Malaysian Journal of Ergonomics 2020, Vol. 2 (1): 11 – 27

ORIGINAL ARTICLE

Ergonomics Work System and Occupational Safety and Health Performance in the Manufacturing Sector.

Fatin Nur Alia Hamid[1], Mohd Nasir Selamat[2]

Pusat Kajian Psikologi dan Kesejahteraan Manusia,Universiti Kebangsaan Malaysia[1,2]

P92902@siswa.ukm.edu.my, md_nasir@ukm.edu.my[1,2]

In the era of Industrial Revolution 4.0, an ergonomic work system, occupational safety and health performance are an important element that needs to be integrated into an organisation's management strategy. These two elements are capable of increasing the productivity of the organisation, but also to provide benefits, especially in the manufacturing sector as a guideline in implementing occupational sickness and occupational stress measures. Isolated performance sparked various problems, especially from the aspect of accidents, sickness, absences and occupational stress due to lack of applications and implementation of three key elements in the organization management system. Therefore, this study is aimed to find the relationship between ergonomic work systems and occupational safety and health performance. Respondents of the study comprised 252 production operators, the centre and the support staff in five organisations in the manufacturing sector around Selangor, Negeri Sembilan and Johor. The survey method employed in this study is to administer the questionnaire form to the manufacturing company required. The measurement of these elements used questionnaires adapted from previous studies focusing on occupational sickness, occupational stress and demographic data. The results showed that the task factor and ergonomics of the machines and equipment factor had an influence on occupational sickness. Further, the task factor also affects significant occupational stress. Established along the findings obtained, this subject area is able to provide information and knowledge to employees from engaging in occupational accidents and occupational health matters. In summation, this field would also cause an impingement on the manufacturing sector in Malaysia as a guideline in building the Standard Operating Procedure (SOP) to enforce and apply ergonomic aspects at the workplace.

Keywords: Ergonomic work systems, occupational safety and health performance, manufacturing sector.

1.0 INTRODUCTION

The manufacturing sector is one of the main contributors to the Malaysian economy. Malaysian economic performance report of the third quarter of 2019 issued by the Department of Statistics Malaysia 2019 showed that the manufacturing sector contributed 4.3% to the Malaysian economy. According to the industrial master plan in Malaysia, the high contribution of the manufacturing sector is the increase in sales of electrical and electronic equipment products (13.9%), petroleum, chemistry, rubber and plastic products (6.3%), food and beverage as well as tobacco products (6.4%) (DOSM 2019). It can be seen when all the industries involved are the main components from leading

the country's equipment and requirements in fulfilling the people's survival. Established on the Department of Occupational Safety and Health, the Ministry of Human Resources submitted a total of 4070 occupational accidents which happened in the manufacturing sector until October 2019. In which, the manufacturing sector recorded the highest number of accidents compared to other sectors (DOSM 2019). A total of 59 workers died in the workplace. Meanwhile, 182 employees were suffering from permanent disability and 3829 workers were suffering from temporary disability. Workplace safety is an important aspect in ensuring the health of the workers is guaranteed when performing their duties (Selamat & Mukapit 2018; Takala 1999; WHO 2010). International Labour Organization (ILO) and World Health Organization (WHO) in 2010 reported that the manufacturing industry recorded the highest records involving accidents and destruction of equipment during production. Every 15 seconds, an employee are engaged with an accidental death or an occupational sickness (WHO 2010).

According to the statistical report on the investigation of occupational disease and poisoning issued by the Department of Occupational Safety and Health, the Ministry of Human Resources stated that a total of 537 cases were confirmed as occupational sickness. In which, the manufacturing sector recorded the highest number of accidents compared to other sectors. A total of 59 workers died in the workplace. Meanwhile, 182 employees were suffering from permanent disability and 3829 workers were suffering from temporary disability. Established on the statistics published by the Union of employees in the public service (CUEPACS), in 2017 there were 20,000 civil servants who retire early a year due to pressure in the workplace and increased in the previous year 2016, a total of 18,920 civil servants who retired earlier a year. As a result, permanent and unsolved pressure effects can have a negative impact on individuals such as safety and health problems, and the performance will be reduced (Carayon & Smith 2000). Therefore, the impingement of the stress faced by actors in the workplace can cause negligence on the safety and health of the proletarians. But also affects the reduction of productivity and therefore affecting the reliability and profit of the brass.

