

Exploratory Factor Analysis of a Sri Lankan Version of the Impact of Event Scale-Revised (IES-R-SL)

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To view a copy of the Sri Lankan version of the IES-R, please email office@traumaid.org

Abstract

An exploratory factor analysis was conducted on a Sri Lankan version of the Impact of Events Scale-Revised (IES-R-SL), a measure of posttraumatic symptoms of intrusion, avoidance and hyperarousal. Results of a principal components analysis revealed that the majority of intrusion and hyperarousal symptoms comprised a single factor, with avoidance and a dissociative item identified as separate factors. Internal consistency for the total scale and subscales was good. Changes across time indicate that the IES-R-SL is less sensitive to the core PTSD construct of hyperarousal in the immediate aftermath of trauma. Similarities between the IES-R-SL and the IES-R suggest that original scoring can be used for comparative purposes cross-culturally.

1. Introduction

The Asian tsunami that struck Sri Lanka on December 26th, 2004 left an estimated death toll of 31,000 and 7,000 people missing (Government statistics cited in Yamada et al., 2006).

Removing bodies, comforting survivors and searching for missing people in the midst of the rubble became the task of many Sri Lankans who arrived in the immediate aftermath to help. The impact of this event on the mental health of both survivors and those exposed to the immediate aftermath is largely unknown. In order to gain some understanding, availability of an easily administered self-report measure of posttraumatic responses is a preliminary step. As there were no suitable psychological instruments available in the local dialects of Sinhala or Tamil an existing self-report measure was translated.

The Impact of Event Scale (IES) was developed by Horowitz, Wilner & Alvarez (1979) as a quick and convenient measure of posttraumatic symptoms and has been used widely in many trauma contexts for over twenty years. Examples of traumatised populations where the IES has been used include: burn injuries (Lawrence, Fauerbach & Munster, 1996), nurses exposed to SARS (Chen et al. 2005), adolescents who survived a shipping disaster (Yule, Ten Bruggencate & Joseph, 1994), children taken hostage in their school (Vila, Porche & Mouren-Simeoni, 1999) and Gulf War Veterans, (Sloan, Arsenault & Hilsenroth, 2005). The scale measures posttraumatic symptoms of avoidance and intrusions (thoughts, memories and sensations) and has been shown to be a reliable and psychometrically sound measure of posttraumatic stress (Neal, Busuttil, Rollins, Herepath, Strike et al, 1994; also see Sundin & Horowitz, 2002, for a review of the psychometric properties of the IES). However, its weakness is that it does not measure hyperarousal symptoms, one of the core symptom clusters of Post Traumatic Stress Disorder (PTSD).

In order to address this weakness, Weiss and Marmar (1997) added seven more items to the Impact of Events Scale. Six items relating to anger and irritability, startle, concentration, and vigilance were included to measure PTSD symptoms of hyperarousal. One additional item relating to flashbacks of the traumatic event was also added to the intrusion subscale. This revised version of the Impact of Events Scale (IES-R) has been used as a quick assessment measure of PTSD following a range of traumatic events including, the Sarin gas dispersed in the Tokyo subway (Ohtani et al, 2004), a disaster rescue operation (Renck, Weisaeth & Skarbo,

2002), maternal breast cancer (Mosher, Danoff-Burg, & Brunker, 2005), the 2001 September 11th terrorist attacks in America (Fullerton, Ursano, Reeves, Shigemura & Grieger, 2006) and burn injuries (Willebrand, Wikehult & Ekselius, 2005).

The IES-R has good psychometric properties similar to the original IES (see Creamer et al, 2003) and has successfully been translated and validated in various languages e.g., French (Brunet, St-Hilaire, Jehel & King, 2003), Chinese, (Huang, Zhang & Xiang, 2006), Japanese (Asukai et al., 2002) and German (Maercker & Schutzwohl, 1998). It has also been shown to have good convergent validity with other measures of PTSD (Ljubotina & Muslic, 2003). The aim of the present study is to validate a Sri Lankan version of the IES-R (referred to as the IES-R-SL) in a community sample exposed to the 2004 tsunami. Additionally, as it has been suggested that the factor structure of the IES-R may vary according to the time administered post trauma (see Creamer et al, 2003; Weiss & Marmar, 1997) the factor structure over time is also investigated.

