ORIGINAL PAPER

Validation of the Malay Version of Impact of Event Scale-Revised (IES-R) Among Flood Disaster Victims in Malaysia

Ahmad Shahril Ab Halim[1], Azizah Othman[1], Sharifah Zubaidiah Syed Jaapar[1], Azidah Abdul Kadir[2], Juwita Shaaban[2], Norzila Zakaria[1], Mohd Azhar Mohd Yasin[1], Azwany Yaacob[3], Wan Nor Arifin[4], Asrenee Ab Razak[1]

[1]Department of Psychiatry, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia
[2]Department of Family Medicine, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia
[3]Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia
[4]Unit of Biostatistics and Research Methodology, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

Abstract

Background: Exposure to extreme disaster may result in severe psychological sequels especially Post Traumatic Stress Disorder (PTSD). The Impact of Event Scale-Revised (IES-R) is the commonly used instruments to assess PTSD, however up to date there is no Malay validated version to assess impact of natural disaster. Hence, this study aims to determine the validity and reliability of the Malay Impact of Event Scale-Revised (M-IES-R) in natural disaster such as flood. Methods: A cross-sectional study was conducted from April to June 2015. The validation process involves back to back translation, content validity and face validity followed by a pilot study before the final data collection involving 168 participants. Depression Anxiety Stress Scale-21, Malay version (DASS-21-M) was used to check for concurrent validity. Construct validity was checked by confirmatory factor analysis and composite reliability by Raykov's rho. Results: The final model of Malay-IES-R consists of 2 factors (psychological and behavioural) with 19 items, as compared to original version with 3 factors with 22 items. It has good model fit (CFI = 0.933, TLI = 0.923, RMSEA = 0.056, SRMR = 0.058) and composite reliability (psychological = 0.89, behavioural = 0.83). M-IES-R was positively correlated with DASS-21-M. Pearson's correlation ranged from *r*=0.37 to *r*=0.63. The optimal cut-off point for PTSD were >14 for psychological construct (sensitivity 0.83) and >6 for behavioural construct (sensitivity 0.78). Conclusion: The final model of two factors with 19 items of the Malay-IES-R has good psychometric properties, thus valid and reliable to measure level of posttraumatic stress symptoms in natural disaster.

Keywords: CFA, Flood, PTSD, IES-R, Validity

Introduction

Natural disasters are unforeseen yet traumatic environmental events that affect entire populations. Exposure to natural disasters can precipitate brief psychological impact, in addition to enduring somatic and psychological sequelae such as depression and post-traumatic stress disorder (PTSD), as well as fatalities and economic losses [1]. Of the specific psychological sequelae, PTSD is the most commonly reported and studied psychological impact of disasters [2].

Post-traumatic stress disorder (PTSD) is a chronic and incapacitating disorder, characterized by specific symptoms that develop following experience to trauma or exposure to actual threatened death, serious injury or sexual violence. An individual may respond to such experience with intense fear, helplessness, or shock. The core symptoms of PTSD are reexperiencing the event, stimuli avoidance, and persistent symptoms of hyperarousal [3]. Consequences of this could lead to impairment of one's quality of life and physical health thus need to be recognised early.

In the event of any traumatic experience, PTSD symptoms can be measured by The Impact of Event Scale-Revised (IES-R) [4]. The scale consists of 3 domains with 22 questions which has shown to have good psychometric properties. This scale has already been translated and validated into different languages including Swedish [6], German [7], Spanish [8], Italian [9], French [10], Japanese [11], Chinese [12], Korean [13], Sri Lanka [14], Greek [15], Turkish [16] and Malay [17]. The available Malay version, however was validated for postpartum women underwent Caesarean section surgery, thus warrants revalidation for the usage for natural disaster.

Although flood is a common monsoon phenomenon in Malaysia, the 2014 floods was the worst described in 30 years [18]. There is a robust need for an easy to use screening scale to assess psychological distress among the flood survivors, for use in both clinical and research settings. Thus, the aim of this study was to examine the validity and reliability of the Malay version of Impact of Event Scale-Revised (IES-R) among adult flood victims in Kelantan, Malaysia.