In fact, according to the state director of Kedah's Department of Safety and Health, this problem was attributed to the attitude of employers who only wanted to profit and caused the occurrence of the safety and health of workers on the premises on the fact that employers did not

want to spend their profits on the very important aspect of the workplace i.e. Safety and health of workers. Research in Malaysia found over 47% of workers exposed to the aspect and risk of hazards in the workplace, especially in the manufacturing sector, thus revealing workers with problems such as body health, accidents, emotional problems, employment absences and psychosocial problems (New Strait Times, September 20, 2015).

The impact of employer and organization's failure to emphasise on occupational safety and health which contributes to workers ' involvement of accidents, stress, employment absences, depression and fatigue (Annalisa, Issabelle, Els & France 2013). Hence, the importance of ergonomic work systems must be beneficial by employers and employees so that the effectiveness of the organisation can be held. Emphasis should be given to avoid problems such as the outcome of non-quality effects from the facilities that are not perfect, the tight working space causes the uncomfortable, unsupportive workload, a dangerous and unsafe working environment. Outdated technology systems would make a difficult for employees to produce a job, according to the needs of globalisation and the most visible effects are to the performance of organizations such as increased cost of organisational management (Ismail, Rani, Makhbul, Ghani, Nuawi & Zulkifli, 2008; Leigh, 1991). Therefore, the existence of appropriate ergonomic work systems and the need to be implemented in the organisation to ensure the continuity of every work activity is safe and healthy. As such, the organisation and employers need to emphasise on occupational safety and health to enhance and launch the continuity of activities in the organization.

Thus, this study is conducted to distinguish the relationship between ergonomic work systems and the operation of occupational safety and health in the manufacturing sector. Introduction to the elements of ergonomics such task factor, organisational factor, environmental ergonomic factor and machine and equipment factor are vital for companies and factories involved in production and manufacturing of products or goods.

2.0 LITERATURE REVIEW

The workplace health and wellness at work are important and if the aspect is ignored, there may be various problems that will exist. There are several dimensions such as accident, sickness,

absences and stress at work that describe the performance of occupational safety and health (Selamat & Mukapit 2018). Meanwhile, the study studied two main dimensions, namely occupational sickness and occupational stress. The implementation of safety and health at work place not only to curb problems related to safety and health while performing their duties. In fact, this implementation could avoid any threat that could occur in the workplace. Therefore, safety and health issues are important aspects in achieving optimum performance in the organization. According to Ludin (1994), safety means positive feelings of safety in the work environment. Meanwhile, Chow (1995) states that safety is a condition that prevents employees from harm, risk or harm to employees, equipment and organizational gains.

Security may also be defined as the perception by employees on tasks, feelings and approaches undertaken by the organisation to prevent danger and loss (Selamat 2016). In addition, according to the World Health of Organization (1998), health not only refers to physical, mental and social wellbeing, even health also refers to prevention of the disease and unhealthy lifestyle. Therefore, compliance with safety and health can prevent the employees from coping with any health problems and benefit the organisation. This is in line with the study of Selamat (2016), compliance with safety and health guidelines, prevent workers to be involved in the workplace safety and health issues. Where, the situation can benefit employees and organisations.

Occupational sickness is a disease of an employee due to exposure to risk factors arising from work activity (World Health of Organization 1998). Occupational sickness also involves sickness caused by exposure to risk in the workplace. For instance, an employee takes in an asthma disease effect from exposure to debris or chemicals at the work.

While the second dimension of the performance of occupational safety and health is stress. According to a pattern that is considered as a pioneer in a written report on stress i.e. Hans Seyle (1976) has established ' pressure ' as a physical response to the demand for either positive or negative demand. According to Rohany & Nor Eda (2001), stress is a normal and important matter in life. However, stress can pose a good condition and vice versa. The pressure caused a condition to become worse when the pressure disrupts a person's psychological aspect (Zafir & Fazilah 2007). Work pressure is specifically seen as a body reaction disturbing the workers ' psychology and physiology

and invites the threat of discomfort against the worker's body (He, Zhao & Archbold 2002). Therefore, the dimension of occupational sickness and occupational stress are an important aspect in ensuring the performance of occupational safety and health continues to increase.

Subsequently, the variable involved in this study is an ergonomic work system. According to Schwind (1995), ergonomics refers to the adaptation to the job or workplace through the design of tasks, workstations and equipment in the capacity and physical limits of employees. Meanwhile, ergonomics refers to the involvement of science elements in managing interaction among human activities, equipment, environment, and systems (Archer et al. 2009; Secure 2016). In addition, the work system is a systematic model in ensuring all elements interact with each other (Carayon 2009). The Work System Model also covers psychosocial, cognitive and physical aspects of work that can create psychosocial, cognitive and physical loads on individuals (Carayon 2009). Meanwhile, ergonomic work systems refer to the elements involved in impacting the workers and products produced. Ergonomic work systems focus on behavioural aspects and have elements such as task factors, individual factors and organizations (Selamat 2016). The system of ergonomics and aspect of ergonomics are leading to the same objective that is to study on the safety, health and wellbeing of the workers (Selamat 2016).