2. Method

2.1 Participants

Participants were 304 adults from various people-helping professions who attended trauma management workshops in Sri Lanka following the 2004 tsunami. All participants had been directly exposed to the immediate aftermath of the tsunami through various professional and lay helping roles. Participants spoke Tamil or Sinhala with English as a second language in some cases. Demographics such as age, gender and language are unknown due to requests for complete anonymity.

2.2 Impact of Events Scale-Revised

The Impact of Events Scale-Revised is a 22-item self-report measure of current subjective distress for a specific traumatic event. Respondents are asked to rate on a 5-point Likert scale (0 = not at all; 1 = a little bit; 2 = moderately; 3 = quite a bit; 4 = extremely) how distressing symptoms of avoidance, hyperarousal and intrusions have been in the past seven days. Creamer et al. (2003) identified scores above 33 as a reliable cut-off score for the detection of PTSD (sensitivity = 0.91, specificity = 0.82,). Huang, Zhang and Xiang (2006) identified scores above 34 as reliable cut-off scores for the detection of PTSD (sensitivity = 0.86, specificity 0.86). The

IES-R was translated into Tamil and Sinhala by local translators working with the author and then back translated for validation. As Tamil and Sinhala can both be spoken within the same community group, the Sri Lankan version of the IES-R (IES-R-SL) comprised each item of the IES-R being written in both languages (see Appendix B).

2.3 Procedure

The principal researcher administered the IES-R-SL to participants attending a trauma management workshop held in Colombo and Batticaloa, Sri Lanka three weeks after the Tsunami. With the assistance of local translators, participants were given instructions on how to fill out the IES-R-SL and procedures to follow should they become distressed whilst completing it. The IES-R-SL was then distributed to participants to complete and return anonymously to a central collection point.

Six months after the initial data collection, Sri Lankan colleagues mailed the IES-R-SL to participants to complete for a follow-up measure. Of the 304 participants who were sent the IES-R-SL, 147 completed them and mailed them anonymously to a central mailing address in Colombo. The returned IES-R-SL forms were then mailed to Australia for analysis.

2.4 Analysis

A principal components analysis (PCA) with varimax rotation was conducted on data at both time points separately to assess the construct validity of the IES-R-SL and to allow observation of any changes over time. In line with the Creamer et al, (2003) study that explored the psychometric properties of the IES-R, factor loadings greater than 0.40 were considered to be significant. Internal consistency for the IES-R-SL and its subscales was calculated using Cronbach's coefficient alpha. SPSS (version 12) was used for all statistical analyses.

3. Results

Of the 304 forms collected at three weeks post-tsunami there were 240 with all 22 questions of the IES-R completed, so only these 240 forms were included in the analysis. Of the 147 returned at six months post-tsunami, 138 had all 22 questions completed and thus these 138 were included in the second analysis.

Mean scores, standard deviations, and alphas for the total score and the three subscales of intrusion, avoidance, and hyperarousal at three weeks and six months post-tsunami are shown in Table 1 (over page).

Table 1. Mean scores, standard deviations (SD) and alphas for IES-R-SL at three weeks and six months post-tsunami.

	Three weeks post-tsunami			Six months post-tsunami		
	Mean	SD	Alpha	Mean	SD	Alpha
Total	37.95	15.11	.88	35.99	17.63	.92
Hyperarousal	9.43	4.92	.68	8.49	6.04	.85
Intrusion	15.32	6.69	.83	14.28	8.04	.91
Avoidance	13.20	6.29	.75	13.22	6.71	.80

Cut-off scores are to be used with caution and can only be taken as an indication of potential PTSD if assessed one month after the traumatic event. However, for purposes of exploring the course of PTSD, percentages above the recommended cut-off of 33 (Creamer et al., 2003) will be reported. At three weeks post-tsunami 59% of respondents had a total score above 33 and at six months post-tsunami 54% of respondents had a total score above 33. These percentages indicate the potential presence of PTSD in a large proportion of the participants.

