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Content Validation of Occupational Health & Safety Monitoring Questionnaire (OHSMQ) For Occupational Stress Risk Assessment among Port Terminal Workers

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ABSTRACT

Exposure to occupational stress is escalating in the working environment. Occupational stress directly or indirectly eclipses many other hazards and contributes to ill health. The Occupational Health & Safety Monitoring Questionnaire (OHSMQ) was developed for use in a port terminal setting. The objective of this paper is to present the process of construction and content validity of the OHSMQ's items in order to conduct Occupational Safety & Health (OHS) control modification for occupational stress risk assessments among port terminal workers. The content validity process involved the act of conceptualisation, development, and validation. The process began with a literature review (adopt and adapt) and expert panel's judgement on the item development process. A list of 20 items was then developed. Its content validation was rated by a panel of fifteen experts. This paper demonstrated the initial phase of scale development for the OHSMQ items. This newly developed item allows the integration of OHS factors during several OHS management activities as constructed through the review and judgement process by a panel of experts in the field. 20 items were deemed acceptable to be passed on to the next stage of data collection. The items' content validity (I-CVI) measurement was within an acceptable range of more than 0.75. The scale's content validity (S-CVI) had an excellent score of 0.95. The study findings show that the Occupational Health & Safety Monitoring Questionnaire (OHSMQ) is valid and has good structural characteristics. Content validity ensures accurate interpretation of results. In order to support the construct validity of an instrument, documenting findings from content validity is therefore essential.

1. Introduction

Occupational stress is a major problem and challenging issue in today's society. Globalisation and dramatic changes in the world of work have built up the magnitude of the problem (ILO, 2016). Positive stress is a good way to boost people's careers and improve efficiency in the working

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environment. However, when stress is accumulated due to various surrounding factors such as unsupportive co-workers, long working hours, no reward and appreciation given, and excess workload and burden, the body then denies to cope with the working environment (Oluoch, Njogu & Ndeda, 2017). In Malaysia, a few studies have indicated that this issue has arisen amongst workers in organisations as they report experiencing occupational stress; those working at port terminals are of no exception. Research on the impact of occupational stress on port workers' safety is highly lacking due to the lack of engagements with workers and the absence of a culture of safety and leadership. The limited approaches to understanding the consequences for workers' health and safety must therefore be the root for sustainability in each organisation (Han et al., 2017; Leung, Chan, & Yu, 2012; Lu & Kuo, 2016). Occupational stress poses a unique challenge to OHS professionals. This challenge is powered by the complexity of research findings, the industry's perception of this issue, and limitations in terms of regulations. Despite this, occupational stress hazards can be managed in the same manner as any other OHS hazard.

Risk is a complicated concept difficult to describe in a single sentence, and follows the same principles with other OHS risk assessments. The approach can be applied to the psychosocial concept as an added technique in finding a simple estimate for occupational stress (IOHS, 2016). It is a primary method for the early detection and prevention of OHS hazards, including occupational stress. Nonetheless, there is a limited number of risk assessment models that focus on workplace psychosocial hazards, especially occupational stress. Additionally, there is no specific tool in the risk assessment matrix that is focused on the port industry. In addition to overcoming this shortcoming due to the use of the existing risk assessment matrix, there is a need to add another dimension of likelihood and severity predictors to ensure its capability and efficiency in reducing occupational stress in Malaysia's port industry. The dimension added to support the risk assessment acts as a control modification to determine the level of OHS management through OHS practices and compliance levels in the port industry. With that in mind, this paper sets out to be part of a tool (instrument development study) used to determine the control modification factor for occupational stress risk assessment at port terminals.

2. literature Review

2.1 Item development

The control modification factor for the occupational stress risk assessment was developed based on data analysis on the OHS Audit, OHS Budget, OHS Training, and Effectiveness of OHS Control Measures. The contributing factors to these OHS injuries and illness are human, worksite, organisation and external factors (Jaafar et al., 2015). The OHS Budget is a resource whose principal or interest is set apart for OHS prevention programmes at the workplace (Kemei & Nyerere, 2016) to increase the workplace's OHS performance and employee productivity (Bonilla Santos & Hernández, 2016; Kumar & Kumar, 2012).