According to Scott Schneider (2000) Tasks factor include the aspect of the error in performing tasks, uncomfortable body posture, excessive workload, doing the same continuous work and external controls. An unclear task can cause employees to frequent errors that could lead to an accident. This is often the case when employees are not given early training and methods to carry out the assignments. As a result, the workers make mistakes when using the appliance without monitoring from the supervisor and cause an accident. Seats or chairs used by employees to perform their tasks have three main goals which are to increase the effectiveness of individuals, minimize fatigue and stress in the workplace, as well as adjusting body shapes (Wojcikiewicz 2003). Stress against the neck, shoulder muscles and sleeves can be minimized by using a chair that can be adjusted and has a hand-armrests (2004 Cook-to-use).

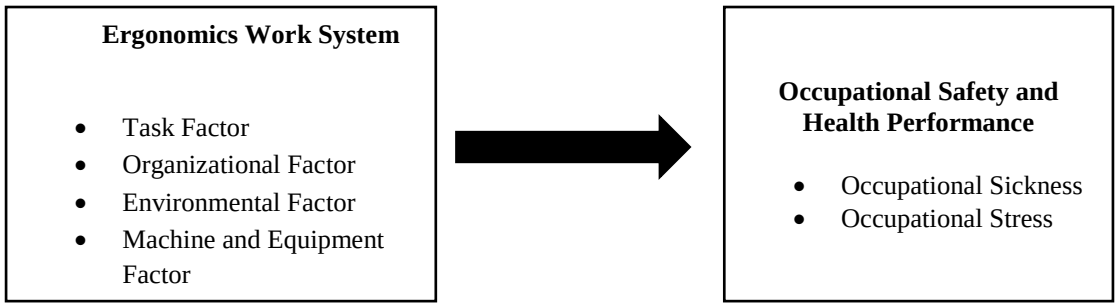
In addition, the organisation factor is also a contributing to the development of occupational safety and health performance. Organisations are an important aspect of measuring the relationship

between ergonomic aspects and occupational safety and health performance. This can be seen when an organisation accepts new technology changes and the company gives support to employees on technology reform by sending employees to undergo training and supervision directly from the supervisors on such changes. This causes employees more motivated to do jobs. Furthermore, employees will tend to be motivated and enthusiastic when the organisation provides an opportunity for career development to their employees (Smith & Carayon 1995). In addition, employee concerns on the case of disposal of the following economic issues will cause workers to be unmotivated and produce an inequality work performance. Whereas, the shift work and overtime work can cause workers to be in negative mental condition as well as a downward health performance (Monk & Tepas 1985). It is estimated 20 to 30 percent of employees does not like to work in shifts due to having difficulty to sleep (insomnia), digestive system disorders and mental functions, which ultimately leads to stress (Costa 2003). Research records that the workers' problems with OSH are less attention to an ergonomic aspect of the workplace (Kawakami & Kogi 2005; Kerr, Mc-Hugh & Mecory 2009; Selamat & Mukapit 2018). This situation causes many occupational ailments that could affect workers.

Further, the work environment could also contribute to the performance of occupational safety and health where they are causing the concentration of workers and resulting in losses because employees ' performance is declining and affects the company's productivity. The environment includes the aspect of ventilation, acoustic systems, lighting, work shift and duration of the work (Zafir et al. 2008). The environment of ergonomic workstation plays an important role in minimizing stress at work (Miles 2000; Antoniou et al. 2003; Selamat et al. 2020). Shikdar and Sawaqed (2003) noted that the environment of non-ergonomic work stations have an impact on emotional and physical stress. This means the environmental factors and poor working conditions can increase the level of individual stress (Cooper & Marshall 1976). In addition, work environment should be adapted to individuals and tasks given. This appropriateness is known as the appropriateness of the individual (person-environment fit – P-E fit). If there is a misfit between an environments with an individual, the situation can trigger a physiological effect, psychological and negative behaviour known as tension (Jamieson & Graves 1998). Will eventually affect the performance of the individual in discharging its duties at the workplace.