Methods

Study design and procedures

A cross-sectional study was conducted in two villages in the Kuala Krai district, Kelantan from April 2015 to June 2015. Kelantan is located at the North Eastern part of Peninsular Malaysia. The selection of this area was based on the severity of the flood impact, as Kuala Krai was one of the worst districts hit by the flood. All adult victims aged 18 years and older in the respective villages were invited to participate in the study during a health camp programme. Those who were illiterate were excluded from the study. A multistage random sampling technique was applied in recruiting the participant.

The study questionnaires were distributed to the participants during health camp programme organized by Department of Psychiatry, Universiti Sains Malaysia (USM), Malaysia. Public health campaign with health talk, medical check-up, treatment and referral to the available psychiatrists and trainees was conducted in each of the selected areas. Data collection was conducted at the health campaign site,

as well as home visits to access those who did not join in the health campaign.

Ethical clearance was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (USM) prior to the study [approval reference: USM/JEPeM/15040111].

Measures

Socio-demographic questionnaire

Socio-demographic characteristics recorded are age, gender, ethnicity, marital status, education level, occupation, household income, past medical and psychiatric history.

Impact of Event Scale - Revised (IES-R)

IES-R is a 22-item self-rated questionnaire that measures three main constructs of PTSD, namely intrusion, avoidance and hyperarousal where 8 items for intrusion, 8 items for avoidance and 6 items for hyperarousal subscale. They are rated on a 5-point scale, ranging from 0 (not at all) to 4 (extremely). The individual overall score signifies the severity of psychological distress after traumatic event, with higher scores representing higher risk to develop PTSD. Psychometric properties from a Korean study showed a good internal consistency with an alpha coefficient and test-retest reliability were 0.93 and 0.91, respectively [13].

Instrument translation

The translation and adaptation process of the IES-R from its original language (English) to Malay is shown in Figure 1. During this phase, two independent native Malay language experts carried out the forward translation whose quality was checked by another independent translator. Both of the translated versions were then back translated to English to assess the accuracy of the Bahasa Malaysia translations by another two independent translators. Then the two forward translations were reconciled and sentence-by-sentence revision was done to produce the first consensus of Malay version. A team of experts comprising of five psychiatrists, a clinical psychologist and two family medicine specialists then examined the content validity by assessing each item based on the suitability relevance of its content in the Malaysian context. A harmonised Malay version of IES-R was produced after necessary amendments were made accordingly. The harmonised Malay version was subsequently pre-tested on ten respondents among staffs in School of Medical Science, USM. The purpose of the pre-test was to gauge if the structuring of the words and sentences were understood by them. After improvement of the questionnaire, the final consensus version was produced and utilized for the validation study.

