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AN EXPLORATORY FACTOR ANALYSIS OF FACTORS AFFECTING SAFETY PERFORMANCE IN MALAYSIAN PARAMEDIC TRAINING INSTITUTES

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Abstract

Safety performance at the government paramedic training institution includes determining what elements might impact the improvement of safety performance and contribute to a preventive safety culture inside the institute. This research intends to investigate and identify the elements that impact safety performance at the Malaysian paramedic training institution. By examining the literature, many elements that affect safety performance have been identified as having a global impact. Using survey questionnaires, exploratory factor analysis (EFA) was used for dimension reduction, and five clustering components of the 48 indicators were identified and discussed. The five factors were management commitment, safety system, risk management, safety competency, and workers' involvement in safety. It was discovered that these factors substantially affect the safety performance of paramedic training institutions in Malaysia. The findings of this research will aid paramedic training institutes in boosting their safety performance, hence creating a safer work environment for employees with fewer hazards and accidents.

Keywords: Safety performance, Safety climate, Safety culture, Malaysian paramedic training institute, Exploratory factor analysis

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Introduction

The educational institutions known as paramedic training institutes provide paramedic training courses to train students with the skills and information, they need to become capable and efficient paramedics. The training is either provided by the government sector as well as the private sector. In the public sector and governmental agencies, safety performance may be subpar. The Ministry of Health Malaysia's paramedic training institution documented 17 in-house events in 2018 which may lead to absenteeism, weaken employee confidence in their capacity to operate successfully, and negatively impact employees' quality of life (Noor Arzahan et al., 2022). According to the Department of Occupational, Safety and Health Malaysia (DOSH) annual report from 2017 to 2020, the number of reported workplace accidents increased by 64 percent from 47 to 77 in the last year for the public service sector (DOSH, 2021). Many negative repercussions, such as a high frequency of workplace mishaps, are a reflection of low or inadequate safety performance (Atak & Kingma, 2011; Fogarty & Shaw, 2010). Hence, safety performance may be focused on to help reducing risk in the training institute or the government agencies in general.

To design a solution that may improve safety performance in certain situations, the solution must be broken down into constituent parts. Imagine we are discussing historical safety performance studies and ideas. In such circumstances, the safety climate component is often stressed due to its vital role in enhancing safety performance. This rationale is the justification for doing this investigation. In order to improve safety performance, researchers may utilize the results of this study to analyze factors or

variables from the safety climate indicators, which include safety management, risk management, safety system, and safety competence for the Public Services and statutory authorities' sector, such as paramedic training institutes. Furthermore, the OSHMP 2020-2025 plan (DOSH, 2021) emphasizes the importance of safety competency through enhancing tripartite (government, employer, and employee) competence in occupational safety and health (OSH) management. However, compared to related factors such as safety knowledge and intention, this element has received less attention as a mediator in previous studies on safety climate and performance (Amirah et al., 2017; Ismara et al., 2019; Mashia et al, 2016).

Understanding the elements impacting the improvement of safety performance will contribute to a preventive safety culture inside the institute. It will serve as a guide for stakeholders, such as the students who will be the future workforce in the healthcare industry, and assist institutes in enhancing their safety profile and creating a safe working environment for their workers. The current research is to investigate and identify the elements impacting this safety performance in the paramedic training institute. By exploratory factor analysis, it will also extract the components from the found influential factors. As a result, it will present a range of recommendations for improving safety performance.

Methods

Data Collection

This study's data was compiled in two phases: (1) a review of the relevant literature, and (2) a survey of the relevant population. A literature study was conducted to determine what variables affect safety performance and culture in training institutes. Researchers also reviewed existing instruments related to safety climate or safety climate, safety competence and safety performance. The purpose was to assess the construct used and determine whether it can be adapted or otherwise according to the suitability of the context of this study. Next, the selection and determination of key constructs were made based on information obtained through literature review and existing instruments. At the initial stage, a total of 50 items were constructed to represent the constructs determined and evaluated by an expert panel using a four-point scale of 1 = not relevant, 2 = somewhat relevant, 3 = very relevant, and 4 = highly relevant. The use of 4 scales was used to ensure no neutral answer choices were made. Although the number of scales used was 4 points, this selection did not detract from the value of item validity and reliability (Lozano et al., 2008). Expert panels in the safety and health field were assigned in the survey questionnaire stage to rate their importance, allowing us to identify the elements that have the greatest impact on safety performance. Reading the relevant literature allowed us to compile this list of indicators affecting safety performance. We used only publications that met our criteria for quality and relevance in our systematic literature review. Factor identification was performed on 11 research that was chosen after being screened to exclude any unimportant or low-quality papers. From this research, we identified 48 indicators that affect a training institute's overall safety performance.

