Psychometric Properties of the Malay version of Impact of Event Scale - Revised (IES-R)

Norhayati MN [1*], Aniza AA [2]

[1] *Universiti Sains Malaysia, Malaysia*
[2] *Universiti Sultan Zainal Abidin, Malaysia*

**** Corresponding Author:*** Dr Norhayati Mohd Noor
Department of Family Medicine, School of Medical Sciences, Health Campus
Universiti Sains Malaysia,16150 Kubang Kerian, Kelantan, Malaysia
Email: hayatikk@usm.my, drnorhayati_mn@yahoo.com
Tel No: +609-7676605, +6013-9388416 | Fax No: +609-7642172

Abstract

Introduction: Posttraumatic stress disorder may result from exposure to extreme psychological stress and the Impact of Event Scale (IES) was probably the most widely used tool used for its measurement.

Aim: The objective of this study was to validate the Malay version of IES-R using a confirmatory validity approach.

Methods: A cross-sectional study involving 118 women who underwent caesarian section operation in postnatal ward, Universiti Sains Malaysia Hospital was conducted. Construct validity and internal consistency was performed after the translation, content validity and face validity process. The data was analyzed using Statistical Packages for the Social Sciences (SPSS) version 20 and Analysis of Moment Structure version 18.

Results: The final model which consists of three constructs with 10 items demonstrated acceptable factor loadings, domain to domain correlation and best fit; (RMSEA=0.079, GFI=0.913, CFI=0.948, TLI=0.927, x2/df=1.697). Composite Reliability and Average Variance Extracted of the domains ranged from 0.654 to 0.847 and 0.500 to 0.827 respectively. Internal consistency reliability ranged from 0.605 to 0.845.

Conclusion: The study suggested that the three factor model with 10 items of the Malay version of IES-R was acceptable to be used to measure Posttraumatic stress disorder because it is valid, reliable and simple.

Key words: Confirmatory factor analysis, Mental health, Psychometrics, Posttraumatic stress disorder, Reliability, Validity

Running Title: Malay version IES-R

Introduction

Posttraumatic stress disorder (PTSD) may result from exposure to extreme psychological stress. More specifically, PTSD may develop following objective threat (actual or threatened death or serious injury, or a threat to the physical integrity of self or others), that elicits a typical subjective response (intense fear, helplessness or horror).[1] The disorder consists of persistent re-experiencing the causal stress condition (example, intrusive memories, flashbacks and nightmares), avoiding reminders or numbing (example, thoughts, activities and places), and hyperarousal (example, sleeping problems, irritability and difficulty concentrating).

Several instruments have been developed to measure posttraumatic stress symptoms and the Impact of Event Scale (IES) was probably the most widely used to measure traumatic stress.[2] However, the original IES cannot measure symptoms the core features of PTSD. A revised version of the IES (Impact of Event Scale - Revised, IES-R) which consist of 22 items is better to capture the DSM-IV criteria for PTSD.[3] It adds a third cluster of symptoms i.e. hyperarousal, to intrusion and avoidance subscales. The main strengths of this revised measure are that it is short, quick and easy to administer and score and may be used repeatedly to assess progress.It is intended to be used as a screening tool, not a diagnostic test.

Psychometric properties from two samples of emergency personnel exposed to a freeway collapse and workers from the 1994 Northridge showed high internal consistency with coefficient alphas ranging from 0.87 to 0.92 for intrusion, 0.84 to 0.85 for avoidance, and 0.79 to 0.90 for hyperarousal. Test–retest correlation coefficients ranged from 0.57 to 0.94 for intrusion, 0.51 to 0.89 for avoidance and 0.59 to 0.92 for hyperarousal. A principal components factor analysis with varimax rotation revealed a strong single factor accounting for 49% of the variance[3].The IES-R have been translated into different languages including Japanese,[4] Chinese,[5] Korean,[6] Sri Lanka,[7] Greek[8] and Malay;[9] and used following several traumatic events including Vietnam war,[10] tsunami,[7] surgery[11] and motor vehicle accident.[5]

The impact of an event in the case of cesarean section often related to trauma and stress. Though the incidence of PTSD was 1.7% after uneventful pregnancy,[12] it was reported to increase after pregnancy complicated by emergency cesarean section.[13-16] Women who underwent emergency caesarian section or instrumental vaginal delivery reported more symptoms of PTSD compared to women who had an elective caesarian section or a normal vaginal delivery.[16] Thus, exploring the psychometric properties of IES-R questionnaire in the Malaysian context is important for assessment of psychological health among postnatal mothers. This study is aimed to determine the psychometric properties of the Malay version of IES-R following caesarian section in Universiti Sains Malaysia (USM) Hospital, Kelantan, Malaysia.