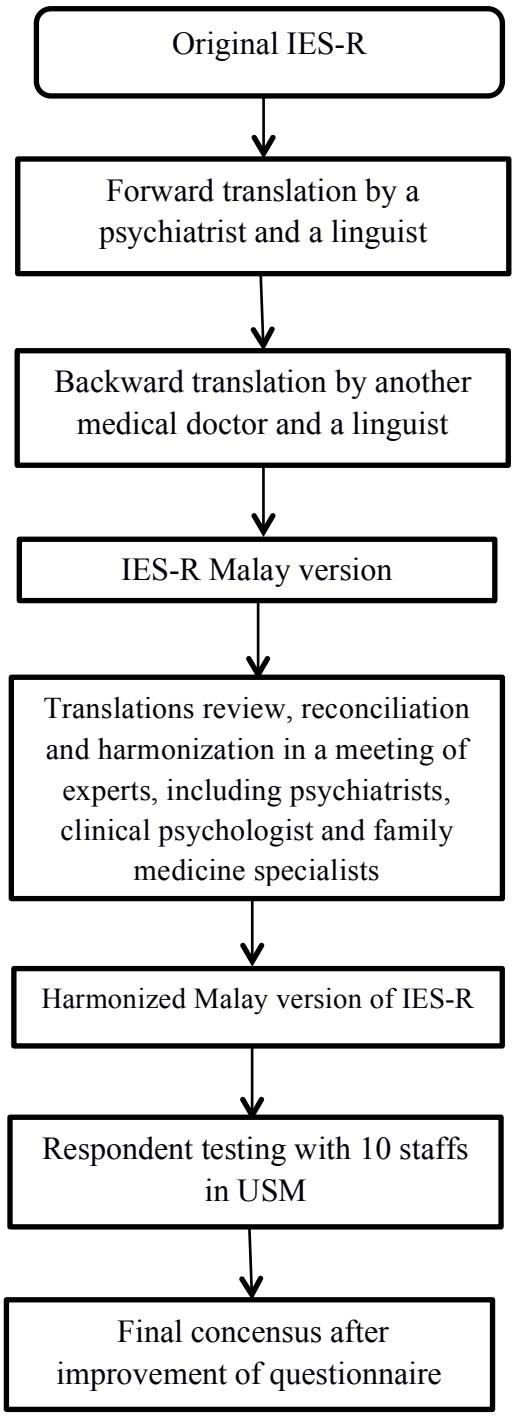

Figure 1. Translation process
Note. IES-R = Impact of Event Scale-Revised; USM = Universiti Sains Malaysia

Depression, Anxiety, and Stress Scale 21, Malay Version (DASS-21-M)

To measure concurrent validity of IES-R, DASS-21-M was used. DASS-21-M is a self-report scale consisting of 21 items, intended to measure psychological distress under domains of depression, anxiety, and stress. There are several Malay versions of DASS-21 which were translated and validated in various different population. DASS-21-M displayed good validity and reliability, with Cronbach's alpha values of 0.84, 0.74, and 0.79, respectively, for depression, anxiety, and stress. It also had good factor loading, ranging from 0.39 to 0.73, and good correlations among scales (0.54 and 0.68) [19].

Statistical analysis

Descriptive data were generated for all variables using Statistical Package for the Social Sciences version 20.0 software [20]. Missing values and data entry errors (value errors and double entry errors) were checked prior to analysis by examining the hard copy of the questionnaire. Categorical variables were examined and presented as frequencies and percentages. Normality of the data was assessed through histogram per item.

Confirmatory factor analysis (CFA) was performed using R version 3.2.1 software [21]. Several goodness of-fit indicators were selected including Chi square value, Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR). Chi-square goodness-of-fit *p*-values of 0.05 or more, TLI and CFI values of 0.95 or more are considered as acceptable fit. The root mean square error of approximation (RMSEA) measures the fit of the hypothesized model to the perfect model and value of < 0.08 with CFI ≥ 0.95 is a good fit. The standardized root mean square residual (SRMR) test the absolute fit and value of $<$ 0.08 indicates a good fit [21]. . Aside from these fit indices, factor loadings for each item were also analysed. Items with factor loadings of less than 0.5 were considered for removal [22].

Pearson's correlations between constructs of IES-R and stress domain of DASS-21-M were performed to assess the concurrent validity. The sensitivity, specificity and area under the curve (AUC) were also computed. The stress domain of DASS-21-M was selected as comparison subscale since IES-R was intended as a screening tool for posttraumatic stress. The suitable cut-off score for IES-R was then determined by comparing the scale with the stress domain, where the presence of probable stress (based on DASS-21-M Stress score ≥ 15) was used as the determining factor for the stress cut off. The area under the curve (AUC) signify the precision level of the scale's capability to correctly classify those with and without the disease in question. AUC of more than 0.7 is considered having acceptable discrimination [23].

Composite reliability (CR) of the IES-R was estimated by Raykov's rho. Raykov's reliability rho of ≥ 0.70 is acceptable [24].