3.1 Internal consistency

As can be seen in Table 1, Cronbach's coefficient alpha for the IES-R-SL was high at both three weeks and six months post-tsunami (.88 and .92). This indicates very good internal consistency for the whole scale. The intrusion subscale was also high (.83 and .91). Cronbach's coefficient alpha for the avoidance subscale was moderate to high (.75 and .80). At three weeks post-tsunami, the hyperarousal subscale was much weaker (.68) but increased to a level comparable to the other two subscales at six months post-tsunami (.85). Correlations between the three subscales are shown in Table 2. There is a high correlation between hyperarousal and intrusion (.87 and .89). The much lower correlation between avoidance and hyperarousal (.52 and .51) and avoidance and intrusion (.44 and .39) suggests that avoidance may reflect a separate construct to the other two highly correlated factors.

Table 2. Pearson correlations between total IES-R-SL score and subscales

	Total		Intrusion		Avoidance		Hyperarousal	
	T1	T2	T1	T2	T1	T2	T1	T2
Total	1		.875**	.890**	.781**	.734**	.883**	.919**
Intrusion					.438**	.390**	.767**	.836**
Avoidance							.522**	.513**
Hyperarousal								1

** Correlation is significant at the 0.01 level (2-tailed)

3.2 Factorial Structure of the IES-R-SL

Three weeks post-tsunami

A principal components analysis (PCA) with varimax rotation was conducted. The PCA identified five components with an eigenvalue > 1.0 accounting for 54.96% of the variance. However, as two components were single items, (item 5 and item 7), Catell's scree test was applied to determine the optimal number of components for extraction. The scree plot indicated a large first factor (eigenvalue = 6.48), and two other factors (eigenvalue = 2.17 and 1.23). A second PCA varimax rotation was then conducted with a forced three-factor solution. Table 3 (over page) outlines the results of the forced three-factor solution with significant factor loadings highlighted in bold.

Item 19 loaded onto two factors and item 16 loaded positively onto one factor and negatively on another. Item 5 and 21 failed to load onto their assigned subscales of avoidance and hyperarousal. Factor 1 accounted for 22.6% of the variance and had loadings on 13 items. Factor 2 accounted for 16.63% of the variance and had loadings on 7 items. Factor 3 accounted for 5.7% of the variance and had loadings on 4 items. The three factors were characterised as intrusion/hyperarousal, avoidance and shock.

Table 3. Three weeks post-tsunami. Principal components analysis of IES-R: three-factor solution $n = 240$

IES-R Item	Communality	Factor 1	Factor 2	Factor 3
		Intrus/Hyper	Avoidance	Shock
1. Any reminder brought back feelings about it	0.39	0.62	0.26	- 0.07
2. I had trouble staying asleep	0.43	0.64	0.10	- 0.00
3. Other things kept making me think about it	0.45	0.66	0.07	- 0.09
4. I felt irritable and angry	0.35	0.58	- 0.02	0.11
5. I avoided letting myself get upset when I thought about it or was reminded of it	0.36	0.10	0.38	- 0.45
6. I thought about when I didn't mean to	0.52	0.69	0.18	- 0.14
7. I felt as if it hadn't happened or wasn't real	0.41	0.08	0.27	0.58
8. I stayed away from reminders about it	0.51	-0.10	0.69	0.19
9. Pictures about it popped into my mind	0.48	0.62	0.22	- 0.20
10. I was jumpy and easily startled	0.32	0.46	0.32	0.10
11. I tried not to think about it	0.55	0.10	0.73	0.13
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	0.36	0.30	0.51	- 0.08
13. My feelings about it were kind of numb	0.37	0.09	0.57	- 0.17
14. I found myself acting or feeling as though I was back at that time	0.60	0.67	0.15	0.34
15. I had trouble falling asleep	0.52	0.70	0.18	0.06
16. I had waves of strong feelings about it	0.57	0.50	0.38	- 0.41
17. I tried to remove it from memory	0.58	0.19	0.73	0.11
18. I had trouble concentrating	0.37	0.51	0.31	0.13
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	0.45	0.47	0.22	0.43
20. I had dreams about it	0.52	0.65	0.25	0.17
21. I felt watchful or on-guard	0.32	0.23	0.52	0.02
22. I tried not to talk about it	0.46	0.15	0.66	0.01

