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The structure of post-traumatic stress symptoms in survivors of war: Confirmatory factor analyses of the Impact of Event Scale—Revised

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ABSTRACT

The study aimed at establishing the factor structure of the Impact of Event Scale—Revised (IES-R) in survivors of war. A total sample of 4167 participants with potentially traumatic experiences during the war in Ex-Yugoslavia was split into three samples: two independent samples of people who stayed in the area of conflict and one sample of refugees to Western European countries. Alternative models with three, four, and five factors of post-traumatic symptoms were tested in one sample. The other samples were used for cross-validation. Results indicated that the model of best fit had five factors, i.e., intrusion, avoidance, hyperarousal, numbing, and sleep disturbance. Model superiority was cross-validated in the two other samples. These findings suggest a five-factor model of post-traumatic stress symptoms in war survivors with numbing and sleep disturbance as separate factors in addition to intrusion, avoidance and hyperarousal.

1. Introduction

The Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) has been widely used to assess symptoms of post-traumatic stress. It contains seven items on intrusion and eight on avoidance reflecting Horowitz's understanding that stress responses following traumatic events are mainly intrusion and avoidance. In response to the DSM-IV (APA, 1994) assumption of a tripartite structure of symptoms of post-traumatic stress disorder (PTSD), Weiss and Marmer (1997) developed a revised version of the scale, the IES-R. In addition to intrusion and avoidance items, IES-R includes items capturing hyperarousal as the third main criterion for PTSD. The avoidance items remained the same as in the original version whilst the original intrusion subscale underwent two minor changes. The item "I had trouble falling asleep or staying asleep" was split into two. The first part of the item remained in the intrusion subscale and the second part ("I had trouble staying asleep") was put into the hyperarousal subscale. A new item on dissociative-like re-experiencing ("I found myself acting or feeling like I was back at that time") was added to the intrusion subscale. Weiss and Marmer (1997) reported high internal consistencies of the three subscales of avoidance, intrusion, and hyperarousal, with alpha coefficients ranging from 0.79 to 0.92, and high test–retest reliabilities, with correlation coefficients ranging from 0.51 to 0.92.

Findings on the factor structure of the original IES have been inconsistent. Several studies have supported the two-factor structure of the IES as suggested by Horowitz (e.g., Shevlin, Hunt, & Robbins, 2000; Zilberg, Weiss, & Horowitz, 1982). Other studies have suggested models with three or four factors. Conducting confirmatory factor analyses (CFA) in a sample of 321 individuals who witnessed the shooting of seven people, Larsson (2000) tested one-, two-, and three-factor models. Only the three-factor model with intrusion, avoidance, and sleep disturbance as factors provided a

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satisfactory fit. In a sample of 195 combat veterans Amdur and Liberzon (2001) found the best fit for an additionally tested four-factor model, with intrusion, avoidance, sleep disturbance, and numbing as factors. Results of two other CFAs (Andrews, Shevlin, Troop, & Joseph, 2004; Witteveen et al., 2006) were consistent with this suggestion of a four-factor model.

Research on the factor structure of the IES-R has also shown inconsistent findings. Weiss and Marmer (1997) conducted an exploratory factor analysis (EFA) with varimax rotation that yielded a single factor accounting for 49% of the variance, i.e., not providing evidence for the three-factor solution. In the discussion of their findings, the authors pointed out that the subjects in their study had rather low symptom levels and that this may have influenced the results. Creamer, Bell, and Failla (2003) tested a three-factor model with intrusion, avoidance, and hyperarousal in a CFA in 120 Vietnam veterans and 154 participants from a community sample. The model deviated significantly from good fit. The authors did not test any alternative models, but conducted an additional EFA. This showed two solutions with similar fit, i.e., single- and two-factor models with intrusion/hyperarousal and avoidance. Similar results were found in a study by Olde, Kleber, van der Hart, and Pop (2006) who conducted a CFA of the IES-R in 435 women who recently gave birth. A relative fit index, the incremental fit index, was however below 0.90, indicating a non-satisfactory fit (Hu & Bentler, 1998). Beck et al. (2008) studied 182 survivors of motor vehicle accidents and the initial results of their CFA failed to support the three-factor structure of the IES-R. After modifying some indices, such as freeing error covariances among items with a common theoretical ground, the model provided a better fit to the data, but the comparative fit index had still a value of 0.89 suggesting a non-acceptable model fit (Hu & Bentler, 1998). Again, the authors did not test alternative models. Eid et al. (2009) tested the factor structure of the IES-R among 312 Norwegian students who had been exposed to media reports of the Tsunami disaster in the weeks following the event. They reported that the original three-factor model exhibited the best fit. However, this model had a goodness-of-fit index of 0.86 still indicating a non-acceptable fit. Here too, only two- and three-factor models were tested.