Findings from the OHS Audit assist the organisation's management to properly manage and overcome occupational health issues in the workplace (Aksorn & Hadikusumo, 2007). The factors influencing an organisation's effectiveness are such as (El-nagar, Hosny & Askar, 2015; Jaafar et al., 2015) safety awareness, lack of training, reluctance to input of resources, reckless operations, and uncertified skill workers (Khodabandeh, Kabir-Mokamelkhah, & Kahani, 2016). These elements play an important role in determining the level of OHS risks at the workplace. If the correct controls are implemented, the outcome will therefore be positive. The organisation's management has to properly decide to select the right controls to overcome OHS risks at their workplace.

2.2 Content validity process

A content validity assessment should be conducted to assess the reliability of a new construct (Rubio, Berg-Weger, Tebb, Lee & Rauch, 2003). An instrument with new and complex constructs must be deemed valid and reliable in order to measure what it is supposed to measure. One that is too long or too difficult to read may lead to lower response rates with a tendency of inappropriate responses (Rubio et al., 2003). Researchers such as Delgado-Rico, Carrctero-Dios and Ruch (2012), Zamanzadeh et al. (2015), Paul, Connor, McCabe and Ziniel (2016), and Vasli, Dehghan-Nayeri and Khosravi (2018) have extensively conducted content validity studies as part of instrument development.

Content validity consists of (1) instrument development, and (2) judgement by an expert panel (Lynn, 1986). Thus, the process of instrument development should begin with the following steps (Carmines & Zeller, 1979; Lynn, 1986):

1. Identification of the entire domain of content linked to the phenomenon of interest, beginning with a comprehensive review of the literature, and;
2. Generation of instrument items linked to the identified domain of content.

The next step in the content validity process is the judgement process by an expert panel to quantify the item's representativeness of the studied context. The method of quantifying content validity is a process where the expert panel evaluates the instrument and rates its representativeness to their content domain (Wynd, Schmidt, & Schaefer, 2003).The judgement process usually takes place after the process of constructing potential items to be included in the instrument (Gilbert & Prion, 2016). This whole process serves as a pre-test assessment of the item. By conducting a content validity study, any information on the clarity or representativeness of an item will be produced. Items that are considered conceptually unreliable will be omitted (Hinkin, 1998). The improved items, based on the expert panel's judgment, can then be used in the preliminary study to further measure other psychometric properties of the instrument (Rubio et al., 2003).

The total content validity score was derived from the content validity index (CVI) score. A low CVI value indicates that the items are not useful in describing the principal construct due to insufficient construct specifications or the lack of expertise to the judging process (Polit, Beck & Owen, 2007). There are two methods for calculating CVI. The first is by computing the item level score (I-CVI), and secondly, by calculating the scale level score (S-CVI). I-CVI refers to the content validity of each item. It describes the proportion of the expert panel whose given a rating of 3 or 4 as indicator of agreement to the items. Meanwhile, the S-CVI refers to the content validity of the whole instrument (Polit, Beck & Owen, 2007). The S-CVI is computed to identify the content validity of the overall scale rather than focusing on each item's content validity (I-CVI). Polit and Beck (2006) reported two ways to compute the S-CVI which are:

1. Universal agreement among experts (SCVI/UA)
2. Averaging the item-level CVIs (S-CVI/Ave)

The SCVI/UA is the percentage of items on the scale that has attained a relevant (agreement) ranking of 3 or 4 from the panel of experts. Meanwhile, the S-CVI/Ave is the average of all I-CVIs for all items on the scale (Polit & Beck, 2006). Hence, the S-CVI/UA and S-CVI/Ave are both scale-level CVIs with different formula computations (Shi, Mo & Sun, 2012).

3. Methodology

3.1 Instrument design and item development

The instrument design process carried out in this study followed three steps; determination of content domain, generation of items, and construction of instrument (Zamanzadeh, Ghahramanian, Rassouli, Abbaszadeh, Alavi-Majd & Nikanfar, 2015). The content domain of the OHS control modification factor was identified based on a review of literature related to OHS management activities (Shamsuddin et al., 2015). The information was then used to guide the item generation from the sampling of items in the content domain, where questions were divided into a few construct categories to represent the modification control of this study clearly. The construct categories are:

A. OHS Audit (Q1- 5);
B. OHS Cost (Q6 - 10);
C. OHS Training (Q11-15);
D. Effectiveness of OHS Control Measures (Q16-20)

3.2 Expert review & panel discussion

Two government agency experts who are directly involved in the Occupational Health and Safety (OHS) field together with thirteen OHS practitioner experts were selected for this study. A set of cover letter and response form was mailed to the expert panel. The expert panel was also provided with a summary of the research to increase their understanding of the content domain. To ensure the best representation of specialty, the selection of expert panel was based on the experts' working experience and involvement in the OHS field. The expert panel was given the task to judge and estimate the instrument's overall comprehensiveness.