Methodology

Translational process

The forward and backward translation was carried out by a group of experts whom consisted of researchers, linguists, physicians and medical doctors. The process of translation has been

carefully planned with the importance of ensuring the preservations of the meanings and followed by the content validity and face validity. Content validity refers to refers adequacy of the content of an instrument in term of the number and scope of the individual questions that it contains; and face validity refers to checking whether items in an instrument appear 'on the face of it' to cover the intended topics clearly and unambiguously.[17] Content validity was assessed by the expert after the production of second consensus. Face validity was assessed after the responding testingof secondMalayconsensus was done. Respondent testing was done among ten female staffs in School of Medical Science, USM. They were required to review and comment the whole questionnaire in terms of its presentation, arrangement, clarity and relatedness. Their understandings on each of item were explored.

Data collection

A cross-sectional study was conducted in Kelantan from September 2012 to April 2013. The inclusion criteria for the study were post caesarian section patients aged 18 years and older and exclusion criteria were illiterate and psychotic. Convenient sampling was applied. There were two approaches of calculations to determine sample size for this study namely Factor Analysis and Reliability. Sample size for confirmatory factor analysis (CFA) depends on the model complexity and basic measurement model characteristics. A minimum sample of 100 is required for a model with five or less latent constructs and more than three items in each latent construct.[18] The self-administered Malay version of IES-R questionnaire was distributed to women underwent caesarian section on day-3 post operation in postnatal ward, USM Hospital. Written consent was obtained. To avoid missing value that may distort the analysis, researcher checked for the completeness of each the questionnaire.

Statistical analysis

IES-R consist of 22 items assessing three major PTSD symptoms (intrusion, avoidance, hyperarousal) on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely).[3] The Intrusion subscale (8 items) is the response of items 1, 2, 3, 6, 9, 14, 16, 20; the avoidance subscale (8 items) is the response of items 5, 7, 8, 11, 12, 13, 17, 22; and the hyperarousal subscale (6 items) is the response of items 4, 10, 15, 18, 19, 21. The mean of each subscale is the mean of item responses and thus, the score for each subscale range from 0 through 4 with higher scores indicating greater impactfrom the event. Data entry and analysis for descriptive statistics and reliability analysis were conducted using Statistical Packages for the Social Sciences (SPSS) version 20 and CFA was conducted using Analysis of Moment Structure (AMOS) version 18. (Table 1)

Construct validity was assessed using CFA with three latent constructs specified for the analysis. Convergent validity is achieved when all items in a measurement model are statistically significant and Average Variance Extracted (AVE) of ≥ 0.5. AVE is the average percentage of variation explained by the items in a construct. For construct validity, several goodness of-fit indicators including: goodness of fit index (GFI), comparative fit index (CFI), Tucker-Lewis

Index (TLI) of > 0.9; *x2*/df of < 5.0 indicate acceptable level. The root mean square error of approximation (RMSEA) tests the fit of the model to the covariance matrix and value of < 0.08 is an acceptable fit [19].In addition to the overall evaluation of goodness of fit, the standardized factor loadings were examined in order to identify the misspecification for model modification. Factor loading of more than 0.6 is acceptable. Discriminant validity is achieved when the measurement model is free from redundant items.[20]

Reliability was estimated by the internal consistency and Cronbachs' alpha coefficient of ≥ 0.70 was considered satisfactory.[21] Construct Reliability (CR) is an internal consistency of the measured variables representing a latent construct and value of CR ≥ 0.6 is required; and AVE ≥ 0.5 is required.[20] The study was approved by Human Research Ethic Committee of USM.

Results

A total 118 as respondents completed the questionnaire in the study. The socio-demographic characteristics of the respondents were as shown in Table 2.

Normality assessment: Tested by two criteria namely univariate and multivariate. Univariate normality checking showed histogram and Q-Q plot of 36 items were normally distributed. The items were checked for multivariate outlier using assessment normality. The value of skewness for all items were satisfied (-2 to 2).[19] In addition, the value of multivariate kurtosis showed lower than 50.0 which support the data normality.[20] The data was normally distributed, therefore, all 118 observations were retained and used for EFA and CFA analysis.