Inconsistent findings on the factor structure of the IES-R may be influenced by four major methodological limitations of existing studies. (A) Sample sizes were below 500 and may have been too small to establish reliable findings. In particular, the samples were not sufficiently large to be split into independent subsamples so that findings in one group of participants could be cross-validated in another group. (B) Some of the studies assessed symptoms following stressful, but not necessarily life threatening events so that the nature of the measured symptoms remains unclear (Eid et al., 2009; Olde et al., 2006). (C) The level of symptom severity varied and some studies included a large proportion of participants with no or very few post-traumatic stress symptoms which may have influenced the factor structure (Weiss, 2004). Sensitivity analyses excluding people with no symptoms or very low symptom levels were not undertaken in these studies. And (D) most studies did not test four- and five-factor solutions although some research on the original IES (Amdur & Liberzon, 2001) and on instruments for assessing post-traumatic stress symptoms other than the IES-R suggest such models.

Against this background, we studied the factor structure of the IES-R in a large sample of individuals who had all experienced war-related potentially traumatic events in the countries of former Yugoslavia. We tested three-, four-, and five-factor models first in a subsample and used two other subsamples for cross-validation. Furthermore, we tested whether the exclusion of participants with low symptom levels (i.e., IES-R score of $\leq$11) would change the results, and repeated the CFAs in sensitivity analyses with only those participants who had an IES-R score of higher than 11, i.e., an average score of higher than 0.5 for each item of the IES-R.

The model specification was based on previous studies on the factor structure of the IES and IES-R and the more general literature on the structure of PTSD symptoms. Although items of the IES-R are not directly related to the detailed DSM-IV (APA, 1994) criteria for PTSD, the scale contains the same cluster structure as the PTSD concept in DSM-IV and measures the core constructs of intrusions, avoidance, and hyperarousal (Creamer et al., 2003). Overall, studies on the structure of PTSD symptoms have failed to provide support for the three clusters of PTSD as defined in DSM-IV (e.g.,

Table 1
Model specification for five alternative models of post-traumatic stress symptoms.

IES-R items	Model				
	3	4a	4b	4c	5
Any reminder brought back feelings about it	I	I	I	I/H	I
I had trouble staying asleep	I	I	D	I/H	SD
Other things kept making me think about it	I	I	I	I/H	I
I felt irritable and angry	H	H	D	Hv	H
I avoided letting myself get upset when I thought about it or was reminded of it	A	A	A	A	A
I thought about it even when I didn't mean to	I	I	I	I/H	I
I felt as if it hadn't happen or it wasn't real	A	N	D	N	N
I stayed away from reminders of it	A	A	A	A	A
Pictures about it popped into my mind	I	I	I	I/H	I
I was jumpy and easily startled	H	H	H	Hv	H
I tried not to think about it	A	A	A	A	A
I was aware that I still had a lot of feelings about it, but I didn't deal with them	A	A	D	A	A
My feelings about it were kind of numb	A	N	D	N	N
I found myself acting or feeling like I was back at that time	I	I	I	I/H	I
I had trouble falling asleep	H	H	D	I/H	SD
I had waves of strong feelings about it	I	I	I	I/H	I
I tried to remove it from my memory	A	A	A	A	A
I had trouble concentrating	H	H	D	I/H	H
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart	H	H	H	I/H	H
I had dreams about it	I	I	I	I/H	SD
I felt watchful and on guard	H	H	H	Hv	H
I tried not to talk about it	A	A	A	A	A

Note: I = intrusion; A = avoidance; H = hyperarousal; N = numbing; D = dysphoria, Hv = hypervigilance; SD = sleep disturbance.