Furthermore, the lack of skills in the use of technology will cause employees to be unmotivated, experiencing pressure and working performance declines (Carayon & Smith 2000). The transition to technology causes workers to be stressful and less motivated to do tasks. The fear of losing work due to the replacement of the labour force to advanced machinery and technology also caused an employee to suffer pressure (Crayon & Smith 2000). In addition, the equipment at the workplace which is incomplete and unorderly, will cause employees to feel less motivated to work. The position of unstructured equipment can also cause accidents and this is often in the manufacturing sector in Malaysia. Workplace design that is not compatible with the task can cause the body's posture and uncomfortable movements that may affect the performance of the Employee (Grandjean 1969). The suitability of equipment and hardware with individuals gives the advantage that the equipment is able to maximise the performance of human resources by making the task easier and minimize the stress (East & Sood 2005). This is also supported by studies from Zafir and Fazilah (2008) as well as studies by Melissa and Selamat (2019), Nur Azreen and Selamat (2020) where machine factors and equipment have a connection with the performance of occupational safety and health. This model provides a clearer picture of the hypothesis of a study built

Figure 1: Conceptual Framework



3.0 METHODOLOGY

In this study, researchers used the design of the survey method using questionnaires that have been adapted and built. Distribution of questionnaires is implemented to collect data from the subjects of the study, and the data collected will be analysed with statistical tests. Data collection for this study is conducted around Selangor, Negeri Sembilan, and Johor. Researchers conduct studies on five organisations which are manufacturing plants in Selangor, Negeri Sembilan, and Johor to obtain

respondents who are directly involved in the production process of their company. The type of company involved in this research are Automotive and Food Company. Among the positions involved in this study were operators, and the support staff of the organisation. To implement this study, researchers have identified the affected population, the number of organisations in the manufacturing sector registered in the Malaysian company's registration, which is a total of 137,861 companies in the Malaysian manufacturing sector. Non-probability sampling is used which means not all individuals in the population have a similar opportunity to choose as a sample. This is because this study only focuses on workers directly involved with production processes such as production operators, the centre and support workers. The criteria of the sample carried by three task which the sample carry out production work directly, interact directly with machine and equipment production and monitoring the process of the products. Therefore, sampling method is intended for use and in accordance with the sample of this study.

The result of distribution of questionnaires has found that a total of 252 respondents involved in this study. The samples of the study were operators of manufacturing factories, and the support staff who worked in the involvement of machinery and equipment. The instrument comprises three main aspects of study which is the first of an ergonomic work system that includes four aspects, task factor, organisation factor, environmental factor and machinery and equipment factor and the second part, which is the performance of occupational safety and health which includes occupational sickness and occupational stress the third is the demographic of respondents. The reliability of the research, measurement tool is shown in table 1 where the reliability, value is derived based on the research, measurement tool used by past researchers in their studies. Therefore, researchers use the survey tool to be used in this study. Table 1 shown the reliability of the instrument that used in this study. Majority of the instrument have a value of reliability and it is proven based on the previous study.

Table 1: Reliability of the Instrument

Dimension	No of Item	Alfa Cornbach	Source
Occupational Safety and Health Performance			
Sickness	14	0.60	Zafir et al. (2008)
Stress	14	0.90	Jex et al. (1992)
Ergonomic Work System			
Task	18	0.74	Mathias et al.(2006)
Organizational	17	0.81	Matthew (2011)
Environmental	11	0.72	Selamat (2017)
Machine and Equipment	15	0.76	Selamat (2017)

This study used an occupational sickness questionnaire that was built by Zafir et al. (2008) which aims to view the relationship between ergonomic and stress work stations among production operators. In addition, researchers have also used an occupational stress questionnaire that was built by Jex et al. (1992) aimed at measuring the work stress among employees. The study on the task was to use questionnaires adapted by Selamat (2015) from Mathias et al. (2006). The questionnaire consists of 18 items for testing psychological pressures at the workplace. In addition, organisations that have been in ergonomics are adapted from Matthew (2011) by Selamat (2015). Finally, the machine ergonomics and the cover obtained from Selamat (2017) aimed at seeing the suitability of machinery and equipment with employee safety in the employment.

Section E in the questionnaire is used to obtain personal information on respondent of the study. The information collected is such as (age, gender, marital status, ethnic group, duration of service in the field of work, level of education and knowledge of ergonomics). This is important to assist the researchers to ensure that the respondent of the study is homogeneous or not overly different in terms of the comfort. This study uses the standards data analysis methods are widely used in this field of study. This method uses quantitative method using the Statistical Package of Social Sciences 23 (SPSS 23.0). The software is used to facilitate the researchers to respond to the more precise, fast and effective hypothesis. The value of significant levels used is at level 0.05 or at 95%.