Using table assessment normality that provided by AMOS software to check the normality of the data, the value of skewness for all items were satisfied because the value shown fall within range between -2 to +2 to indicate normal distribution.[22] In addition, the value of multivariate kurtosis for data set also showed lower than 50.0 which support the data multivariate normality distribution.[20] Therefore, all 118 observations were retained and used for CFA analysis using AMOS software.

Construct validity: Conceptual framework of Malay version of IFSAC with three latent exogenous construct was designed. Confirmatory factor analysis showed seven models were generated to achieve acceptable fitness. Model 1 (Figure 1) showed unacceptable fitness level as GFI, TLI, CFI below 0.9 and RMSEA above 0.08 (Table 3). Standardize factor loadings (Standardized regression weights) for each item was identified after constructed the full measurement model to meet criteria fitness indexes. Three items (A6, H5, I8) with factor loading of < 0.6 (ranging 0.31 to 0.46) were removed one by one, leaving 19 items for Model 2.

Model 2 showed unacceptable fitness level (Table 3). Three items (A2, H6, I2) with factor loading of< 0.6) were removed leaving 16 items for Model 3. Figure 4 showed measurement

model 3 with improved values of GFI, TLI and CFI. However, the fitness level was still unacceptable and further deletion of item A8, H2 and I6 was done.

Model 4 showed that the fitness indexes requirement level was still not achieved and two items (H4, I4) has factor loading below 0.6. Items were deleted and new measurement model was re-specified. Model 5 showed that the fitness indexes requirement level was still not achieved although all items have factor loading > 0.6. Selection for elimination of redundant items was done using Modification Indices (MI). The MI of 12.564 is considered high[20] between item 10 and item 21 which is considered redundant and its measurement errors between e10 and e21 is highly correlated. Hence, item with lower factor loading i.e. item 21 was deleted from measurement model.

Model 6 showed the fitness indexesvalue of GFI, TLI and CFI were above the requirement level of 0.9 [20]. However, since RMSEA value was still above 0.08, Mahalanobis distance was used to identify and eliminate the outlier(s). Observations 57, 61, 84 and 24 were assumed outliers[20] and were eliminated from data set and measurement model was further re-specified. Elimination of the items also consider content validity. Finally, model 7 (Figure 2) was accepted as the final model with three constructs and 10 items because it demonstrated acceptable factor loadings, domain to domain correlation and best fit.

Discriminant validity: According to Zainudin (2012), discriminant validity will achieve when a diagonal value in bold is higher than the values in its row and column (Table 4). The diagonal values in bold is the square root of AVE while other values are the correlation between the constructs. Based on Table 5, the values of diagonal of constructs (in bold) were higher than other values of correlation between constructs (other values in its row and column). Thus, discriminant validity was achieved.[20]

Convergent validity: Convergent validity assessed the items related to the proposed construct. The Average Variance Extracted (AVE) is a summary measure of convergent among the items. It is acceptable when value of AVE > 0.5.[20] Table 7 showed AVE of Intrusion (0.500), Hyperarousal (0.503), and Avoidance (0.827) construct with adequate convergent.

Reliability: Table 5 showed all three constructs had good reliability as their Composite Reliability ranged from 0.654 to 0.847 and internal consistency reliability ranged from 0.605 to 0.845. Thus, reliability for this model was satisfied.

Discussions

This is the first study that reports on psychometric properties of the Malay version of IES-R among postpartum women and none of previous studies[4,8,23-26] reported on validity and reliability of IES-R using CFA. Confirmatory factor analysis provides measurement of validity by using

AMOS. Confirmatory factor analysis based on maximum likelihood method (ML) is a parametric procedure and it relies on a number of assumptions which are basically similar to linear regression analysis.[27] The repeated process of modification was performed based on the factor loadings, correlation between domains and the model fitting. Additionally, consideration of content relatedness was applied at each step of modification. Degree of redundancy and relevance of the items to the factor were used together with the statistical criteria as a means for item removal.[27]

The initial model of 22 items were loaded into three domains and the final model with 10 items exhibited most acceptable fit (RMSEA=0.079, GFI=0.913, CFI=0.948, TLI=0.927, *x2*/df=1.697).In general, the confirmatory factor analysis suggested that the final model with 10 items had the best fit. All the CFA goodness of fit indices which include RMSEA, GFI, CFI, TLI and *x2*/df supported the model fitness.