Table 1. Summary of fit indices

Fit index	Cut-off points	Comments
Chi square for goodness-of-fit (GOF)	P-value > 0.05	Non significant P-value indicates good model fit to the data that we have. But as it is very sensitive to sample size, it is commonly used reported but not a must to have non significant P-value for chi-square
Absolute fit index		
• SRMR (standardized root mean square residual)	< 0.08	Based on guidelines by Brown, 2015
Parsimony correction fit index	RMSEA & 90% CI < 0.06 CI fit> 0.05	
• RMSEA (root mean square error of approximation)	< 0.08 (adequate, less restrictive)	Based on guidelines by Brown, 2015
Comparative fit indices		
• CFI (comparative fit index) • TLI (Tucker-Lewis index)	Both ≥ 0.95	Based on guidelines by Brown, 2015

Results

Sample Characteristics

A total of 168 flood victims consented and involved in this study. Table 2 summarizes the comparison of sociodemographic profiles of the participants.

Table 2. Descriptive analysis of the socio-demographic factors of participants. (n= 168)

Variables		Mean (SD)	Frequency (%)
Age		51.21 (16.92)	
	18- 59		111 (66.1)
	>60		57 (33.9)
Gender			
	Male		69 (41.1)
	Female		99 (58.9)
Marital status			
	Single		23 (13.7)
	Married		130 (77.3)
	Divorcee/ Widow		15 (9.0)
Education level			
	Formal education (Primary/ Secondary/ Tertiary)		135 (80.4)
	No formal education		33 (19.6)
Employment			
	Not working/ Housewife		84 (50.0)
	Self- employed/ government/ private		84 (50.0)
Level of income			
	RM0- RM499		56 (33.3)
	RM500- RM999		73 (43.5)
	> RM1000		39 (23.2)
History of mental illness			
	Yes		1 (0.6)
	No		167 (99.4)
Family history of Mental illness			
	Yes		5 (3.0)
	No		163 (97.0)
History of chronic illness			
	Yes		55 (32.7)
	No		113 (67.3)

Confirmatory Factor Analysis

Prior to performing the CFA by maximum likelihood (ML) estimation method, the multivariate normality of the data was assessed. The multivariate normality assessment was done by Mardia's normalized estimate of multivariate kurtosis [25] and the chi-square versus the Mahalanobis distance plot [26]. A critical ratio of kurtosis < 5.0 [27] and a fairly straight line on the chi-square versus the

Mahalanobis distance plot [26, 28] indicated multivariate normality. The results showed data were not following multivariate normal distribution, as multivariate kurtosis was 657.55 with critical ratio of kurtosis of 25.84 and the chi-square versus the Mahalanobis distance plot did not form a straight line. Thus, robust maximum likelihood (MLR) estimation method was used as it suitable as alternatives for complete and incomplete non-normal data [29].

Results of CFA are shown in Table 3 and 4. The feasibility of the original hypothesized three-factor model (IES-R-III) consisting of avoidance, hyperarousal and intrusion constructs proposed by Weiss and Marmar was examined. The initial model, however, had poor fit of data as indicated by all fit indices were not within the acceptable threshold. The only exception in this regard was SRMR (0.072). High correlation (r = 0.962) between two constructs (intrusion and hyperarousal) indicates multicollinearity problem whenever any between-factor correlation is more than 0.85 [22]. Thus, an alternative model was designed with two constructs with intrusion and hyperarousal subscales combined and named as Psychological construct and avoidance subscale as single Behavioural construct (IES-R-II, Model 1). The model did not fit well with fit indices presented in Table 3. Modification to the model was required to obtain good fit.