To assess the indicators affecting safety performance in paramedic training institutes, a questionnaire survey was developed. It included two sections: one with demographic questions, and another with an assessment of the variables found in the literature review. The distribution and collection of the questionnaire took place from January 2021 to April 2021. Participants were recruited from training institutes all around Malaysia. Before beginning the distribution of questionnaires, permission was sought from the responsible person at the training institutes. All replies gathered were to be kept confidential, and participation was optional. The participants had to (1) work more than a year in the institute (2) be an organizational member that is knowledgeable of health and safety practice/a member of the safety and health committee. The questionnaire was sent to the participants via an online medium such as WhatsApp messenger and email and received 258 responses after the due date.

Statistical Analysis

Exploratory factor analysis was employed as a statistical method to break down the variables impacting safety performance in paramedic training institutes into its constituent parts. Among factor analysis's many applications is the reduction of data sets to manageable sizes while preserving as much of the original information as possible. As a result of these correlations, factor analysis can reveal the

fundamental factors that link the various study variables (Field, 2009). The phrase "exploratory factor analysis" is used when the researcher is unclear of the number or identity of underlying components necessary to adequately explain the initial dataset (Hinton et al., 2014). The data was analyzed using SPSS 22.0.

Result and Discussion

Identification of Factors Affecting Safety Performance in Malaysian Paramedic Training Institutes

From this comprehensive literature research, we compiled a list of five factors that affect. This review of the literature provides new empirical evidence about the safety culture, safety climate, and safety performance relationship in the healthcare industries. This, together with the acquisition of the experiences of many researchers in the same subject, contributed to the most thorough design feasible of the factor list studied in the current study. The perceived importance of each of the indicators under these five factors was measured by averaging expert's responses. The factors that were found to impact on the safety performance in healthcare sector are listed in Table 1. These findings may vary from nation to country.

Table 1. Factors Affecting Safety Performance in Healthcare Facilities

Factors that affected safety performance	Frequency (%)
Management commitment/supervision/participation/involvement	8 (73%)
Safety resources/policies/training	9 (82%)
Risk management/communication	6 (55%)
Safety rules/procedures/equipment/rewards	5 (45%)
Worker's involvement/participation	5 (45%)

Questionnaire data reliability

The reliability analysis was conducted using IBM SPSS and was based on Cronbach's alpha value. Referring to Cronbach's alpha score proposed by George and Mallery (2016) for reliability index interpretation, the scores recorded for each construct ranged from 0.71 to 0.94. Cronbach's alpha scores recorded in the study indicated that this instrument is acceptable.

Participant demographic profile

Participants from Ministry of Health training institutes around Malaysia were sought for this study. The demographic characteristics of the respondents are shown in Table 2. Participants' mostly from Central Zone (40.7%), in the Klang Valley area. The participants also had diverse occupations. Most of the participants were Tutor (37.6%), followed by Administration staff (29.4%). Their common levels of education were Degree (36.4%), and Diploma (34.9%).

Table 2. Demographic characteristics of respondents

Demographic variable		Frequency (n=258)	Percentage (%)
Location of working			
	North Zone	20	7.8
	East Coast Zone	22	8.5
	Central Zone	105	40.7
	South Zone	36	14
	Sabah Zone	48	18.6
	Sarawak Zone	27	10.5
Position			
	Head of Department	3	1.2