The factor loading initial model evaluation was followed by convergent and discriminant validity. The convergent validity assessed the items related to the proposed construct. The AVE is a summary measure of convergent among the items. All the domains in the present study showed an AVE of 0.5 and above indicating adequate convergent. Therefore, all domains indicate that the items were well correlated with the construct.

CFA in present study also tested the discriminant validity of constructs through the intercorrelations among the latent factors.[28] The discriminant validity is referred to the construct should not correlate with dissimilar or unrelated variables.[29] It was presented as the square root of AVE and the these values were higher than the correlation values between the constructs.

Final evaluation involves reliability analysis. Reliability refers to the accuracy and precision of a measurement procedure.[30] The present study demonstrated all constructs had good constructs reliability as the Composite Reliability for Intrusion, Hyperarousal and Avoidance were 0.732, 0.659, 0.654 and 0.847 respectively. The Cronbach's alpha for Intrusion and Avoidance domains were highly satisfactory except for Hyperarousaldomain which was slightly low. Even though this study used 0.7 as a cut-off level for Cronbach's alpha, a minimum value of 0.60 is desirable.[31] In general, composite reliability based on CFA and Cronbach's alpha support the internal consistency of the scales.

Several limitations have been encountered during the entire process of the study. Firstly, Malay version of IES-R was only administered on a single occasion in this study, so we were unable to examine other potentially important psychometric properties such as test-retest reliability or sensitivity to change over time. cultural differences showed that the original construct does not present in our population. In addition, original author did not perform CFA and therefore, our results differ from the original study.

Conclusions

In general, the psychometric tests of the Malay version of IES-R showed satisfactory results. Ithas achieved the content validity through translational process and expert review. The

confirmatory factor analysis showed that the final model with 10 items had a good fit (RMSEA=0.079, GFI=0.913, CFI=0.948, TLI=0.927, *x2*/df=1.697). The three constructs had showed a measure of good convergent validity, discriminant validity, internal reliability and construct reliability.

Recommendation

Replication in other study population is recommended to confirm the structure and testing its invariance across samples. This would provide further evidence to support the Malay version IES-R items.

Competing Interests: The authors declare that they have no competing interests.

Authors Contribution: NMN drafted the manuscript and performed the statistical analysis. AAA helped to draft the manuscript. All authors read and approved the final manuscript.

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Table 1: IES-R subscales and items

Item	Subscale	Content
	Intrusion	
1	I1	Any reminder brought back feelings about it.
2	I2	I had trouble staying asleep.
3	I3	Other things kept making me think about it.
6	I4	I thought about it when I didn't mean to.
9	I5	Pictures about it popped into my mind.
14	I6	I found myself acting or feeling ...
16	I7	I had waves of strong feelings about it.
20	I8	I had dreams about it.
	Avoidance	
5	A1	I avoided letting myself get upset ...
7	A2	I felt as if it hadn't happened or wasn't real.
8	A3	I stayed away from reminders of it.
11	A4	I tried not to think about it.
12	A5	I was aware that I still had a lot of feelings ...
13	A6	My feelings about it were kind of numb.
17	A7	I tried to remove it from my memory.
22	A8	I tried not to talk about it.
	Hyperarousal	
4	H1	I felt irritable and angry.
10	H2	I was jumpy and easily startled.
15	H3	I had trouble falling asleep.
18	H4	I had trouble concentrating.
19	H5	Reminders of it caused me to have physical ...
21	H6	I felt watchful and on-guard.

Table 2: Socio-demographiccharacteristics

Socio-demographic characteristics	mean(SD*)	n(%)
Age (year)	30.3(6.06)	
Personal income (RM/month)	1444.5(2011.84)	
Duration of marriage (year)	4(9) †	
Parity	3(3) †	
Number of children	2(2) †	
Race		
Malay		117(99.2)
Non-Malay		1(0.8)
Occupation		
Working		96(81.4)
Not working		22(18.6)

* Standard deviation

† median (interquartile range) Skewed to the right

Table 3: The fitnes indexes of model 1- 7

Model	RMSEA	GFI	CFI	TLI	*x2*/df
Model 1	0.089	0.753	0.788	0.763	1.936
Model 2	0.094	0.782	0.814	0.787	2.034
Model 3	0.093	0.825	0.856	0.829	2.004
Model 4	0.105	0.845	0.865	0.830	2.282
Model 5	0.104	0.877	0.896	0.861	2.264
Model 6	0.088	0.904	0.934	0.907	1.900
Model 7	0.079	0.913	0.948	0.927	1.697