Q13 was first removed due to highly correlated with too many other items. Next, Q19 was removed due to high correlation across domains. Lastly, Q7 was dropped as it had very low factor loading of 0.390, and its removal resulted in best improvement in fit indices. This model is referred as IES-R two-factor model 2 (IES-R-II, Model 2), presented in Figure 2. In total, there were 19 items remaining after the modification with two factors, with thirteen items as indicators for the first factor (Psychological) and six items for the second factor (Behavioural). The model fit indices are presented in Table 3. IES-R-II, Model 2 was accepted as final measurement model as it had good model fit and significant factor loading, ranging from 0.47-0.84 (Table 4).

Table 3. **Model fit indices of the IES-R measurement models**

Model	Chi-square (df), p-value	CFI	TLI	SRMR	RMSEA	90% CI
IES-R-III	472.506 (206), <0.001	0.813	0.791	0.072	0.088	0.078, 0.097
IES-R-II						
Model 1	473.493 (208), <0.001	0.814	0.793	0.072	0.087	0.078, 0.096
Model 2	228.500 (149), <0.001	0.933	0.923	0.058	0.056	0.043, 0.069

Note. IES-R = Impact of Event Scale-Revised; IES-R-III = three-factor model of Impact of Event Scale-Revised; IES-R-II = two-factor model of Impact of Event Scale-Revised; df = degree of freedom; CFI = comparative fit index; TLI = Tucker–Lewis fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; CI = confidence interval.

Table 4. Factor loadings (λ) and composite reliability of the final model IES-R

Factors	Item	Factor loading	Raykov's rho
Psychological	Q1	0.536	0.895
	Q2	0.622	
	Q3	0.654	
	Q4	0.492	
	Q6	0.730	
	Q9	0.808	
	Q10	0.746	
	Q14	0.674	
	Q15	0.616	
	Q16	0.843	
	Q18	0.674	
	Q20	0.469	
	Q21	0.646	
Behavioural	Q5	0.649	0.837
	Q8	0.640	
	Q11	0.815	
	Q12	0.615	
	Q17	0.763	
	Q22	0.551	
Factor correlation: Psychological ↔ Behavioural r = 0.770			