Amdur and Liberzon, 2001; King, Leskin, King, & Weathers, 1998; Rasmussen, Smith, & Keller, 2007; Simms, Watson, & Doebbeling, 2002). Most studies support four-factor models of PTSD symptoms, albeit in different forms (Asmundson, Stapleton, & Taylor, 2004). Four-factor models with the best fit among the tested models are those with the factors of intrusion, avoidance, numbing, and hyperarousal (King et al., 1998); dysphoria, intrusion, avoidance, and hyperarousal (Simms et al., 2002); and aroused intrusion, numbing, avoidance, and hypervigilance (Rasmussen et al., 2007).

Based on the literature, the following five models were tested (see Table 1). *Model 3* is a three-factor model with eight items loading on the intrusion factor, eight items on the avoidance factor, and six items on the hyperarousal factor. This model reflects the theoretical factor structure of the IES-R as specified by its authors. *Model 4a* is based on the findings by King et al. (1998) and specifies a correlated four-factor model with eight items loading on the intrusion factor, six items on the avoidance factor, six items on the hyperarousal factor, and two items on the numbing factor. *Model 4b* is based on the findings by Simms et al. (2002) and suggests four correlated factors with seven items loading on the intrusion factor, five items on the avoidance factor, seven items on the dysphoria factor, and three items on the hyperarousal factor. *Model 4c* is a correlated four-factor model based on the findings by Rasmussen et al. (2007) in Central African refugees. In this model, 11 items are hypothesized to load on the intrusion/hyperarousal factor, two items on the numbing factor, six items on the avoidance factor, and three items on the hypervigilance factor. Finally, *Model 5* has five correlated factors with six items loading on the intrusion factor, six items on the avoidance factor, five items on the hyperarousal factor, two items on the numbing factor, and three items on the sleep disturbance factor. *Model 5* reflects the findings on the original IES by Amdur and Liberzon (2001) and others (Andrews et al., 2004; Witteveen et al., 2006). It is theoretically based on the assumption that those items of the IES-R which also were in the original IES will have the same factor structure as shown in the study by Amdur and Liberzon (2001), and that the new subscale on hyperarousal will largely form a factor on its own (with the exception of item 15 "I had trouble falling asleep" that became part of the subscale on sleep disturbance).

2. Methods

2.1. Procedure

The data obtained in a multi-centre study assessing long-term mental health outcomes in people who had experienced potentially traumatic events during the war in Ex-Yugoslavia and had either stayed in the countries of conflict (Bosnia–Herzegovina, Croatia, Kosovo, Macedonia, and Serbia) or taken refuge in Western European countries (Germany, Italy, and the United Kingdom (UK)). The rationale of the study and its methods have been described in detail elsewhere (Priebe et al., in press, 2004).

The sampling procedure in the countries of former Yugoslavia followed a randomized multi-stage probabilistic cluster-sampling frame (Priebe et al., in press). In Germany, Italy, and the UK the sampling procedure was less rigorous and had to be compromised for various reasons. Most importantly, in these countries there are no areas with a sufficient density of survivors of war in Ex-Yugoslavia to use a random walk method for recruitment. In Germany and Italy potential interviewees were identified through local resident registers and snowball sampling. Potential participants on resident registers were sent invitation letters. In the case of no response, participants were sent two additional reminder letters. In the absence of accessible resident registers in the UK, potential interviewees were contacted through community organizations and snowball sampling.

Table 2
Socio-demographic, trauma-related characteristics, and the distribution of the IES-R scores of the samples in the Balkan countries and in Western European countries.