Ample time was given to the expert panel judges so as to reach an agreement on the construct's overall relevancy and clarity in order to ensure that the instrument is comprehensive. Although it may be hard to determine, it is important for the experts to feel that the instrument actually measures what it is intended to measure, and suggest any additional constructs on the control factor of occupational stress risk assessment in the Malaysian context. To give the experts an edge, they were first asked to provide independent judgement before they were allowed to evaluate the clarity and relevance of the developed items. This review was followed by a panel in which the experts evaluated the instrument item-by-item and described its appropriateness to the local culture and practice. Recommendations and comments made by the panel were recorded in writing.

3.3 I- CVI index computation

Based on a 4-point rating scale, the fifteen experts were asked to rate each item according to Malaysian port terminals' context in terms of OHS control modification factors. The rating criteria for measuring clarity comprised of 1 = not clear; 2 = item needs to be revised; 3 = clear but needs minor revision; and 4 = clear. Meanwhile, the scales for measuring relevancy were 1 = not relevant; 2 = item needs to be revised, 3 = relevant but needs minor revision; and 4 = relevant.

The I-CVI was calculated as the number of experts giving a rating of 3 (quite relevant) or 4 (very relevant) divided by the number of experts (Polit et al., 2007). A CVI score of 1.00 indicates a 100 percent agreement amongst the expert panel judges. The expert panel had also given additional qualitative comments regarding the FDPA items and the tool's overall representativeness.

3.4 S- CVI index computation

The S-CVI was computed by averaging the item-level CVIs (S-CVI/Ave). The acceptable S-CVI value was 0.90 (Polit et al., 2007) by assuming that there was complete agreement among the experts on most of the items (I-CVI= 1.00) or a modest amount of agreement on just a few items (e.g., I-CVI= 0.75).

3.5 Kappa Statistics

The Kappa statistics represent the proportion of remaining agreement after a chance agreement is removed (Hallgren, 2012; Gwet, 2014) To ensure that the data collected in the study represents the correct representation of the measured variable, rater reliability is thus considered necessary (McHugh, 2012; Sim & Wright, 2005). In consideration of increasing certainty of the content validity of a new instrument, Bennan (1992) recommended reporting both the proportion agreement (CVI-Index) and Kappa statistics as a manifestation of data variability and measure of agreement while considering the chance agreement (Bennan, 1992).

To adjust changes to the agreement ratings by the expert panel, a Kappa statistics test was conducted by taking the item-level CVIs (I-CVIs) into values of a modified Kappa statistic (Polit et al., 2007). The acceptable level of Kappa coefficients is based on Fleiss (1971) and Cicchetti (1984) as shown in Table 1.

Table 1
Kappa coefficients' magnitude parameters

Strength of Agreement	Kappa Statistics
Poor	<0.40
Fair	0.40-0.59
Good	0.60 -0.74
Excellent	0.75-1.00

To calculate the score of the modified Kappa statistic (k^*), the probability of chance agreement by binomial random variable (p_c) was first computed using Equation 1 and inserted into formula k^*. The p_c value was then inserted into Equation 2 to compute the Kappa statistics score:

$$\mathrm{p_c} = [\frac{\mathrm{N!}}{\mathrm{A!(N-A)!}}]\ .5^{\mathrm{N}} \quad (1)$$

where
N = number of experts, and
A = number of agreements rated 3 or 4.

The formula for the modified Kappa statistics is:

$$k^* = \frac{(I-CVI)-P_C}{1-P_C} \quad (2)$$

where
p_c = probability of chance agreement, and
I-CVI = content validity on item level.

4. Results and Discussion

4.1 Item development

A good first step in item development is determining the content's domain. The search for literature on the content domain for this study focused on the control modification factor in the OHS field. The instrument development process began with a careful review and comparison of existing literature on a) predictor of OHS control measures, b) the monitoring and review of OHS profile, and c) OHS awareness among organisations working at port terminals. Table 2 lists the elements of items developed and included in this study.