Medical Officer	8	3.1
Tutor	97	37.6
Nurse	59	22.9
Administration Staff	76	29.4
Health Assistant	15	5.8
Sex		
Male	108	41.9
Female	150	58.1
Highest Degree Qualification		
SPM/equivalence	30	11.6
Diploma	90	34.9
Degree	94	36.4
Master	44	17.1
Health & Safety Committee		
Yes	212	82.2
No	46	17.8
Working Experience		
More than a year	258	100
Less than a year	0	0
Had formal training on health and safety		
Yes	258	100
No	0	0
Type of incident happened in the workplace		
Lost time injury (LTI)	14	5.4
Minor injury (MI)	70	27.1
First aid	19	7.4
Near miss	22	8.5
No incident	133	51.6

The participants' years of experience was also documented. All participants had working for more than a year in the MoH and majority had attended formal training on safety and health. Based on the respondent's responses, 51.6% of respondents don't have any incident in their workplace while another 27.1% of respondent responded that incident happened in their workplace resulting in minor injury.

Exploratory factors analysis

According to Seo et al. (2004), EFA is a precursor of SEM. Hence, the researcher used EFA analysis to determine the factor-analysability of the factors in this study. This means that the EFA validated the proposed construction of safety performance model's five-element constructs. In this work, the factor extraction method used was Principal Component Analysis, while using the Varimax Rotation Method with Kaiser Normalization to determine the one-dimensionality of the elements. This safety performance model's study parts were compared using a bivariate correlation.

Kaiser-Meyer-Olkin and Bartlett's test

The researcher has analyzed by using IBM SPSS version 22.0 to evaluate the reliability, discriminant validity, and convergent validity of the instrument. Based on data gathered from pilot studies, the model factors were analyzed using EFA. Principal Component Analysis used the factor extraction method while the research used Varimax Rotation Method with Kaiser Normalization to determine one-dimensionality of the elements.

The sufficiency of data sampling was assessed using Bartlett's Test of Sphericity and the Kaiser Meyer Olkin (KMO). Tabachnick et al. (2007) mentioned that the KMO value range from zero to one, with a minimum of 0.60, which was suitable to proceed with factor analysis. Meanwhile, Hair et al. (2010) recommended a base value of KMO more than or equal to 0.70. Therefore, in this pilot study, data with KMO's of more or equal to 0.70 ($p<0.05$) was considered factor-analyzable. Thus, the researcher removed items with the value less than 0.70.

Besides that, EFA also gives the data calculation of Eigenvalue where factors between the items proposed calculation output with over one was considered significant and can explain the variance. Eigenvalues lower than one are considered insignificant and, therefore, removed (Hair et al., 1995). The following tables will show and discuss all data, such as reliability and convergent and discriminant values under each safety and health culture practice and performance.

Management and supervision in safety

Findings for ten items measuring management and supervision in safety are presented in Table 3. All of the corrected item-total correlation values for the ten indicators of management and supervision in safety have shown far more significant than 0.3, the minimum value indicating them to be a relevant and good measure of the management and supervision factor. The Cronbach alpha value was 0.938, which denoted acceptable internal reliability is greater than the 0.70 cut-off value (Nunnally & Bernstein, 1994). This factor also was said to be consistent based on Hair et al. (2010) where the value of Kaiser-Meyer-Olkin (KMO) of 0.870 was greater than the cut-off value at 0.70. Bartlett's Test of Sphericity gained also showed consistency with $p<0.001$ was less than the recommended value of $p<0.05$, suggesting that factor analysis could be performed.

Table 3. Management and supervision in safety

Item	Question	Factor loading	Corrected item-total correlation	Cronbach's alpha deletion
MC1	I/We need to prepare a training plan related to safety on an annual basis.	0.713	0.763	0.931
MC2	I/We able to identify safety acts and regulations relevant to institutional members in the workplace.	0.53	0.665	0.935
MC3	I/We will seek references from books related to safety acts and regulations for any safety-related issues.	0.564	0.775	0.931
MC4	I/We need to give access to all institution members to get references from books related to safety acts and regulations.	0.579	0.671	0.935
MC5	I/We coordinate safety policies as important as other human resource policies.	0.709	0.741	0.932
MC6	I/We need to display safety policies in most work areas within the institution.	0.763	0.844	0.928
MC7	I/We need to review the safety policy annually or if there are any changes in the institution.	0.591	0.717	0.933
MC8	I/We are committed to holding regular *JKKP* meetings to discuss safety needs and issues.	0.49	0.677	0.934
MC9	I/We need to prepare a risk assessment report related to the institution and the preventive measures that have been taken.	0.742	0.786	0.930
MC10	I/We must keep a record of the findings for each hazard inspection at the institution. (e.g., checklists, pictorial evidence, etc.)	0.74	0.688	0.934

