

Convergent validity of four instruments for measuring posttraumatic stress disorder

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Three instruments for measuring posttraumatic stress reactions, Mississippi Combat Related Scale (M-PTSD, 35 items), Impact of Event Scale – Revised (IES-R, 22 items), and Watson PTSD Interview (PTSD-I, 17 items), were administered to a sample of 154 war veterans. High correlations were found between total scores measured by these instruments. The correlations ranged from .866 to .900, the same range of coefficients was found among the first principal components defined by these three instruments (correlations ranging from .883 to .906). As a fourth measure, shorter version of the Mississippi scale (Short M-PTSD) consisting of 11 items taken from the original one was used. The correlation of this short questionnaire with the total scores of the Mississippi scale was .970, while its correlation with the other parts of the M-PTSD scale was .932. Internal consistency of all four measures was rather high and varies from $\alpha = .914$ (for IES-R) to $\alpha = .966$ (for M-PTSD). Results obtained on this sample showed a high convergent validity of all four PTSD measures we used.

As a formal diagnostic category posttraumatic stress disorder (PTSD) appeared for the first time in 1980 in the third edition of the *Diagnosics and Statistics Manual of Mental Disorder DSM-III* (DSM-III, 1980). Minor changes were made in versions *DSM-III-R* (1987) and *DSM-IV* (1994), while the disorder was also described in *International Disease Classification IDC-10* (MKB, 1994). This mental disorder belongs to a broader group of anxiety disorders and refers to psychological difficulties which develop as a result of traumatic events, and includes a group of symptoms.

Typical symptoms include episodes of repeated re-experiencing of the trauma in intrusive memories (“flash-backs”) or dreams, occurring against the persisting background of a sense of “numbness” and emotional blunting, detachment from other people, unresponsiveness to surroundings, anhedonia, and avoidance of activities and situations reminiscent of the trauma. Commonly, there is fear and avoidance of cues that remind the sufferer of the original trauma. Rarely, there may be dramatic, acute bursts of fear, panic or aggression, triggered by stimuli arousing a sudden recollection and/or re-enactment of the

trauma or of the original reaction to it, difficulties in social, working or other important aspects of everyday life.

Posttraumatic stress disorder can be defined as a delayed and/or protracted response to a stressful event or situation (either short- or long-lasting) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone (e.g. natural or man-made disaster, combat, serious accident, witnessing violent death of others, or being the victim of torture, terrorism, rape, or other crime).

For the diagnosis to be established it is essential for the person to have experienced or witnessed a traumatic event and to have experienced an intensive feeling of fear, helplessness and terror. In diagnostics we distinguish between acute PTSD (the symptoms lasted less than three months) and chronic PTSD (the symptoms lasted longer than three months), while by postponed PTSD we understand the symptoms which appeared at least six months after the traumatic event.

The development and validation of instruments for diagnosing PTSD and for assessing the level of PTSD symptoms started right after the diagnostic category appeared. The assessment tools can be divided into two groups. The first consists of structured and semi-structured interviews which demand individual access, and some of which result in a diagnostic dichotomy (presence/absence of PTSD), while the second also indicates the intensity of symptoms on a continuous scale. Generally, administering the instruments implies the assistance of a skillful clinician.

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Some of the most frequently used structured interviews include "Diagnostic Interview Schedule – DIS" (Robins, Heltzer, Croughan, & Ratliff, 1981), Structured Interview for PTSD – SI-PTSD (Davidson, Smith, & Kudler, 1989), Structured Clinical Interview – SCID (Spitzer, Williams, Gibbon, & First, 1990), PTSD-I Interview (Watson, Juba, Manifold, Kucala, & Anderson, 1991), Schedules for Clinical Assessment in Neuropsychiatry – SCAN (Wing et al. 1990), and Clinical Administered PTSD scales – CAPS (Blake, Weathers, & Nagy, 1990).

Probably the first instrument translated into Croatian was Watson's PTSD Interview (PTSD-I), with a scale of 17 items which, besides the diagnostic classification, offers the possibility of measuring disorder intensity.

Psychometric scales make the second group; they give information about the level and kind of symptoms and the cut-off scores can be an indication of PTSD. In principle, these instruments are shorter, can be administered to groups and are more suitable for screening. Also, they generally have better psychometric characteristics than the interview. On the other hand, however, sometimes they can make it impossible for the clinician to collect all the information necessary for a clinical diagnosis.

