ORIGINAL ARTICLE

The Relationship Between Safety Culture Maturity and Mental Health among Workers in Automotive Industry

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ABSTRACT

Introduction: The present study aims to investigate the relationship between the level of safety culture maturity, socio-demographic characteristics and occupational information with mental health among automotive workers. **Methods:** This cross-sectional study was conducted among automotive workers. A Safety Culture Assessment Tools (SASTO) questionnaire was used to measure the safety culture maturity level while Depression Anxiety Stress Scale (DASS)-21 was used to measure the level of depression, anxiety, and stress. Convenience sampling method was used to distribute the questionnaires to 18 automotive industry companies in Malaysia. There were 224 completed questionnaires. **Result:** Result showed that on average the companies have moderate level of safety culture which indicates calculative level. More than half of the respondents reported to have mild to extremely level of severe depression, anxiety, and stress. Small percentage of respondents having severe to extremely severe depression (9.9%), anxiety (18.7%) and stress (1.8%). None of the socio-demographic and occupation information parameters were found to be statistically significantly associated with depression and stress. There were significant association between age, position at work, and working experience and anxiety. Working experience has the strongest association with anxiety. The safety culture has no relationship with depression, anxiety, and stress. **Conclusion:** The level of depression, anxiety and stress were high among respondents, therefore it is important to create a balance job demands and occupational skills to improve the workers mental health. Also, Improvement strategies are needed to improve safety culture to a higher level.
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INTRODUCTION

According to an ILO analysis on Occupational Safety and Health (OSH), 2.78 million employees die each year from workplace accidents and diseases, of which 2.4 million are disease-related, and an additional 374 million employees suffer from non-fatal occupational accidents (1). U.S. Department of Labour reported that there are 2.7 million workers to have work-related diseases and injuries in 2020. According to Abdalla (2) a substantial majority of workplace accidents occurred due to a lack of work-place safety awareness. In Malaysia, the total number of occupational injuries from all sectors reported are 32,674 in 2020. It is reported that manufacturing industries have highest accident rate among other industries which is 10,303 injuries (3). Although there is a reduction in fatality and occupational injury cases in the manufacturing sector in Malaysia compared to 2019, a lot more needs to be done to achieve the goal of Occupational Safety and Health Master Plan 2025 (OSHMP25) which is to enhance safe and healthy working culture (4).

The term safety culture refers a combination of the attitudes, values, and perceptions that influence how something is done in the workplace, rather than how it should be done (5). There are a lot of things that influences the culture within the organization, and it needs to be embraced and practiced by every-one in an organization including the employers. According to the International Atomic Energy Agency (IEAA) the Chernobyl accident was caused by "deficient of safety culture at Chernobyl throughout the Soviet design, operating and regulatory organization" (6). INSAG defined the terms of safety culture as obligated rules that should exist at a nuclear plant. The accident occurred due to the flaws in operating of nuclear power plant without proper inspection of safety and the employees are not competent enough in the finding of safety analysis. The IEAA, defines safety culture as "that collection of qualities and attitudes in organizations and individuals that established that, as an overriding priority, nuclear plant safety issues receive the attention

required by their significance." The importance of a framework within an organisation and management accountability are two of the elements of safety culture that have been established by the IAEA. Second, the way employees at all levels responded to and benefited from the framework.

Safety culture may influence mental health of workers because a better safety culture is always related to a safer workplace and workers normally feel more secured and protected in a safe work environment. However, studies that looking into the relationship between safety culture and mental health is very limited. This relationship is shown in a study made in Iran among workers in oil and gas industries where there was a significant relationship between safety culture and mental load, which is significantly correlated with work stress (7). The researchers explained that when mental workload is high, the work performance is decreased which leads to likelihood of work accidents. Similarly in another study in USA, it was found that healthcare workers with higher level of burnout had lower level of safety culture dimensions which are the teamwork climate and safety climate (8). Profit et al. postulated that safety culture is important to predict care quality. When healthcare workers are having better mental health and well-being, they may be more aware of the potential safety hazards and more alert of their patients' and families' needs (8).

As in Malaysia, it is a rapidly developing country hence, the work expectation in industries is rising which may increase mental health issues among workers. In automotive industry itself, the National Automotive Policy 2020 (NAP 2020) has targeted 323,000 of total job opportunities in 2030 (9). Anxiety and depression are the most prevalent mental health issues that can happen to an individual. Malaysia's National Health and Morbidity Survey 2019 revealed that half a million Malaysian had depression. (10). The question on how mental health is related to safety culture in Malaysia have yet caught the attention of researchers. Therefore, this study aims to investigate this relationship to filling in the existing knowledge gap. Knowledge gain from this research might help in reducing the issues on mental health among Malaysian workers in the perspective of safety culture.