Six months post- tsunami

A principal components analysis (PCA) with varimax rotation was conducted on the data collected at six months post-tsunami. The PCA identified four components with an eigenvalue > 1.0 accounting for 61.8% of the variance. Due to a single item (item 7) on factor 4, Catell's scree test was applied to determine the optimal number of components for extraction. As with the analysis conducted at three weeks post-tsunami, the scree plot indicated a large first factor (eigenvalue = 8.72), and two other factors (eigenvalue = 2.17 and 1.23). A second PCA with varimax rotation was then conducted with the forced three-factor solution. Table 4 outlines the results of the forced three-factor solution with significant factor loadings highlighted in bold.

A similar factor structure to that identified at three weeks post-tsunami resulted with the exception of item 5 that now loaded onto the assigned avoidance scale. Factor 1 accounted for 39.63% of the variance and had loadings on 14 items. Factor 2 accounted for 12.6% of the variance and had loadings on 8 items. Factor 3 accounted for 6.24% of the variance and loaded onto a single item. Factors were characterised as intrusion/hyperarousal and avoidance with a single item representing numbing.

Table 4. Six months post-tsunami. Principal components analysis of IES-R: three-factor solution. $n = 138$

IES-R Item	Communality	Factor 1	Factor 2	Factor 3
		Intrus/Hyper	Avoidance	Numbing
1. Any reminder brought back feelings about it	0.59	0.77	0.02	- 0.07
2. I had trouble staying asleep	0.64	0.79	0.14	0.02
3. Other things kept making me think about it	0.60	0.77	0.11	0.03
4. I felt irritable and angry	0.48	0.66	0.10	- 0.18
5. I avoided letting myself get upset when I thought about it or was reminded of it	0.49	0.07	0.68	- 0.16
6. I thought about when I didn't mean to	0.61	0.76	0.08	0.17
7. I felt as if it hadn't happened or wasn't real	0.73	0.21	0.12	0.82
8. I stayed away from reminders about it	0.56	0.10	0.73	0.11
9. Pictures about it popped into my mind	0.59	0.74	0.04	0.19
10. I was jumpy and easily startled	0.66	0.79	0.18	0.09
11. I tried not to think about it	0.60	0.15	0.73	- 0.21
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	0.38	0.25	0.45	0.34
13. My feelings about it were kind of numb	0.33	- 0.32	0.53	0.22
14. I found myself acting or feeling as though I was back at that time	0.56	0.70	0.17	0.19
15. I had trouble falling asleep	0.70	0.80	0.14	0.22
16. I had waves of strong feelings about it	0.61	0.73	0.23	0.17
17. I tried to remove it from memory	0.61	0.22	0.75	0.00
18. I had trouble concentrating	0.55	0.68	0.30	0.07
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	0.54	0.70	0.20	0.02
20. I had dreams about it	0.57	0.68	0.09	0.31
21. I felt watchful or on-guard	0.54	0.42	0.58	0.20
22. I tried not to talk about it	0.66	0.14	0.73	0.32

The assigned hyperarousal and intrusion items loaded onto the same factor at both time points. Items assigned to the avoidance scale by Weiss & Marmar (1997) all loaded onto the avoidance factor with the exception of item 5 ("I avoided letting myself get upset when I thought about it or

was reminded of it”) at three weeks post-tsunami and item 7 (“I felt as if it hadn’t happened or wasn’t real”) that remained a separate item at both three weeks and six months post-tsunami. Item 21 (“I felt watchful and on-guard”) loaded onto avoidance rather than its assigned hyperarousal grouping at three weeks post-tsunami and then loaded onto both avoidance and intrusion/hyperarousal at six months post-tsunami.