Table 4: The CFA results for discriminant validity

Construct	Intrusion	Hyperarousal	Avoidance
Intrusion	**0.71**		
Hyperarousal	0.756	**0.71**	
Avoidance	0.811	0.639	**0.73**

Table 5: The CFA validity and reliability results for final model (Model 7)

Construct	Item	Factor Loading	Cronbach's Alpha	CR	AVE
Intrusion	I1	0.72	0.734	0.732	0.500
	I3	0.63			
	I5	0.72			
Hyperarousal	H1	0.87	0.605	0.654	0.503
	H3	0.50			
Avoidance	A1	0.73	0.845	0.847	0.527
	A3	0.76			
	A4	0.78			
	A5	0.62			
	A7	0.73			

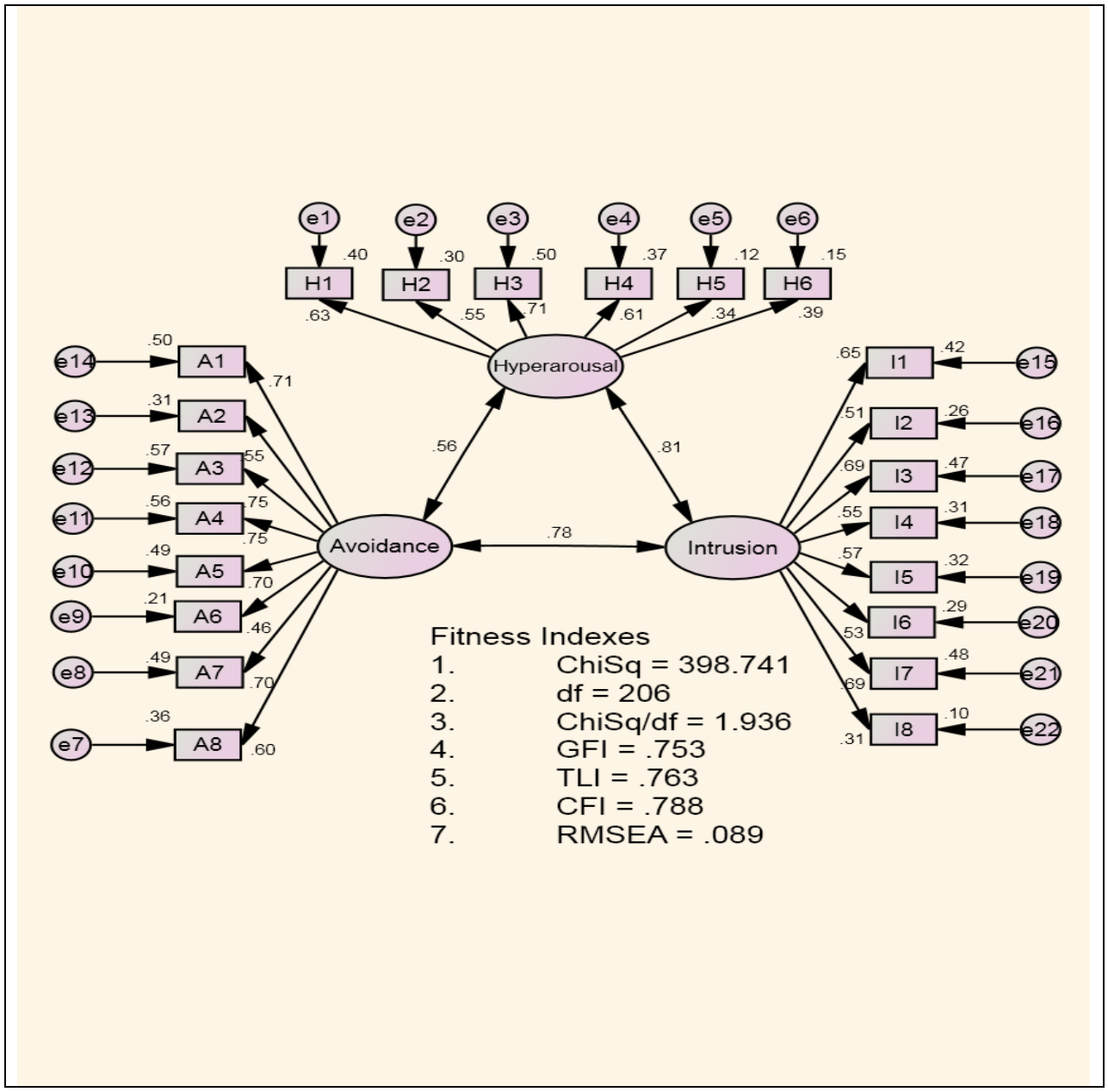

Figure 1: The IES-R measurement model based on three construct (*model 1*)