	Balkan countries (*N* = 3313)	Western countries (*N* = 854)
Female gender	1793 (53.8)	438 (51.3)
Age	42.5 (12.0)	41.6 (10.8)
Marital status		
Married/cohabiting	2328 (70.3)	652 (76.3)
Single	606 (18.3)	89 (10.4)
Divorced/separated	176 (5.3)	76 (8.9)
Widowed	202 (6.1)	37 (4.3)
Education level attained		
None or primary education	1007 (30.4)	188 (22.0)
Secondary school	1618 (48.8)	354 (41.5)
Vocational/tertiary	688 (20.8)	312 (36.5)
Employment status		
Employed	1188 (35.9)	351 (41.1)
Unemployed	1545 (46.6)	438 (51.3)
Retired	439 (13.3)	31 (3.6)
Training/education	141 (4.3)	34 (4.0)
Combat involvement	578 (17.4)	192 (22.5)
Number of pre-war traumatic events	0.7 (1.1)	1.1 (1.3)
Number of war traumatic events	4.2 (2.8)	6.8 (3.6)
Number of post-war traumatic events	0.6 (0.8)	1.1 (1.3)
Time since most traumatic war trauma (years)	8.1 (3.3)	10.5 (3.1)
IES-R total	24.2 (23.2)	31.8 (26.8)
Intrusion	9.1 (9.0)	12.5 (10.5)
Avoidance	8.8 (8.4)	11.2 (9.4)
Hyperarousal	6.3 (6.9)	8.6 (8.2)

Note: Socio-demographic data are presented as *N* (%), trauma-related characteristics and the IES-R scores are presented as *M* (SD); IES-R = Impact of Event Scale—Revised.

The total refusal rate in the countries of former Yugoslavia was 29.9%. In the countries of Western Europe, the rates of individuals who participated in the study were much lower (52.9%), and we cannot establish the response rates for snowball sampling.

2.2. Participants

Altogether, 3313 participants in the countries of Ex-Yugoslavia and 854 refugees living in Western European countries were interviewed in the study. Socio-demographic characteristics and trauma-related variables are reported in Table 2. Participants who still lived in the regions of former conflict and refugees did not significantly differ in terms of gender, age, or education (all $ps > 0.01$[1]). However, there were differences as to employment status, with fewer refugees being retired than participants in the Balkans ($ps < 0.001$). Furthermore, more participants in the Western countries were married (76.3% vs. 70.3%).

For purpose of cross-validation, the group of war survivors still living in Ex-Yugoslavia ($N = 3313$) was randomly divided in two samples. The sample for the first CFA consisted of 1662 participants and the other sample of 1651 participants. The refugee group was used as another sample for cross-validation.

To test the effect of the inclusion of participants with low level symptoms, we conducted additional CFAs in sensitivity analyses including only those participants who had an IES-R score of higher than 11, i.e., an average score of higher than 0.5 for each item of the IES-R. This procedure excluded 1369 participants (i.e., 41.3%) from the sample in countries of Ex-Yugoslavia and 271 (i.e., 31.7%) participants in Western European countries. The resulting sample sizes for the sensitivity analyses were 1944 for the countries of Ex-Yugoslavia and 583 for sample in Western European countries. The

[1] Due to the large sample sizes, it was decided to set a significance level of 0.01.

Balkan sample was then randomly divided into two groups ($N = 962$ and $N = 982$) to match the design of primary analyses.

2.3. Measures

The Life Stressor Checklist—Revised (Wolfe & Kimerling, 1997) was used in an amended form to assess 24 potentially types of war-related traumatic events.

The Impact of Event Scale—Revised (IES-R; Weiss & Marmer, 1997) was used to assess post-traumatic stress reactions. A detailed description of this scale was offered above. The responses of the 22 items range from 0 (“not at all”) to 4 (“extremely”).

2.4. Data analysis

Five confirmatory factor models were specified and estimated using M*plus* 5 (Muthén & Muthén, 1998–2007). To account for the ordinal level of measurement of the items and the complexity of the models to be tested, a robust weighted least square estimator of model parameters, the WLSMV estimator (Muthén et al., in press) implemented in M*plus*, was used. Specification of the five models was as shown in Table 1. All factors were allowed to correlate and no correlated errors were included in any of the models. To evaluate overall model fit, different fit indices were used as recommended by Bollen and Stine (1993). The chi-square test statistic was used to test the model fit. A non-significant *p*-value indicates a good model fit. Furthermore, the root mean square error of approximation (RMSEA; Steiger, 1990) was used as descriptive index of model fit. For this index, values of <0.05 represent excellent model fit, values of 0.05–0.08 represent moderate fit, and values of 0.08–0.10 represent acceptable fit (Browne & Cudeck, 1993). Finally, a comparative index was also used: the Tucker–Lewis index (TLI; Bentler & Bonett, 1980), with values of >0.97 indicating a good model fit and values of 0.95–0.97 indicating an acceptable model fit (Hu & Bentler, 1995, 1998, 1999).