The Impact of Event Scale – IES, developed by Horowitz, Wilner and Alvarez (1979), belongs to this group. It was published for the first time in 1979. In 1984 Keane, Maloy and Fairbank proposed the use of a scale derived from MMPI-1 and, later, from MMPI-2 Questionnaire (Kean, Malloy, & Fairbanks, 1984). The next instrument, the Hopkins Symptoms Checklist-25, was developed by Mollica and associates (Mollica, Caspi-Yavin, Bollini, Truong, Tor, & Lavelle, 1992). Probably the most frequently used scale for assessing PTSD (especially among war veterans) is the Mississippi Scale for Combat-Related PTSD or M-PTSD (Keane, Cadell, & Taylor, 1988).

The choice of the measuring instrument depends on the measuring goal, sample and theoretical context. Some instruments are based on older diagnostic criteria and might leave out some new diagnostic criteria. On the other hand, changing instruments causes difficulties in the longitudinal follow-up of the respondents and in comparisons of different samples.

In Croatia several measures of posttraumatic stress reactions have been used but their evaluation and standardization are still missing. In this paper we shall try to compare characteristics of three frequently used instruments for measuring PTSD.

The Mississippi PTSD scale was developed according to the DSM-III criterion for PTSD. It consists of 35 statements (symptoms) which the subjects respond to on a 5-point scale. The sum of responses to each statement gives the total score, with the theoretical range between 35 and 175. The authors suggest the score of 107 as the cut-off for

a diagnosis of the posttraumatic stress disorder. However, the scale was primarily constructed in a psychometric manner, as a measure of intensity of the posttraumatic reaction, and less as an instrument for diagnostic classification. In order to establish the diagnosis according to DSM criteria some additional information is to be collected. The reliability for the total scale is about .94 (Keane et al., 1988).

The Mississippi Scale for Civilian PTSD is a sub device of the Mississippi Scale for Combat-related PTSD. The scale consists of 35 original items and four added items, which assess re-experiencing, psychogenic amnesia, hypervigilance, and increased arousal.

At the beginning of 1990s some authors (Fontana & Rosenheck, 1994; Fontana, 1996) suggested the use of the shortened version of 11 out of the original 35 items. The items were selected on the basis of a validation study completed on 436 veterans.

Eight items included in this shorter version are very similar to the criterion symptoms for the diagnosis of PTSD as defined by the American Psychiatric Association (DSM-III-R, 1987). Two items relate to re-experiencing and intrusion, three to avoiding and numbing and three to hyperarousal. The remaining three items measure the suicidal feelings, substance use and feeling different from other people. The administration of this shorter version lasts 5-10 minutes; it is shorter in comparison with other similar instruments.

The results on this scale range from 11 to 55 and authors suggest the score of 34 as the cut-off for the PTSD diagnosis; these results show a 93% correspondence with the longer scale version. Fontana (1996) reports a correlation of .96 with the longer version and a respectable correlation with the Mississippi Scale without these 11 items (.90).

The Original Impact of Event Scale – IES (Horowitz et al., 1979.) contains 15 statements that form two separate sub-scales and describes two key PTSD symptom categories: symptoms of intrusion (7 statements) and symptoms of avoidance (8 statements). Subjects assess the frequency of symptom appearance within the last week on a 4-point scale (0-never, 1-rarely, 3-sometimes, 5-often). Horowitz and his associates report good internal consistencies for the individual subscales and the total scale: .78 for the Intrusion sub-scale (test-retest: .89), .82 for the Avoidance sub-scale (test-retest: .79) and .86 for the total scale (test-retest: .87). The correlation between the sub-scales (.42) shows that they measure different but still related aspects of posttraumatic reactions (McFall, Smith, Roszell, Tarver, & Malas, 1990).

The instrument was developed before the official acceptance of the PTSD diagnosis in DSM-III. Although it measures a limited range of PTSD symptoms, some studies point to its good discriminative value in distinguishing

groups with a PTSD diagnosis. The total scale and the Intrusion sub-scale are moderately related with the Mississippi Scale ($r=.53$ and $r=.56$). The Avoidance sub-scale shows a low correlation with the Mississippi Scale ($r=.29$), while its correlation with the MMPI sub-scale of PTSD is not even statistically significant (McFall et al., 1990).

In order to adjust the original IES to contemporary diagnostic PTSD criteria and to get a complete estimations of reaction to the traumatic event, Weiss and Marmar (1997) extended the original scale. They added statements which cover symptoms of intensified hyperarousal included in DSM-III-R and DSM-IV. Weiss and Marmar (1997) developed an additional seven statements, six of which cover the area of hyperarousal symptoms. These additional items were randomly included in the original IES scale so that the revised version has 22 items.