MATERIALS AND METHODS

Study design, study location and sampling
Quantitative research design was used to examine the relationship between sociodemographic data, safety culture maturity, and mental health of the workers in the automotive industry. The study design used in this study is cross-sectional study. A convenience sampling method was used to recruit a minimum requirement of 222 respondents. The respondents were Malaysian and above 18 years old. The total number of employees

was not provided by the companies. In this study, convenience sampling method was conducted by online survey and every respondent. It was applied by approaching any individuals to answer the questionnaire in google form. The respondents were invited through networking websites such as LinkedIn and WhatsApp and to any individuals who was known in person. Those who have been clinically diagnosed by the professional on mental health problem such as depression, anxiety, or other psychological diseases were excluded for data analysis. Each participant gave their informed consent prior to participating the research. The study's participation was completely voluntary. The confidentiality of their data is being maintained.

Instrumentation and Data Collection
Self-administered questionnaires were used for this study. The survey was distributed through social media platform as LinkedIn and WhatsApp. Respondents were allowed to choose their preferable language either Bahasa Melayu or English. Safety Culture Assessment Tool (SASTO) was developed for the survey. It contains Section A and Section B. Section A required workers' information on socio-demographic and occupation information while Section B consists of safety culture questions with three different aspects. The aspects are psychological, behavioural, and situational. The level of safety culture in this study is determined by rounding off the mean value of each dimension. The level of safety culture is adapted from Hudson's Model (11), where level 1 (pathological level), level 2 (reaction level), level 3 (calculative level), level 4 (proactive level), and level 5 (generative level). Each level has distinct characteristics and is a progression from the previous level. The internal reliability for SASTO was assessed by using Cronbach's Alpha. The internal reliability is 81.9%.

The Depression, Anxiety, and Stress Scale 21 (DASS)-21 was used to measure mental health status of respondents. Lovibond and Lovibond created the DASS questionnaire to assess the main signs of de-pression, anxiety, and stress (12). In this questionnaire, each item is scored on a 4-point Likert scale that ranged from 0 ("Never") to 3 ("Almost always"). Cronbach's Alpha was used to assess the internal re-liability. The internal reliability for DASS-21 is 0.930. The scores for depression, anxiety, and stress are calculated using the sum of scores for each item. Then the scores for each subscale on the DASS-21 was multiplied by 2 to get the overall score. For depression, the score is categorised as normal (0-9), mild (10-12), moderate (13-20), severe (21-27), and extremely severe (28-42). Anxiety score is categorised into normal (0-6), mild (7-9), moderate (10-14), severe (15-19), and extremely severe (20-42) for anxiety. Meanwhile, the score for stress is categorised as normal (0-10), mild (11-18), moderate (19-26), severe (27-34), and

extremely severe (35-42) (12).

Statistical analyses

Microsoft Excel 2016 was used to key in all data while IBM SPSS version 27.0 was used for analysis. Descriptive statistics of frequency and percentage were analyzed for socio-demographic and occupation information distribution and level of mental health. Meanwhile, the safety culture maturity was analyzed by calculating the mean and standard deviation of each dimension of the safety culture. Associations between socio-demographic and occupation information with mental health were studied using Chi-square. The p-value that shows $p<0.05$ (two-tailed) was considered significant.

In this study, the five levels of DASS-21 score were classified into two groups which is normal to mild and moderate to extremely severe. Next, the relationship between safety culture and mental health were identified by using Spearman's Rank-Order Correlation, r. The normal distribution of data was not found when the normality tests (Kalmogorov-Smirnov and Shapiro Wilk) were performed. Therefore, non-parametric statistics were used. Spearman correlation analyses were performed to determine the correlation between safety culture maturity and mental health of the respondents, considering a 95% confidence interval. The effect size test was conducted while considering the Z/N calculation (by pairs), and the statistically significant results were based on the null or minimal effect size (r) (values 0.00-0.10), weak (0.11-0.25), moderate (0.30-0.49), and strong (0.50) (13). The correlation's strength was categorised as being either weak (less than 0.3), moderate (0.3 to 0.59), high (0.60 to 0.99), or perfect (1.0).