Table 2
Elements of each item in the developed instrument

Section	Description	Item	Source
OHS Audit (Q1-5)	Periodic OHS audits are conducted on the execution of prevention plans and compliance level of OHS legislations	5 items: • Never • Once a year • Twice a year • Thrice a year • Quad a year	Investigators; Kamar and Ahmad, 2016
OHS Cost (Q7-10)	Sufficient budget to support OHS implementation and improve prevention performance in organisation	5 items: • Less than 0.5% • 0.5 – <1% • 1 - < 2% • 2 - < 3% • More than 3%	Investigators; Ikpe, Hammon, and Oloke, 2012
OHS Training (Q11-15)	Training can improve OHS attitude and awareness, and give an impact on an organisation	5 items: • Never conduct any training • 25% of total • 50% of total • 75% of total • 100% of total	Investigators; Endroyo, Yuwono and Mardapi, 2015
Effectiveness OHS Control Measure (Q16- 20)	Existing OHS control measures represent good practice, minimise exposure to risk, and are adequate for an organisation	5 items: • Potential increase of risk • Does not change the risk • Slightly reduces the risk • Reduces the risk • Significantly reduces the risk	Investigators; Rajbhandari and Snekkenes, 2011

4.2 Items' relevancy (I-CVI and S-CVI Scores)

For the developed instrument, a majority of the experts rated each item as "relevant" (experts scoring 3 or 4). Only 3 out of the 20 items listed received low I-CVI scores (less than 0.88). The range of scores considered as highly relevant (evidence of good content validity) is between 0.78 and 1.0 (Polit, Beck & Owen, 2007). A score of 1.0 denotes that all of the experts had agreed that the item is relevant to the scope of the study.

4.3 Items' clarity modification

The I-CVIs only demonstrate the items' relevancy to the content domain. In this study, further considerations to the item selection were filtered by the clarity scores (Table V). Items with low I-CVI scores for clarity were subjected to modification or deletion. However, more focus was given to the I-CVI's relevancy, followed by clarity. Both were structurally revised based on suggestions by the expert panel, which meant that the first filter was I-CVI for relevancy, followed by the I-CVI for clarity.

Overall, the content validity of all items was above the acceptable range (more than 0.75), except for the two items mentioned above. The S-CVI value was also considered excellent with a score of 0.95. The final construct consisted of 20 items of OHS control modification factor for occupational stress risk assessment was accepted for further study after very minor adjustments. Overall, the content validity index conducted ensured accurate interpretations of results. In order to support the construct validity of an instrument, documenting findings from content validity is essential.

5. Conclusion

This present study demonstrated the initial phase of scale development for an occupational stress risk assessment. The content validity assessment is part of the validation process of items represented in this scale. The development of this scale purposely acts as a control factor in the occupational stress risk assessment that will be conducted on port terminal employees. The review and judgement process by the expert panel resulted in good content validity of the instrument. The process yielded good recommendations from the experts. The final construct was modified per the experts' recommendation and quantification of the content validity assessment results.

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Table 3
Content validation results by experts on the OHS Monitoring survey

Item	Question description	Expert agreement (denoted by "✓")															Total agreement	CVI Index
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	Frequency of OHS audit/inspection in a year calendar																	
Q1	Never	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q2	Once a year	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	14	0.93
Q3	Twice a year	✓	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	14	0.93
Q4	Thrice a year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q5	Quad a year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
	The cost of OHS prevention estimates from the overall cost of the OHS organisation																	
Q6	Less than 0.5%	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q7	0.5 – <1%	✓	✓	X	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	13	0.87
Q8	1 - < 2%	✓	✓	X	✓	✓	✓	✓	X	✓	X	✓	✓	✓	✓	✓	12	0.80
Q9	2 - < 3%	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q10	More than 3%	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
	Number (percentage) of OHS related training have been taught to the employees																	
Q11	Never conduct any training	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	14	0.93
Q12	25% of total	✓	✓	✓	✓	✓	✓	✓	X	✓	X	✓	✓	✓	✓	✓	13	0.87
Q13	50% of total	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q14	75% of total	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q15	100% of total	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00

	Existing OHS control measures impact																	
Q16	Potential increase the risk	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q17	Does not change the risk	✓	✓	X	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	13	0.87
Q18	Slightly reduces the risk	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	14	0.93
Q19	Reduces the risk	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00
Q20	Significantly reduces the risk	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	15	1.00