4. Discussion

This study conducted an exploratory factor analysis on a Sri Lankan version of the IES-R administered at two different time points after the 2004 tsunami. The Cronbach coefficient alphas for the total scale were high (.88 and .92). Cronbach coefficient alphas for the intrusion (.83 and .91) and avoidance subscales (.75 and .80) at both time points were high with the hyperarousal subscale at 6 months post-tsunami reaching equivalent reliability (.85). These results indicate that the IES-R-SL has good internal consistency and is therefore a useful tool in the assessment of traumatic stress responses.

The weaker alpha (.68) for the hyperarousal subscale at three weeks post-tsunami is similar to that reported by Baumert, Simon, Gundel, Schmitt and Ladwig (2004). They reported an alpha of .66 on the hyperarousal subscale of the IES-R. At six months post-tsunami the alpha for the hyperarousal scale (.85) was comparable to that identified by Weiss and Marmar (1997) in their large-scale study on the psychometric properties of the IES-R (reported alphas of .79 to .90). The initial low alpha for the hyperarousal scale may be a result of the high arousal levels across the majority of people at three weeks post-tsunami. At six months post-tsunami, the greater variation in hyperarousal scores across participants may have increased the sensitivity of the scale to detect core posttraumatic hyperarousal symptoms.

The intrusion and hyperarousal subscales in this study were highly correlated at both three weeks (.77) and six months (.84) post-tsunami and predominantly loaded onto a single factor. This finding is in accordance with Asukai et al, (2002) and Creamer et al. (2003). The interrelation between these two factors across studies suggests that both subscales may be measuring the same underlying traumatic stress reaction.

Item 7 (“I felt as if it hadn’t happened or wasn’t real”) remained a separate factor across both time points. This separation of item 7 from its assigned scale matches similar factorial studies

with both the original IES (e.g., Amdur & Liberzon, 2001; Andrews, Shevlin Troop & Joseph, 2004; Thatcher & Krikorian, 2005) and the IES-R (e.g., Creamer et al., 2003; Brunet et al., 2003), suggesting it may represent a distinct construct from hyperarousal/intrusion and avoidance. Item 7 may represent a dissociative factor not currently assessed adequately by the IES-R. A factor analytic study by McWilliams, Cox & Asmundson (2004) suggested that individuals with PTSD who experience numbing do not experience avoidance, thus reinforcing the inappropriateness of assigning this item to the avoidance subscale in the original IES-R.

Finally, item 21 (“I felt watchful or on guard”) loaded onto avoidance at three weeks post-tsunami and then both avoidance and hyperarousal/intrusion at six months post-tsunami rather than its assigned hyperarousal grouping. This difference is likely due to the literal Tamil translation of item 21. The literal translation of the Tamil version is: “I was sensible to be watchful or to guard myself”. Here the Tamil word for sensible could also be interpreted as mindful, but sensible is the most common meaning. The Tamil word for watchful could also be interpreted as careful, and careful may be the most common meaning taken by the reader. Similarly the Tamil word used for guard could also be interpreted as protect, and protect may be the meaning taken by some or many readers. The question may thus be read as either “I was sensible to be watchful or to guard myself” or “I was mindful to be careful and protect myself”. Both of these translations clearly represent active avoidance behaviour whereas the Sinhala version is literally translated as "I was always expecting it to come again" which is more in line with the English meaning of increased arousal to danger.

Without further validation of the IES-R-SL with other PTSD measures and clinical assessments the cut-off scores should be applied cautiously. It should be noted however, that the cut-off scores indicate a potential high rate of PTSD in the participants six months after the tsunami. A related study by Dawson, Ariadurai and Satchithanandakumar (2007) explores possible mediating factors for the potential high rate of PTSD.

In summary, the IES-R-SL is consistent with other studies that explored the factorial structure of the IES-R. High reliability coefficients were found for the total scale and subscales and identified factors were in accordance to that reported in other studies. Similar weaknesses also emerge in this study to those reported in English, French and Japanese versions of the IES-R. Given the similarities across all aspects of the IES-R-SL to other versions of the IES-R it is

concluded that the IES-R-SL can be scored according to the original IES-R for comparative purposes cross-culturally.

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