protect their employees as healthy mental wellbeing will determine a productive and sustainable business of the company. It is very imperative for all employers to bear in mind that the wellbeing of their employees is an important element under the health division. This study was able to represent minor examples of mental workload and mental health status of oil and gas workers.

However, further research is needed by expanding the coverage of the organization and excluding risk factors that are not work-related such as personal problems and prevailing medical history to ensure data reliability and validity. To date, studies specifically in the oil and gas industries in Malaysia are extremely scarce that data comparison for cases in Malaysia is hardly discussed by the researcher. Therefore, the researcher recommends that more in-depth study in various or larger organizations should be conducted comprehensively to reach data saturation to aid in policymaking of protection of the health and wellbeing of oil and gas employees.

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