As outlined above, primary analyses were conducted with all participants who had reported war-related traumatic experiences. Sensitivity analyses were based on IES-R scores of higher than 11 in two randomly divided samples of war survivors still living in the areas of former conflict ($N = 962$ and $N = 982$) and among 583 refugees as an additional sample.

3. Results

3.1. Preliminary results

All participants reported exposure to at least one war-related potentially traumatic event that can be regarded as equivalent to the objective component of the stressor criterion 1A of PTSD described by the DSM-IV. The most reported traumatic events among both refugees and participants in the areas of former conflict were “shelling or bombardment” (85.1% of the refugees vs. 84.6% of the participants in the Balkans), followed by “lack of shelter” (64.5% of the refugees vs. 51.4% of the participants in the Balkans), “siege” (59.5% of the refugees vs. 40.1% of the participants in the Balkans), and “murder or death of a close person due to violence” (60.8% of the refugees vs. 35.9% of the participants in the Balkans). Further information is reported in Table 2. On average, refugees in the Western countries reported a significantly higher number of traumatic events ($M = 6.76$, $SD = 3.62$) than the participants still living in the areas of former conflict ($M = 4.17$, $SD = 2.79$, $t(4165) = 22.61$, $p < 0.001$).

The IES-R had a high and similar internal consistency of the total scale as well as of the three subscales for all samples ranging from with $\alpha = 0.92$ to $\alpha = 0.95$ for all samples. The distribution of the IES-R scores is reported in Table 2.

Table 3
Goodness-of-fit indices for the models of IES-R in sample 1 ($N = 1.662$).

Model	χ^2	df[a]	*p*	RMSEA	CFI	TLI
3	1717	100	<0.001	0.099	0.936	0.994
4a	1702	101	<0.001	0.098	0.937	0.994
4b	1693	100	<0.001	0.098	0.937	0.994
4c	1611	98	<0.001	0.096	0.940	0.995
5	1167	106	<0.001	0.078	0.958	0.996

[a] The degrees of freedom for WLSMV are estimated according to a formula given in the M*plus* User's Guide (Muthén & Muthén, 1998–2007).

3.2. Confirmatory factor analyses for sample 1

Confirmatory factor analyses were conducted on each of the five models described in Table 1. For sample 1, the fit indices are reported in Table 3. The chi-square test statistic is significant for each of the five models, indicating a bad model fit. However, power of the chi-square test is very high due to the large sample size. This can result in a rejection of models with no serious misspecification. Therefore, the other fit indices should be taken into account more than the chi-square test statistic. As all models have appropriate values of TLI, only *Model 5* holds the values of a moderate model fit considering RMSEA (0.078) and of an acceptable model fit considering CFI (0.958). Thus, *Model 5* was taken as the best fitting model among the five alternative models.

The standardized factor loadings of *Model 5* for sample 1 are shown in Table 4. All factor loadings were high, ranging from 0.77 to 0.93 and statistically significant ($p < 0.05$).

3.3. Cross-validation: confirmatory factor analyses for sample 2

For cross-validation the five models were tested for sample 2 (see Table 5). Again, the chi-square test is significant for all five models and the values of TLI are appropriate for all models. But only *Model 5* holds the values of a moderate model fit considering RMSEA (0.076) and of an acceptable model fit CFI (0.956). Therefore, results of sample 1 can be cross-validated with results of sample 2.

All standardized factor loadings of *Model 5* for sample 2 were high as well, ranging from 0.79 to 0.94 and statistically significant ($p < 0.05$).

Table 4
Standardized factor loadings in the five-factor model (*Model 5*) of IES-R in sample 1 ($N = 1.662$).