4.0 RESULTS AND DISCUSSION

The descriptive results of this study were participated by a total of 252 respondents from various organisations. Of the total participant, a total of 159 male participants (63.1%) Female participants of 93 people (36.9%). The respondent of the respondents in this study comprises of 18 to 27 years of 116 persons (46%), followed by respondents aged 28 to 37 years, of which a total of 81 (32.1%), 38 to 47 years or as many as 33 persons (13.2%), 48 to 57 years of 20 people (7.9%) And the least of them were respondents aged in the range of 58 years above of 2 (0.8%). A single respondent is represented by 131 respondents (52%). Married respondents were represented by a total of 111 respondents (44%), while the divorced respondents were 2 (0.8%). Last but not least, the respondent represented by widower is 8 persons (3.2%). Researchers have also classified ethnicity based on major ethnic groups in Malaysia, namely ethnic Malays, Chinese and Indians. The respondents were the highest respondent in this study, with a total of 233 people (92.5%) Attended by the Chinese race of 12 people (4.8%), Indian respondent of 6 people (2.4%) and other races of 4 people (0.4%). In addition, this study also saw the aspect of employee service period in the manufacturing sector. Results showed a total of 130 people (51.5%) of the respondents had served for less than 5 years. Meanwhile, 73 people (29%) The respondent has served for 5 to 10 years, 15 (6%)

The respondent has served for 11 to 15 years of service, the respondent has served for 15 to 20 years of 15 (6%) and the end of 19 respondents (7.5%) who have served more than 21 years. Finally, researchers have also listed the category of education level owned by the respondent of the study. Researchers have listed seven categories of academic qualification, i.e. Bachelor or higher, Diploma, School of work (MCE/SPM), low secondary, primary school, professional/technical certificate and others. The findings of this study find the majority of the respondents of the study, a total of 116 people (46%) Respondents with an academic qualification (MCE/SPM) followed by 68 people (27%) respondents who possess an academic clearance at the Diploma level. Meanwhile, a total of 30 people (11.9%) The respondent has academic approvals at the bachelor's degree level or higher, respondents who possess academic qualification at the primary school of 13 people (5.2%). In addition,

respondents with a professional/technical certificate approval of 18 people (7.1%) and others were 2 persons (0.8%). Table 2 shows the demographic of the respondent.

Table 2: Demographic of the Respondent

	Domain	**Frequency**	**Percentage (%)**
Umur	18-27 years old	116	46
	28-37 years old	81	32.1
	38-47 years old	33	13.2
	48-57 years old	20	7.9
	58 years old above	2	0.8
Sex	Male	159	63.1
	Female	93	36.9
Marital Status	Single	131	52.0
	Married	111	44.0
	Divorced	2	0.8
	Widower	8	3.2
Ethnic	Malay	233	92.5
	Chinese	12	4.8
	Indian	6	2.4
	Other Races	1	.4
Service	Less than 5 years	130	51.5
	5-10 years	73	29
	11-15 years	15	6
	16-20 years	15	6
	21 years above	19	7.5
Education Level	Bachelor or higher	30	11.9
	Diploma	68	27.0
	Secondary School *(MCE/SPM)*	116	46.0
	Lower Secondary School	13	5.2
	Primary School	5	2.0
	Professional/technical certificate	18	7.1
	Others	2	.8

The reliability results according to the dimensions showed that there were dimensions that have a very strong and moderate relationship strong. The dimensions of occupational pain and occupational stress showed the reliability value of 0.882 and 0.877 where its relationship was good and received between items studied in the dimension. In the case dimensions, the reliability value is derived from the 0.787 value where the value indicates good and received. Similarly, other

dimensions such as the organizational dimension with the reliability value of 0.791 and the ergonomics of the environment are 0.790 that show good and accepted. Meanwhile, the reliability value of the ergonomic dimensions of machinery and equipment, i.e. 0.856 describes of the items are very good, effective, high consistency levels.

5.0 OCCUPATIONAL SICKNESS

The analysis results on Table 3 found that the task factor had significant relationships with occupational sickness. This is in line with the study of Safe & Mukapit (2018) where the duty dimension has an influence of significant against occupational sickness. In fact according to Shaliza et al. (2009); Zafir (2009); Zafir et al. (2013) also found that job pains were attributed to the increase in job load in the workplace. The proof of relationship can be demonstrated by the Selamat (2016) where, in order to balance the performance of employees, the task factor plays a very important role in improving occupational safety and health performance especially occupational and health stress. Meanwhile, organizational dimensions and ergonomic dimensions environment do not have significant relationships against employment sickness. However, the ergonomic dimension of machinery and equipment has a significant connection against occupational sickness. The study was supported by Grandjean (1969) when a workplace design that does not suit the task can cause a body posture and uncomfortable movements that could affect the performance of employees. In fact, this study is in line with the study by Melissa and Selamat (2019), Nur Azreen and Selamat (2020) where machine and equipment factors have a connection with the performance of occupational safety and health.