As reported in the table above, all of the ten items were loaded together and expected to measure the management and supervision in safety based on the factor loadings value ranging between 0.49 to 0.763,

which was more than the suggested value of 0.40 by Field (2005). In this factor, one Eigenvalue was established with a value greater than 6.045. This explains 60.45% of the variance in the data. Hence, this construct has been supplied with adequate evidence of convergent validity.

Safety competence

Table 4 shows findings for three items measuring safety competence. All of the corrected item-total correlation values for the three indicators of safety competence have demonstrated the value of far more excellent than 0.3, the minimum value indicating them to be a relevant and good measure (Nunnally & Bernstein, 1994) of the competence element. The Cronbach alpha value was 0.815, which denoted acceptable internal reliability is greater than the 0.70 cut-off value (Nunnally & Bernstein, 1994). This factor also was consistent with Hair et al. (2010), where the value of Kaiser-Meyer-Olkin (KMO) of 0.706 was greater than the cut-off value at 0.70. Bartlett's Test of Sphericity gained also showed consistency with $p<0.001$ being less than the recommended value of $p<0.05$, suggesting that factor analysis could be performed.

Table 4: Safety competence

Item	Question	Factor loading	Corrected item-total correlation	Cronbach level after deletion
SC1	I/We need to appoint a safety-competent as the secretary of *JKKP*.	0.584	0.615	0.797
SC2	I/We should prepare a list of roles, responsibilities, authorities, and accountability (RRAA) for the chairman, secretary, and employee and employer representatives in JKKP.	0.764	0.690	0.724
SC3	I/We need to set up an emergency response team consisting of institutional members.	0.781	0.705	0.705

As reported in the table above, all three items were loaded together and expected to measure the safety competence based on the factor loadings value for all three items ranging between 0.584 to 0.615, which is more than the suggested value of 0.40 by Field (2005). In this factor, the result displayed one Eigenvalue greater than 2.193, which explains 73.10% of the variance in the data. Hence, this construct has been supplied with adequate evidence of convergent validity.

Safety systems

Table 5 shows findings for five items measuring safety systems. All of the corrected item-total correlation values for the five indicators of safety systems have demonstrated a value far more significant than 0.3. This value passed the minimum value, indicating them to be a relevant and good measure (Nunnally & Bernstein, 1994) of the safety systems factor. The Cronbach alpha value was 0.846, indicating acceptable internal reliability greater than the 0.70 cut-off value (Nunnally & Bernstein, 1994). This factor also was consistent with Hair et al. (2010) where the value of Kaiser-Meyer-Olkin (KMO) of 0.786 was greater than the cut-off value at 0.70. Bartlett's Test of Sphericity gained also showed consistency with $p<0.000$ was less than the recommended value of $p<0.05$, suggesting that factor analysis could be performed.

Table 5: Safety systems

Item	Question	Factor loading	Corrected item-total correlation	Cronbach level after deletion
SS1	I/We should have safe working procedures for all activities in the institution.	0.849	0.788	0.775
SS2	I/We should have an adequate budget for the provision of safety-related equipment (e.g., PPE, Fire Prevention Equipment, etc.).	0.736	0.714	0.797
SS3	I/We should have a system for members of the institution to report new or recurring incidents.	0.746	0.576	0.834
SS4	I/We should have a safety policy that reflects our responsibility for safety in the institution.	0.546	0.641	0.817
SS5	I/We should have an adequate provision for the safety-related equipment (e.g., PPE, Fire Prevention Equipment, etc.).	0.599	0.576	0.834

As reported in the table above, all five items were loaded together and expected to measure the safety systems based on the factor loadings value for all five items ranging between 0.546 to 0.849, which is more than the suggested value of 0.40 by Field (2005). In this factor, the outcome displayed one Eigenvalue greater than 3.103, which explains 62.06% of the variance in the data. Hence, this construct has been supplied with adequate evidence of convergent validity.