	Intrusion	Avoidance	hyperarousal	Numbing	Sleep disturbance
IES 1	0.88				
IES 3	0.88				
IES 6	0.91				
IES 9	0.91				
IES 14	0.87				
IES 16	0.93				
IES 5		0.89			
IES 8		0.89			
IES 11		0.91			
IES 12		0.86			
IES 17		0.86			
IES 22		0.88			
IES 4			0.86		
IES 10			0.93		
IES 18			0.87		
IES 19			0.88		
IES 21			0.89		
IES 7				0.82	
IES 13				0.77	
IES 2					0.91
IES 15					0.93
IES 20					0.89

Note: All factor loadings presented are statistically significant ($p < 0.05$).

Table 5
Goodness-of-fit indices for the models of IES-R in sample 2 (N = 1.651).

Model	χ^2	df[a]	p	RMSEA	CFI	TLI
3	1569	99	<0.001	0.095	0.935	0.995
4a	1507	100	<0.001	0.092	0.938	0.995
4b	1755	96	<0.001	0.102	0.927	0.994
4c	1506	99	<0.001	0.093	0.938	0.995
5	1091	103	< 0.001	0.076	0.956	0.997

[a] The degrees of freedom for WLSMV are estimated according to a formula given in the M*plus* User's Guide (Muthén & Muthén, 1998–2007).

Table 6
Goodness-of-fit indices for the models of IES-R in sample 3 (N = 854).

Model	χ^2	df[a]	p	RMSEA	CFI	TLI
3	858	83	<0.001	0.105	0.949	0.995
4a	845	83	<0.001	0.104	0.949	0.995
4b	972	81	<0.001	0.114	0.942	0.994
4c	860	83	<0.001	0.105	0.949	0.995
5	634	87	<0.001	0.086	0.964	0.997

[a]The degrees of freedom for WLSMV are estimated according to a formula given in the M*plus* User's Guide (Muthén & Muthén, 1998–2007).

3.4. Cross-validation: confirmatory factor analyses for the refugee sample

The five models were then subjected to cross-validation in the refugee sample. Table 6 shows the fit indices. Again, *Model 5* is the only model that holds the value of an acceptable model fit considering CFI (0.964). Although RMSEA (0.086) is here a bit higher than in the two other samples it still is in the adequate range (Browne & Cudeck, 1993). On the other hand, values of RMSEA for the other four models are all above 0.10 and thus represent a non-adequate model fit. The CFI values among *Models 3*, *4a*, *4b*, and *4c* are also in the range of non-adequate model fits. Therefore, it can be concluded that the findings of sample 1 can be cross-validated with the results of the refugee sample.

The standardized factor loadings of *Model 5* for sample 3 were also statistically significant (p < 0.05) with high factor loadings, ranging from 0.64 to 0.95.

3.5. Sensitivity analyses excluding participants with low symptom levels

In sensitivity analyses CFAs were also conducted with only those participants from the original samples who had an IES-R score of higher than 11: 962 and 982 participants from the Balkan countries and 583 refugees. The internal consistency values of the IES-R for the new samples were α = 0.94 for the total scale for all three samples, α = 0.89 for the intrusion subscale for all three samples, α = 0.82–0.84 for the avoidance subscale, and α = 0.87–0.89 for the hyperarousal subscale. Distribution of the IES-R scores in sample 1 had a mean of M = 39.10 (SD = 19.08), in sample 2 M = 39.30 (SD = 19.28), and in the refugee sample M = 46.35 (SD = 20.65).

Model 5 was the best fitting model in all three samples. In all three samples, only *Model 5* had an acceptable model fit considering RMSEA with values ranging from 0.092 to 0.098. The CFI indices ranged from 0.964 to 0.956, and the TLI indices ranged from 0.977 to 0.983. Furthermore, the standardized factor loadings of *Model 5* for all three samples were statistically significant (p < 0.05), with high factor loadings ranging from 0.41 to 0.88.