Table 3: Hierarchical Regression Analysis Results for the relationship between Ergonomic Work System and Occupational Sickness.

	Task Factor	**Organizational Factor**	**Environmental Factor**	**Machine and Equipment Factor**
(β)	.467**	-.024	-.095	-.206**
R2	.396	.409	.465	.487
F	46.519**	25.021**	22.826**	19.176**

6.0 OCCUPATIONAL STRESS

The analysis results on Table 4 found that the task dimension had significant relationships with occupational stress. The study was supported by Shaliza et al. (2009) when the load at work place increased, then stress to workers will also increase. According to a review of the Safe & Mukapit (2018) found that the task dimension had a significant relationship against occupational accidents, occupational pain and occupational stress. This is consistent with the study of Ahsan et al., (2008) and Yahaya et al., (2010) where many workload loads, high pressure and long working hours can contribute to the performance of poor occupational safety and health. In addition, organizational factor, environmental factor and the machinery and equipment factor do not have contact with occupational stress.

Table 4: Hierarchical Regression Analysis Results for the relationship between Ergonomic Work System and Occupational Stress.

	Task Factor	**Organizational Factor**	**Environmental Factor**	**Machine and Equipment Factor**
(β)	.457**	-.023	-.104	-.154
R2	.394a	.404b	.449c	.462d
F	45.967	24.305	20.914	16.743

7.0 IMPLICATIONS AND SUGGESTIONS

This study found that the task dimension had significant relationships against occupational sickness and occupational stress. This can be proven when a lot of work loads and the ambiguity of duties carried out by the production operator, the centre and support staff can affect the health issues and the workers can be involved with occupational stress problems. The information and results of the researchers allow employees in the manufacturing sector to obtain knowledge and exposure to new knowledge i.e. ergonomics work system, occupational safety and health performance. The information obtained by employees allows employees to adhere to the rules and standards of Operating Procedure (SOP) outlined by the organisation in the avoidance of engaging in occupational accidents and health issues. According to Azadeh et al. (2011) an effective ergonomic application in

system design can cause an employee's characteristic balance and task requirements. The emphasis and ergonomic applications at work can have a positive impact on the organisation. In which, employees will be less involved in occupational accidents and health issues and thus increasing productivity and profit for the organization. In addition, the sharing of information to the organisation is able to reduce the cost of organisational expenses for occupational safety and health training.

This is because employees have been equipped with the knowledge and application of measures in handling accidents in the workplace. In addition, the third implications of this study can be used by the manufacturing sector in Malaysia as a guideline in building the Standard Operating Procedure (SOP) organization in the production division. This are due to the production sector, the highest sector to record accidents in the workplace, which amounted to 4,070 cases in 2019 compared to other sectors. Therefore, the result of this study could contribute to the organisation guidelines in the Production division as a step to address occupational accidents and problems related to occupational safety and health.

8.0 CONCLUSION

In conclusion, this study is aimed to find the relationship between ergonomic work systems and occupational safety and health performance. Respondents of the study comprised 252 production operators, the centre and the support staff in five organisations in the manufacturing sector around Selangor, Negeri Sembilan and Johor. The survey method used in this study is to administer the questionnaire form to the manufacturing company required. The results showed that the task factor and ergonomics of the machines and equipment factor had an influence on occupational sickness. Further, the task factor also affects significant occupational stress. Established along the findings obtained, this subject area is able to provide information and knowledge to employees from engaging in occupational accidents and occupational health matters. In summation, this field would also cause an impingement on the manufacturing sector in Malaysia as a guideline in building the Standard Operating Procedure (SOP) to enforce and apply ergonomic aspects at the workplace.

Finally, the research also strengthens the benefits brought by the ergonomics work system in improving occupational safety and health performance. Therefore, this study supports ergonomic aspects to be applied and practiced in the manufacturing sector on the purpose of building a safe and vulnerable working environment from any risk of occupational accidents, occupational illness and occupational stress. In addition, this study confirms that the test tools used are able to gauge the instruments surveyed and can be used in the context of Malaysia. For the future, this research can be continue by using the mix method which include survey using a questionnaire and experiment about the aspect of ergonomic that been apply at the machine and equipment in the company.