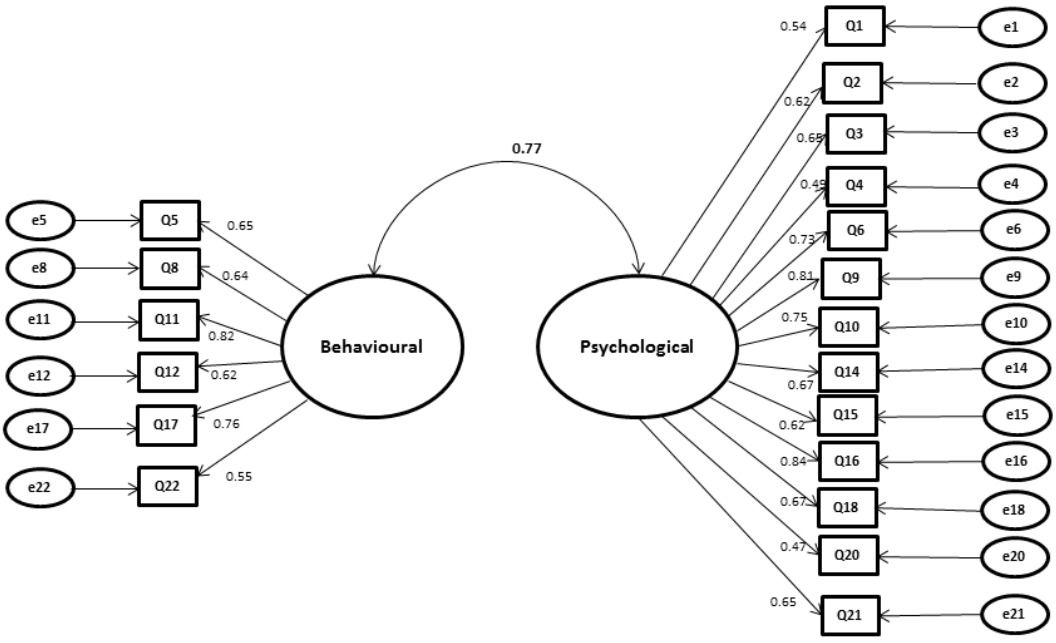

Figure 2. **Path diagram of two-factor model of IES-R-M**

It was observed that the modified two-factor model (Psychological and Behavioural construct) fit the data better as compared to the original three-factor model. The comparative fit index (CFI) improved from 0.813 to 0.933, which was very close to the recommended value of 0.95. The Tucker-Lewis Fit Index (TLI) also improved close to the recommended value of optimal fit with value of 0.923 for two-factor model. Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) values of 0.056 and 0.058, respectively, both were lower than the stipulated value of 0.08.

A positive correlation was found between the psychological and behavioural construct of IES-R with stress domain of DASS-21-M with Pearson's correlation coefficients of r=0.630 (p<0.001) and r=0.368 (p<0.001), respectively. The area under the curve (AUC) was 0.804 (psychological construct) and 0.704 (behavioural construct), suggesting that the IESR has fairly good accuracy in discriminating those with and without PTSD. The optimal cut-off point for PTSD were >14 for psychological construct and >6 for behavioural construct with each sensitivity of 82.6% and 78.3% as shown in Table 5. Despite relatively low specificity shown for both constructs (61.4% and 48.3%), as IESR is considered to be utilised as a screening tool, which implies a necessity for greater sensitivity while maximizing specificity, it is considered acceptable.

Table 5. Validity indices (%) of IES-R at the optimal cut-off point based on stress domain of DASS-21-M

Domain	Cut-off point score	Sensitivity	Spesificity	AUC*
Psychological	> 14	0.826	0.614	0.804
Behavioural	> 6	0.783	0.483	0.705

*AUC, *area under the curve*. 0.7 and more is considered having acceptable discrimination (Hosmer & Lemeshow, 2000).

Reliability

All two constructs had good reliability as their Raykov's rho of the Psychological domain was 0.89, whereas for the Behavioural domain was 0.83 (Table 4). Thus, internal consistency reliability for this model was satisfied.

Discussion

Given that the use of scales for assessing traumatic experiences has become more important, this study aims to examine the validity and reliability of IES-R in natural disaster suited for Malaysia context. While the IES-R is one of the commonly utilised tools for assessing the dimensions of trauma, prior local study focus on post Caesarean section women as their subjects and using CFA approach [17]. However, because of the difference in the studied population, we considered it was imperative to perform a replication of it.

In the present research, our findings showed

that all items achieved a satisfactory factor loading to the respective factors. Most items achieved a loading more than 0.5, except for 2 items (Q4 and Q20) which values slightly lower than 0.5. Regarding the factor structure, there were few factors that need to be considered in implementing model modification in CFA. These were factor loadings, multicollinearity between constructs, standardized residuals and Modification index. Necessary modifications to improve model fit were done by eliminating problematic item and combining factors if multicollinearity exists between factors [22].

A three-factor model (constructs of intrusion, avoidance, and hyperarousal) with 22 items was the originally hypothesized model of IES-R scale. However, the findings of this current study do not support the previous research. The CFA result showed a final 19 items, two-factor model (Psychological and Behavioural) of IES-R (IES-R-II, Model 2), with the removal of other poor performing items (Q7, Q13 and Q19) in the model modification step. An adequate model fit was presented in the final CFA model and can be regarded to be the best validated scale. Additionally, it is interesting to note that all fit indices which include RMSEA, SRMR, CFI and TLI showed improvement after model modification close to the recommended value of optimal fit. Chi-square for goodness-of-fit (GOF) value should not be statistically significant if there is a good model fit. However, it is very sensitive to sample size and is no longer relied upon as a basis for acceptance or rejection [30]. Thus, Chi-square for GOF <0.05 did not affect the model fitness much as the use of multiple fit indices has developed a more holistic view of GOF, taking into account of model complexity and other relevant issue apart from the sample size.