Ethical Consideration

For this research paper, ethical issues were submitted for approval by the Ethic Committee for Research Involving Human Subject (JKEUPM) prior to data collection. Data collection started as ethical approval received from JKEUPM (JKEUPM-2022-389). Next, a clarification was given to the respondents, and they had ample time to consider whether to participate. If the respondent agreed to do so, they were provided written permission to receive their signature as approval. Details about the respondent were strictly controlled and confidential in a secure manner.

RESULTS

Response rate and sociodemographic background

The response rate of this study is 100% as this research was able to obtain required number of respondents. Data of 224 respondents was analyzed. Table I shows the sociodemographic and occupation information distribution. Descriptive analysis was used to reproduce the collected data in terms of frequency and counts to draw out the demographic features of the respondents concerning their gender, age, education level, working experience, automotive sector division, work position, and accident experience throughout their life. The 18 automotive industry companies involved were classified into three sector division.

Safety culture among respondents

In this study, there are three different aspects under safety culture such as psychological aspect, behavioural aspect, and situational aspect. The scoring method of SASTO questionnaire was adopted from Hudson's Model that consists of five level of safety culture maturity. Level 1 and level 2 shows poor safety culture while level 4 and level 5 are strong safety culture. Meanwhile, level 3 which is calculative level shows moderate safety culture. The overall mean score of safety culture maturity level among respondents was 3.4876 which indicated that the level of safety culture was at calculative level which is in moderate level. The safety culture for each of the three aspects is at calculative level and the situational aspect recorded the highest mean score. See table II.

The Level of Depression, Anxiety, and Stress

Table III shows the level of depression, anxiety, and stress of the respondents. More than half of the respondents reported to have mild to extremely level of severe depression, anxiety, and stress. Small percentage of respondents having severe to extremely severe depression (9.9%), anxiety (18.7%) and stress (1.8%). See Table III for more detail.

The Association Between Socio-Demographic and Occupation Information with Mental Health

In this study, some of the categories in certain variables were combined to ensure 80% of the expected counts is more than 5. For instance, the five level of mental health were classified into two groups which is normal to mild and moderate to extremely severe. Next, the categories for education level also combined into four categories which is SPM/STPM, Diploma, Degree and above, and others for the same reason. Meanwhile, working experience categories were classified into less than 10 years, 11-20 years, and 20 years and above. The result of chi-square test shows that none of the sociodemographic and occupation information were significantly associated with depression and stress. Meanwhile for anxiety, age (p=0.043), working experience (p=0.028), and work position (p=0.022) were all found to be statistically significantly.

The Relationship Between Safety Culture Maturity and Mental Health Among Respondents

Spearman's rank correlation test was used to determine the correlation between safety culture maturity and mental health among the respondents. Results found that safety culture was not correlated with all three

Table I : Socio-demographic and Occupation Information (N=224)

Parameter		Frequency	Percent (%)
Gender	Male	137	61.2
	Female	87	38.8
Age	18 – 25 years old	64	28.6
	26 – 55 years old	151	67.4
	>56 years old	9	4.0
Education Level	SPM/STPM	40	17.9
	Diploma	53	23.7
	Degree	87	38.8
	Master and above	23	10.3
	Others	21	9.4
Working Experience	<1 year	36	16.1
	1 – 5 years	66	29.5
	5 – 10 years	31	13.8
	11 – 15 years	33	14.7
	16 – 20 years	26	11.6
	21 – 25 years	18	8.0
	>26 years	14	6.3
Automotive Sector Division	DRB-HICOM Distribution	108	48.2
	DRB-HICOM Manufacturing & Engineering	73	32.6
	DRB-HICOM Defence	43	19.2
Work Position	Non-executive	110	49.1
	SG1 – SG4	62	27.7
	SG5 – SG8	39	17.4
	SG9 and above	13	5.8
Accident Experience	Have experience	39	17.4
	No experience	185	82.6

Table II : Level of safety culture (N=224)

Safety Culture	Mean	Standard Deviation
Overall Safety Culture	3.4876	0.62947
Psychological Aspect	3.2972	0.71400
Behavioural Aspect	3.5779	0.80370
Situational Aspect	3.5876	0.76388

Level of Safety Culture:

1 – Pathological Level, 2 – Reaction Level, 3 – Calculative Level, 4 – Proactive Level, 5 – Generative Level

dimensions of mental health, depression, anxiety and stress.

DISCUSSION

The main objective of this study is to determine the relationship between sociodemographic data, safety culture maturity, and mental health among workers in automotive industry.