REFERENCE

(1) Annalisa C., Isabelle, G. & Els, C. 2013. Women's Adverse Conditions on the Labour Market as Key Factor for the Gender Absenteeism Gap. *Psychology & Health* 28: 36-36.

(2) Antoniou, A. S. G., Davidson, M. J. & Cooper, C. L. 2003. Occupational Stress, Job Satisfaction and Health State in Male and Female Junior Hospital Doctors in Greece. *Journal of Managerial Psychology*, 18(6), 592–621.

(3) Archer, D., Eby, M., Brovkin, V., Ridgwell, A., Cao, L., Mikolajewicz, U., Caldeira, K., Matsumoto, K., Munhoven, G., Montenegro, A. & Tokos, K. 2009. Atmospheric Lifetime of Fossil Fuel Carbon Dioxide. *Annual Review of Earthand Planetary Sciences*, 37(1), 117–134.

(4) Azadeh A., Moghaddam M., Asadzadeh S. & Negahban A. 2011. An Integrated FuzzySimulation-Fuzzy Data Envelopment Analysis Algorithm for Job-Shop Layout Optimization: The Case of Injection Process with Ambiguous Data. *European Journal of Operational Research* 214(3), 768-779.

(5) Carayon, P. 2006. Human Factors of Complex Sociotechnical Systems. *Applied Ergonomics* 37: 525-535.

(6) Carayon, P. 2009. The Balance Theory and the Work System Model. Twenty Years Later. *International. Journal of Human–Computer Interaction* 25(5): 313-327.

(7) Carayon, P. & Lim, S. Y. 1999. *Psychosocial Work Factor*. The Occupational Ergonomics and Handbook. CRC Press Bota Raton, FL: 275-283.

(8) Carayon, P. & Smith, M. J. 2000. Work Organization and Ergonomics. *Applied Ergonomics* 31: 649–662.

(9) Chow J.C. (1995). Measurement Methods to Determine Compliance with Ambient Air Quality Standards for Suspended Particles. *Journal of Air & Waste Management Association* 45(5): 320-382.

(10) Cook, B. I., Mann, M. E., D'Odorico, P. & Smith, T. M. 2004. Statistical Simulation of the Influence of the NAO on European Winter Surface

(11) Temperatures: Applications to Phonological Modelling. *Journal of Geophysical Research D: Atmospheres* 109(16).

(12) Cooper, C. L. & Marshall, J. 1976. Occupational Sources of Stress: A Review. *Journal of Occupational Psychology* 49(1): 11–28.

(13) Costa, A. C. 2003. Work Team Trust and Effectiveness. *Personnel Review* 32(5): 622-672.

(14) Cox, T. (1985). *Repetitive Work*. Occupational Stress and Health. John Wiley and Sons, New York 85-112.

(15) Gyekye 2005. Workers' Perceptions of Workplace Safety and Job Satisfaction. *International Journal of Occupational Safety and Ergonomics* 11(3): 291–302.