Another important finding was that three items were removed from the original items, which were Q7 “Saya berasa seolah-olah ia tidak berlaku atau ia bukan benar” (“I felt as if it hadn’t happened or wasn’t real”, Avoidance subscale), Q13 “Perasaan saya mengenainya menjadi kaku” (“My feelings about it were kind of numb“, Avoidance subscale), and Q19 “Ingatan mengenainya menyebabkan saya mengalami reaksi fizikal (contohnya: berdebar-debar, berpeluh, susah bernafas” (“Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart”, Hyperarousal subscale). These items were removed because of very poor factor loading of 0.390 (Q7) and high correlation with other items across domain (Q13 and Q19). One possible explanation for these findings is the fact that cultural differences may affect the performance of a scale. It was probably due to the nature of Malays in expressing emotion is limited, but rather somatized their psychological disabilities [31]. Thus, in this study, the flood survivors possibly have the tendency to rate the severity of their psychological distress lower than the actual level and give negative answer to the questions. Furthermore, the previous Malay validation study also removed too many items resulting in the final 10 items.

Nonetheless, our result is consistent with a study conducted in Spain that suggested the IES-R is made of two factors rather three factors using EFA approach [8]. Baguena et al. reported a two-factor structure model that they labelled as ‘intrusion–hyperactivation and avoidance’. They described the reason for their finding is the studied samples are not experience any actual traumatic stressor as the study involved 1078 adults without traumatic experience.

The optimal cut off point suggested from

this study are >14 for psychological construct and >6 for behavioural construct. These findings were in contrast to the cut-off points from earlier studies, which use cut off points ranged from 22 to 33 [11,33-34]. This discrepancy could be attributed to the use of total IES-R score to determine the cut off score in previous studies, rather than each domain score as observed in this study.

The findings of this study indicated that for the suggested cut off values, IES-R was sensitive in assessing PTSD with sensitivity of 82.6% and 78.3% for psychological and behavioural constructs, respectively. Still, the scale's specificity was relatively low for both constructs (61.4% and 48.3%). As compared to diagnostic tools which need to capture item conforming to specific criteria of diagnosis, screening instruments acts otherwise. They possibly constructed on any ways that can effectively predicts the diagnosis condition, such as self-reported items. Thus, the suggested cut off values meet the least goal for high sensitivity while intensifying specificity [32].

Reliability on the other hand is the ability of the scale to reflect the true variation among the score with minimal error. The result of this study showed that both domains have good composite reliability as the Raykov's rho of the Psychological construct is 0.89, whereas for the Behavioural construct is 0.83. This is comparable with the study in Korea and Sweden in which the Cronbach's alpha was 0.93 [13] and range of 0.85–0.95 [6] respectively. In general, composite reliability based on Raykov's rho supported the internal consistency of the scales.

Limitations

Due to the demographical nature of the study site, only Malay participants involved in this study which may affect the generalizability of the results to other ethnicities. However, it provides a culturally suitable tool for the local population. Secondly, as the traumatic events in this present study were limited to flood disaster, it is still a question whether these findings will generalize to other types of traumatic events. Thus, cross-validation studies on other populations are recommended to further support its use. In addition, the recruitment of participant in health camp would attract the participants who have physical health issue that possibly complaint more of physical or somatic illness rather than psychological illness.

Conclusion

In conclusion, the Malay version of IES-R is an instrument with good psychometric properties and therefore is a valid and reliable screening tool to assess post-traumatic stress disorder among post-disaster in Malaysian population.

Conflict of interest

The authors report no conflict of interest in this work.

Acknowledgement

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Corresponding Author
Dr Ahmad Shahril Ab. Halim
MBBS (Malaya), MMed (Psy) (USM)
Department of Psychiatry, School of Medical Sciences, Universiti Sains Malaysia,
16150 Kubang Kerian, Kelantan, Malaysia
Tel: +609-7676715
Fax: +609-7659057

Email: shahrilabhalim@usm.my