Safety risk management

Table 6 displayed four items that were measuring safety risk management. All of the corrected item-total correlation values for the four indicators of safety risk management showed a value far more significant than 0.3. This value passed the minimum value, indicating them to be a relevant and good measure (Nunnally & Bernstein, 1994) of the risk management factor. The Cronbach alpha value was 0.805, which denoted acceptable internal reliability greater than the 0.70 cut-off value (Nunnally & Bernstein, 1994). This factor also was consistent with Hair et al. (2010), where the value of Kaiser-Meyer-Olkin (KMO) of 0.701 was greater than the cut-off value at 0.70. Bartlett's Test of Sphericity gained also showed consistency with $p<0.000$ being less than the recommended value of $p<0.05$, suggesting that factor analysis could be performed.

Table 6: Safety risk management

Item	Question	Factor loading	Corrected item-total correlation	Cronbach level after deletion
RM1	I/We need to take precautionary measures to prevent recurrence of incidents.	0.517	0.629	0.758
RM2	I/We need to conduct risk inspections/assessments at the institution.	0.765	0.687	0.726
RM3	I/We will use a checklist for hazard inspection activities at the institution.	0.483	0.616	0.759
RM4	I/We will communicate regularly with members of the institution about incidents/risks of danger in the institution.	0.758	0.581	0.782

As reported in the table above, all four items were loaded together and expected to measure the safety risk management based on the factor loadings value for all four items ranging between 0.483 to 0.765, which is more than the suggested value of 0.40 by Field (2005). In this factor, the result showed one Eigenvalue greater than 2.564, which explains 64.11% of the variance in the data. Hence, this construct has been supplied with adequate evidence of convergent validity.

Workers' involvement in safety

Table 7 shows three items that measured workers' involvement in safety. The value of the corrected item-total correlation for the indicators of workers' participation in safety demonstrated a value of more than 0.3. This value indicates a relevant and good measure (Nunnally & Bernstein, 1994). The Cronbach alpha value was 0.841, which shows acceptable internal reliability greater than the 0.70 cut-off value (Nunnally & Bernstein, 1994). This factor also was consistent with Hair et al. (2010), where the value of Kaiser-Meyer-Olkin (KMO) of 0.707 was greater than the cut-off value at 0.70. Bartlett's Test of Sphericity gained also showed consistency with $p<0.000$ being less than the recommended value of $p<0.05$, suggesting that factor analysis could be performed.

Table 7: Workers' involvement in safety

Item	Question	Factor loading	Corrected item-total correlation	Cronbach level after deletion
WIN1	I/We need to provide opportunities to institution members who are experts in their respective fields to provide relevant safety procedures from time to time (e.g., safe work practice/ emergency response plan, etc.).	0.721	0.728	0.770
WIN2	I/We should encourage the involvement of institutional members in safety activities.	0.752	0.639	0.858
WIN3	I/we find that members of the institution actively contribute to reporting to *JKKP* if hazards/risks exist in the institution.	0.787	0.774	0.710

As reported above, all three items were loaded together and expected to measure the workers' involvement in safety based on the factor loadings value range between 0.721 to 0.787, more than the suggested value of 0.40 by Field (2005). In this factor, the result established one Eigenvalue greater than 2.243 that explains 74.763% of the variance in the data. Hence, this construct has been supplied with adequate evidence of convergent validity.

Conclusion

With the completion of this study, the factors affecting the paramedic training institute's safety performance in Malaysia have been identified. In this case, a list of 25 contributing indicators were clustered into five primary components using exploratory factor analysis, which were then explored. The factors that go into ensuring the safety performance of a training institute including the following: management commitment, safety system, risk management, safety competency, and workers' involvement in safety. The results of this research will be used to help those involved in the higher education and training sector create a safer workplace for their employees by boosting safety performance on sites.

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Author Contribution

IS Noor Arzahan – planned the research, conducted the literature review, evaluated the quality of the literature, and wrote the paper. Z Ismail and SM Yasin – drafted an article outline, conducted a literature study, evaluated the quality of the literature. Each author contributed to the paper and approved the final version submitted for publication.

Conflict of Interest

Authors declare no conflict of interest

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