4. Discussion

The study tested alternative confirmatory factor analytic models of post-traumatic stress symptoms as measured with the IES-R among war survivors who still live in the area of former conflict or have taken refuge in other countries. Our findings identified a correlated five-factor model with distinct factors of intrusion, avoidance, hyperarousal, numbing, and sleep disturbance as the best fitting model. The model superiority was cross-validated in two different samples, and still applied when participants with low symptom levels were excluded. Results suggest that numbing items and sleep disturbance items form separate factors.

The study has used the largest samples for testing the factor structure of the IES-R so far reported in the literature, and all participants had experienced at least one potentially traumatic event. The findings were cross-validated in two independent samples and held true in a sensitivity analysis, excluding people with few or no symptoms. The samples included people who stayed in the area of conflict and those who took refuge in Western countries which might suggest that the findings can be generalized to different groups of war survivors.

However, the study also has two major limitations: (A) although the indices of fit showed acceptable model fit for the five-factor solution, they did not reach scores indicating excellent model fit, and (B) all participants had experienced war in Ex-Yugoslavia, and findings might not be generalizable to samples who experienced different types of traumatic events in different contexts.

Previous studies on the structure of the IES-R usually focused on models with three or even fewer factors. The original IES has more often been analysed testing models with more than three factors. Our findings have some similarity with the four-factor model of the original IES. Amdur and Liberzon (2001) as well as Andrews et al. (2004) and Witteveen et al. (2006) suggest a four-factor model with the factors of intrusion, avoidance, numbing, and sleep disturbance. Thus, they differentiated numbing from avoidance and additionally identified a separate sleep disturbance factor, consisting of two items from the intrusion cluster and one from the hyperarousal cluster. As the original IES was revised and the additional subscale of hyperarousal added, the current findings can be seen as a replication of previous results on the original IES. The five-factor model suggested by our study consists of four factors that have also been found in the structure of the original IES (Amdur & Liberzon, 2001) and the additional fifth factor which marks the difference between the original IES and the IES-R.

The findings also suggest a construct validity of post-traumatic stress symptoms as measured by the IES-R in war survivors in Europe. The factor structure of war-related post-traumatic stress appears similar to the structure found in other populations in Western countries that survived different forms of traumatic experiences (Amdur & Liberzon, 2001; Andrews et al., 2004; Witteveen et al., 2006). This might indicate that post-traumatic stress symptoms as measured by the IES-R are not a "culture-bound" syndrome. The finding is consistent with the results of a study by Smith, Perrin, Dyregrov, and Yule (2003) on the factor structure of the Impact of Event Scale in Bosnian children who had been exposed to war-related traumatic events.

While our results replicate several findings that suggest a distinction between avoidance and numbing (e.g., Asmundson, Wright, McCreary, & Pedlar, 2003; Foa, Zinbarg, & Rothbaum, 1992; King et al., 1998), they also diverge from some recent work that found a four-factor model with intrusion, avoidance, dysphoria, and arousal factors as the best fit (Palmieri, Weathers, Difede, & King, 2007; Simms et al., 2002). Considering that other studies testing the four-factor model of Simms et al. (2002) failed to support it (e.g., McWilliams, Cox, & Asmundson, 2005; Palmieri et al., 2007), some unclarity remains about whether any model can be generalized as the best fitting model of the factor structure of post-traumatic stress symptoms. Part of the difficulty in interpreting the results of the CFA studies might be sample variability. Future studies should use representative samples in order to determine the most stable factor structure of post-traumatic stress symptoms. In any case, one may conclude that much of the existing evidence is not consistent with the PTSD cluster structure as defined in DSM-IV.

The aim of this study was to test the factor structure of IES-R. The findings might be measure dependent and be different when other measures are also considered. Thus, future studies on the structure of post-traumatic stress symptoms might use different or even multiple measures of post-traumatic stress including interview-based instruments. Furthermore, longitudinal research is required to explore the stability of the factor structure of post-traumatic stress symptoms.

In conclusion, our results suggest distinguishing between avoidance and numbing, at least in survivors of war. Such a distinction might influence psychological treatment approaches. Some evidence suggests that cognitive-behavioural approaches have a bigger impact on symptoms of avoidance than on numbing (Keane et al., 1989). Other intervention techniques that address emotional numbing might be required to improve overall outcomes of PTSD treatment.

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