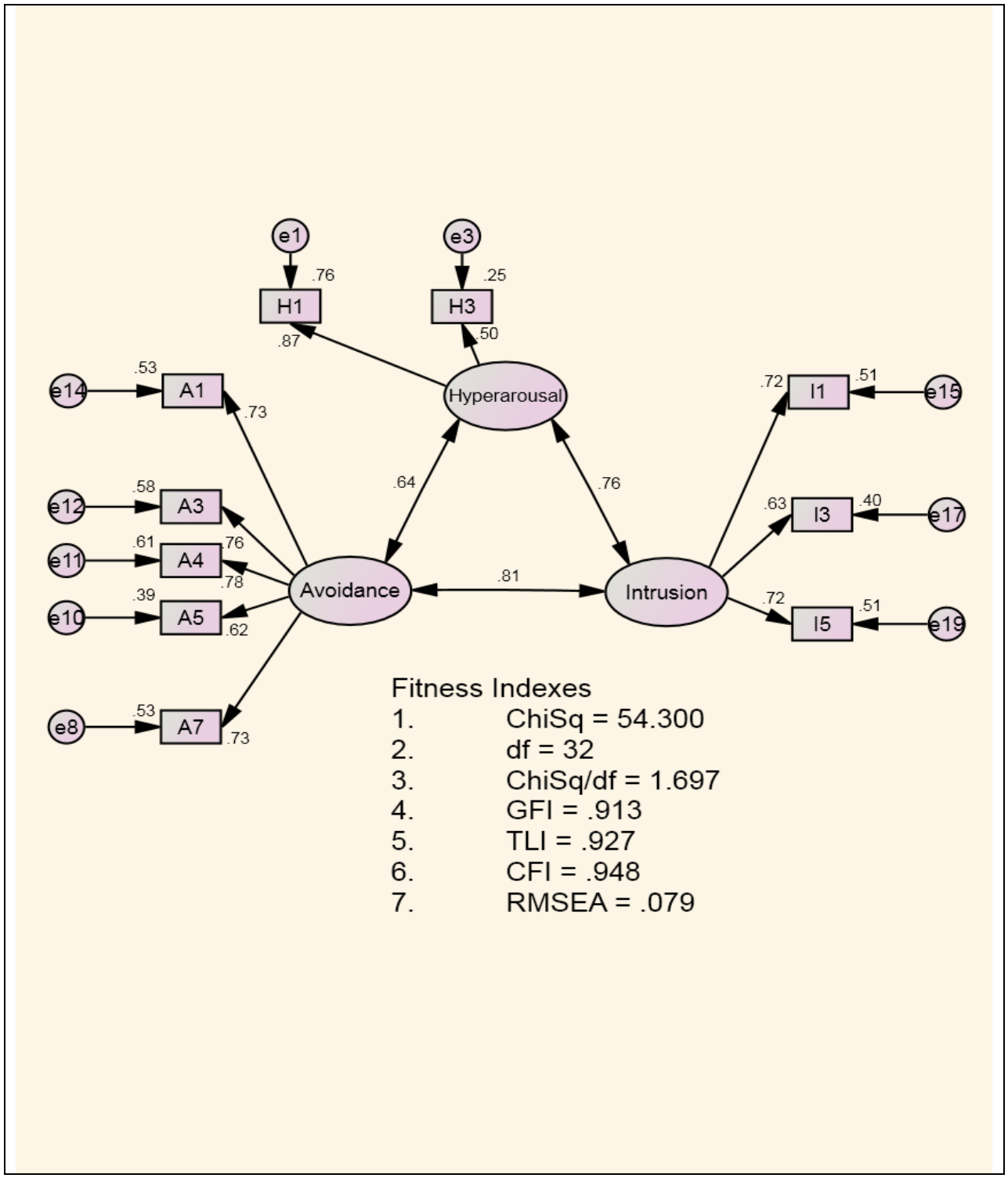

Figure 2: The measurement model after elimination of outliers (*model 7)*