Sociodemographic And Occupation Information Distribution Among Respondents

Most of the respondents enrolled in this study were male (61.2%). Meanwhile, most of the respondents

Table III : Level of Depression, Anxiety, and Stress based on DASS-21 Score (N=224)

Mental Health	Frequency	Percent (%)
Depression		
Normal	102	45.5
Mild	61	27.2
Moderate	49	21.9
Severe	10	4.5
Extremely Severe	2	0.9
Anxiety		
Normal	74	33.0
Mild	27	12.1
Moderate	82	36.6
Severe	26	11.6
Extremely Severe	15	6.7
Stress		
Normal	111	49.6
Mild	92	41.1
Moderate	17	7.6
Severe	4	1.8
Extremely Severe	0	0

Table IV : Association between Sociodemographic and Occupation Information with Anxiety (N=224)

Sociodemographic & Occupation Information	Total number n (%)	Anxiety n (%)		x^2	p-value
		Normal to Mild	Moderate to Extremely Severe		
Gender				0.114^a	0.735
Male	137 (61.2)	63 (28.1)	74 (33.0)		
Female	87 (38.8)	38 (17.0)	49 (21.9)		
Age				6.277^a	*0.043
18 – 25 years old	64 (28.6)	23 (10.3)	41 (18.3)		
26 – 55 years old	151 (67.4)	71 (31.7)	80 (35.7)		
>56 years old	9 (4.0)	7 (3.1)	2 (0.9)		
Education Level				5.796^a	0.122
SPM/ STPM	40 (17.9)	23 (10.3)	17 (17.6)		
Diploma	53 (23.7)	19 (8.5)	34 (15.2)		
Degree and above	110 (49.1)	47 (21.0)	63 (28.1)		
Others	21 (9.4)	12 (5.4)	9 (4.0)		
Working Experience				7.151^a	*0.028
<10 year	133 (59.4)	51 (22.8)	82 (36.6)		
11-20 years	59 (26.3)	30 (13.4)	29 (17.4)		
>20 years	32 (14.3)	20 (8.9)	12 (5.4)		
Sector Division				0.097^a	0.952
Automotive Distribution	108 (48.2)	48 (21.4)	60 (26.8)		
Manufacturing & Engineering	73 (32.6)	34 (15.2)	39 (17.4)		
Defense	43 (19.2)	19 (8.5)	24 (10.7)		
Work Position				9.678^a	*0.022
Non-executive	110 (49.1)	47 (21.0)	63 (28.1)		
SG1-SG4	62 (27.7)	24 (1.07)	38 (17.0)		
SG5-SG8	39 (17.4)	19 (8.5)	20 (8.9)		
>SG9	13 (5.8)	11 (4.9)	2 (0.9)		
Accident Experience				0.731^a	0.392
Yes	39 (17.4)	20 (8.9)	19 (8.5)		
No	185 (82.6)	81 (36.2)	104 (46.4)		

[a] = Pearson Chi Square, *p-value is significant at $p<0.05$

were aged 26 – 55 years old (67.4%) which indicates the age group who is in their prime working lives (14). In 2019, about a 11.34 million people aged 25 – 54 years old were employed in Malaysia. In the present study, majority of the respondents (38.8%) also come from people who are degree holders. However, most employed persons in 2019 have secondary education which includes degree. Therefore, the respondents had higher education level than the Malaysia general population.

Safety Culture Among Respondents
The overall safety culture shows that the level of safety culture in the workplace is calculative level, which is moderate safety culture. This indicates that the organisation has a system for risk management but still primarily driven by the management. This is aligned with a previous finding (15) which also showed a safety culture maturity level of the company in that study was calculative level. They also agreed that top management is extremely important to improve safety culture in an organisation with the calculative level of safety culture. However, the respondents involved in that study was oil and gas workers which the job scopes in that field are different with automotive industry workers. The hazards exposed in oil and gas industry are also far more danger than automotive industry. Hence, it is more challenging to control. Furthermore, the result of overall safety culture in the current study is also aligned with another previous study in the healthcare organisation. The study used Fleming's Safety Culture Model. It showed that majority of the responses reflected bureaucratic level of safety culture which also indicates moderate level of safety culture, similar as calculative level in Hudson's Safety Culture Model (16).

The Severity Level of Depression, Anxiety, And Stress Among Respondents
Results shows that more than half of the respondents reported to have mild to moderate level of de-pression, anxiety and stress. Similar findings were found in the study among 2041 manufacturing workers in Malaysia, Indonesia and Thailand (17). However, the level of anxiety among respondents in the present study was higher which may relate to the increasing workplace demands of automotive industry to meet the National Automotive Policy 2020 (NAP2020) where workers continue to keep up with the target. Higher work demand has consistently found to be associated with mental health among workers (18) and in male dominated industries in particular (19).