(16) He, N., Zhao, J. & Archbold, C. A. 2002. Gender and Police Stress: The Convergent and Divergent Impact of Work Environment, Work-Family Conflict, and Stress Coping Mechanisms of Female and Male Police Officers. *Policing*, 25(4): 687–708.
(17) International Labour Organization [ILO]. 1996. Your health and safety at work; A Collection of Modules. *Ergonomic*. Geneva Switzerland: ILO.
(18) Ismail, A. R., Rani, M. R. A., Makhbul, Z. K. M., Ghani, J. A., Nuawi, M. & Zulkifli, R. (2008). Optimum Solution of Environmental Factors towards Productivity Improvement Using Taguchi Method. International Conference on Energy, *Environment, Ecosystems and Sustainable Development* June 347–352.
(19) Jex, S. T. J., Terry, B. A. & Cathlyn, R. K. 1992. The Meaning of Occupational Stress Items to Survey Respondents. *Journal of Applied Psychology* 77(5): 623-628.
(20) Jia Wern, M. K., & Selamat, M. N. 2019.Sistem Kerja Ergonomik dan Prestasi Keselamatan dan Kesihatan Pekerjaan dalam Industri Pembuatan di Klang, Selangor. *Jurnal Wacana Sarjana 3*(1): 1-14.
(21) Kawakami, T. & Kogi, K. 2005. Ergonomics Support for Local Initiative in Improving Safety and Health at Work: International Labour Organization Experiences in Industrially Developing Countries. *Ergonomics* 48(5): 581–590.
(22) Kerr, R., McHugh, M., & McCrory, M. 2009. HSE Management Standards and Stress Related Work Outcomes. *Occupational Medicine* 59(8): 574–579.
(23) Malaysia. 1969. Akta Keselamatan Sosial Pekerja.
(24) Malaysia. 2017. Akta Keselamatan Sosial Pekerjaan Sendiri (Akta 789).
(25) Malaysia. 2017. Akta Sistem Insurans Pekerjaan (Akta 800).
(26) Malaysia. 2019. Laporan Prestasi Ekonomi Malaysia Suku Tahun Ketiga 2019.
(27) Matthews, M. W. 2011. A Current Review of Empirical Procedures of Remote Sensing in Inland and Near-Coastal Transitional Waters. *International Journal of Remote Sensing* 32(21): 1-45.
(28) Matthias, N., Ulrich, S., Hans-Martin, H., Martina, M. & Friedrich, H. 2006. *Measuring Psychological Stress and Strain at Work: Evaluation of the COPSOQ Questionnaire in Germany*. GMS Psycho-Social-Medicine 3.
(29) Metin, B. & Mustafa, C. U. 2018. *The Relationship between OSH Prevention Costs, OHSMS Practices, Employess Satisfaction, OHS Performance and Accident Costs*. Total Quality Management & Business Excellence.
(30) Miles, R. H. 1976. Roles requirements as sources of organizational stress. *Journal of Applied Psychology* 61: 172 – 179.
(31) Monk, T. H. & Tepas, D. I. 1985. *Job Stress and Blue Collar Work*. Wiley. New York 65-84.
(32) Nur Azreen Binti Rahman, Mohd Nasir Selamat. 2020. Sistem Kerja Ergonomik Prestasi Keselamatan dan Kesihatan Pekerjaan di Industri Pembuatan Malaysia. *Jurnal Wacana Sarjana* 1-10.
(33) Pallant, J. 2016. SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS 6th Ed. England: Open Univeristy Press.
(34) Rohany Nasir & Nor Eda Nusi. 2001. Tekanan Kerja, Tekanan Rumahtangga dan Komitmen Kerjaya di Kalangan Pegawai Wanita Polis Di Raja Malaysia. *Jurnal Psikologi*. Universiti Kebangsaan Malaysia.Selangor.
(35) Selamat, M. N. & Mukapit. M. 2018. The Relationship between Task Factors and Occupational Safety and Health (OSH) Performance in the Printing Industry. *Jurnal Sains Sosial dan Kemanusiaan Asia Tenggara* 88(3): 65–76.
(36) Selamat, Mohd. Nasir. 2013. The Determinant of OSH Performance: A Study on Ergonomic Work System. *Journal Occupational Environmental Medicine* 70.
(37) Selamat, Mohd. Nasir. 2016. Ergonomic Work System and Occupational Safety and Health Performance: Mediating Effect of Psychosocial Work Factor. Ph.D Thesis, Malaysia Universiti Sains Malaysia. Penang.
(38) Shaliza Azreen Mustafa. 2007. Aplikasi Ergonomik dalam Sistem Kerja untuk Kesejahteraan Motivasi Pekerja Menggunakan Terminal Paparan Visual. (Tesis Sarjana, Universiti Sains Malaysia).

(39) Shaliza Azreen Mustafa, Shahrul Kamaruddin, Zalinda Othman & Mohzani Mokhtar.2009. The Effect of Ergonomics Applications in Work System on Mental Health of Visual Display Terminal Workers. *European Journal of Scientific Research* 31: 341-354.
(40) Smith, M. J. & Carayon-Sainfort, P. 1989. A balance theory of job design for stress reduction. *International Journal of Industrial Ergonomics* 4(1), 67–79. Spiro Business Guides.
(41) Takala, J. 1999. Global Estimates of Fatal Occupational Accidents. *Fatal Occupational Accidents* 640-646.
(42) WHO. 1998. The World Health Report. Life in the 21st Century, A Vision for All.
(43) WHO. 2010. Progress on the Health-Related Millennium Development Goals.
(44) Wojcikiewicz, K. 2003. Seven Key Factors for Ergonomic Workstation Design. *Manufacturing Engineering* 131(1): 45.
(45) Zafir Mohamed Makhbul & Fazilah Mohd Hasun. 2007. Ergonomik dan stres di Malaysia: Implikasi Terhadap Teori, Metodologi dan Pengurusan. *Jurnal Pengurusan,* 26: 99-130