The Association Between Sociodemographic and Occupation Information with Mental Health
From the present study, it is clearly depicted that sociodemographic and occupation information does not significantly associate with mental health among respondents except for anxiety. Gender, age, education level, working experience, sector division, and accident experience has not influenced the presence of depression and stress among respondents. Results showed that there was significant association between age and anxiety. The respondents of 26 – 54 years old had higher self-rated anxiety scores than the other age groups. This is aligned with a previous study that showed ageism were positively related with anxiety symptoms (20). Other than that, based on another study, it also had found that there was association between age and mental health among industrial workers in southern India (21). Among middle-aged adults and older age, anxiety becomes more prevalent. This could be driven on by a number of factors, including aging-related changes in the brain and nervous system and a higher propensity to experience stressful life situations that could bring on anxiety (22). Meanwhile, it is contradicted with another previous study which showed that there were considerably fewer cases of any current anxiety problem and any lifetime anxiety disorder in older people, even after adjusting for relevant demographic and clinical factors (23). However, the study population on that study was major depressive disorder with psychotic features patients. Meanwhile, in this current study, person who were diagnosed with any mental health disorder were excluded.

Next, results of the present study found that there was also association between working experience and anxiety among respondents in this study. Contrary to findings from a previous study, which found that the number of years of employment and the symptomatic anxiety score were statistically insignificant (24). The contradicted result from the current study shows that the automotive industry workers might experience overworking in the organisation whereas it can lead to burnout and consequently anxiety. It is important to note that working experience have negative effect on their mental health. Hence, more approaches need to be done by the organisation to improve workers' mental health.

Nonetheless, according to Rao & Ramesh (24), the study result shows the association between work position and anxiety among the respondents (p=0.022). Higher work position indicated that they have higher income. A prior study revealed a strong correlation between income level, living pressure, and sleep duration (25). Both living pressure and sleep duration are shown to be the predictors to anxiety problem (26). Other than that, another previous study also revealed that shorter sleep was more common among those with lower incomes (27).

The Relationship Between Safety Culture Maturity and Mental Health Among Respondents
The current study showed that there was no relationship between safety culture maturity with

mental health among respondents. Similar findings were found in oil and gas industries (7). Though, the work ambient of oil and gas industries is riskier than that of automotive industries which may explain the discrepancy of the results. These finding is contradicted with a previous study which suggested that safety attitudes were significantly associated with psychological outcomes including burnout, anxiety, and depression (28). It was unclear whether low safety attitudes are a cause of burnout, anxiety, or de-pression, or if these mental health issues cause bad safety attitudes. However, safety attitude is not the same as safety culture. It is a part of safety culture which has broader scopes and several more dimensions. Furthermore, a study in Iran among workers in telecom industries found significant relationship between work stress and safety culture in such a way that workers with higher work stress had lower safety culture compared to those of lower work stress. (29). In this study the level of the prevalence of those with high stress level was very high (76.7%) which is so different compared with that found in the present study.

CONCLUSION

In conclusion, the safety culture of the respondents was at calculative level. Moreover, every aspect that is under safety culture such as psychological aspect (3.2972), behavioural aspect (3.5779), and situational aspect (3.5876) is also at calculative level. The calculative level means that the safety is still primarily driven by management and imposed rather than looked for by the workforce. At this level, management focus only on numbers and systems with lots of data collection and audit although evidence on the benefits of the numbers and system on improving safety behaviour is unclear. Every person in an organization must take a role in improving safety culture maturity despite of their work position. Safe-ty-related concepts need to be fully internalized by the organization, rather than only concentrating on the perceptions of employees. Consequently, it would improve the job performance and help in meeting the job demands. Meanwhile, more than half of the respondents had mild to extremely severe level of depression, stress and anxiety. Other than that, only age, working experience, and work position had been found to be associated with anxiety. All socio-demographic and occupation information parameters are not statistically significant associated to depression and stress. It is important to create a balance job demands and occupational skills to improve the workers wellness and wellbeing. Other than that, the organization also should give more awareness on mental health as recommended by WHO to reduce mental health problems in the future. Also, there was no relationship between safety culture maturity and mental health. These findings are in contrary with most of the existing literature. Since most of the available studies are from other countries, therefore more local studies are needed to further explore on this matter for better insight. Moreover, the main limitation of the present study is that findings of the present study cannot be generalized to other working population in Malaysia. Thus, it is worth for the future studies to be done across other working population group.

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