The only modification to the IES items was the bifurcation of the item "I had trouble falling asleep or staying asleep" into "I had trouble falling asleep" (assigned to the Hyperarousal sub-scale), and "I had trouble staying asleep" (retained in the Intrusion sub-scale).

The item "I found myself acting or feeling like I was back at that time" was added to the original Intrusion sub-scale. The other items remained unchanged. Six new items form the Hyperarousal sub-scale. The authors report internal consistencies for the three sub-scales ranging from .79 to .92, and coefficients of stability being satisfactory (.51 to .94). The correlations are higher with shorter intervals between two applications of scales as well as with shorter intervals between the traumatic event and scale administration.

Watson's PTSD-I Questionnaire consists of five parts. The first part (Section A) relates to the experience of trauma outside the range of usual humane experience. The next 17 items closely reflect PTSD as described in DSM-III-R sections B (trauma re-experiencing), C (avoidance), and D (arousal). Section E of the questionnaire assesses the presence of current or lifelong PTSD.

Unlike structured and semi-structured interviews for diagnosing PTSD this one is considerably shorter (lasts about 10 minutes) and is very simple for administration. Besides the dichotomy diagnostic classification (presence/absence of PTSD), the interview makes it possible to express the results on a continuum taking into consideration the frequency of the symptoms. The authors state good psychometric properties of the original interview (Watson et al., 1991). The test-retest coefficient is .95, while the internal consistency on a sample of psychiatric patients from the Vietnam War is .62. Marušić Kozarić-Kovačić, Arcel and Folnegović-Šmalc (1998) report the internal consistency of .95 on a sample of refugees, the test-retest reliability of .95 and the correlation with the Mississippi scale of .60.

The difficulty with Watson's PTSD-I questionnaire is that it is designed according to the DSM-III-R criteria. The questionnaire part consists of 17 symptoms whose severity is assessed on a 7-point scale and which cover the categories of re-experiencing the traumatic event, avoidance, numbing and hyperarousal.

This convergent validation study assesses the three instruments' concordances (plus that of the short version of the Mississippi PTSD scale), i.e., the extent to which they reflect the same construct.

METHOD

Participants and Procedure

244 participants took part in the study. The sample consisted of male persons, war veterans and members of the Croatian Army with direct war experience. 90 participants were later excluded from testing on the basis of the following criteria: existing or suspected psycho-neuralgic disorders, incompletely filled questionnaires, suspected simulation or dissimulation, suspected alcoholism. Psychometric validation was carried out on the remaining 154 participants.

The mean age of the participants was 36.5 (ranging from 24 to 60), 22% had completed elementary school, 73.5% had completed secondary education and 4.5% had completed college or university education. On average, they had been in combat for 34 months (range: 2 to 72 months). All data were collected in one session.

Instruments

Three instruments were used (the Short M-PTSD scale items are included in the original M-PTSD scale).

a) *Mississippi Combat Related Scale M-PTSD* (Keane et al., 1988), which consists of 35 items describing different problems connected with PTSD. Intensity of the symptoms is assessed on a 5-point scale. The total result is shown as a sum of responses to all 35 items, 10 of which are scored inversely. The theoretical range of results varies from 35 to 175.

The shorter version was used in the analysis too. It consists of 11 items drawn from the original version (Fontana & Rosenheck, 1994) and will be referred to as Short M-PTSD. The items drawn are as follows: 7, 10, 11, 14, 15, 16, 22, 25, 29, 31 and 35. The scale scores range from 11 to 55, with two items scored inversely.

b) *Impact of Event Scale – Revised IES-R (Weiss & Marmar, 1997)*

The scale consists of 22 items divided in to three sub-scales: the Intrusion sub-scale (8 items), the Avoidance sub-scale (8 items) and the Hyperarousal sub-scale (6 items). The subjects assess the frequency of each symptom within the last seven days on a 4-point scale (0=not at all, 1=rarely, 3=sometimes and 5=frequently). The theoretical range of scores for the total scale is between 0 and 110, i.e.: 0 to 40 for the Intrusion and Avoidance sub-scales, and 0 to 30 for the Hyperarousal sub-scale. The sub-scale scores is expressed as a sum of responses to single items. We applied the same scoring system in our study since it made it possible for us to compare our results with the original version of the IES questionnaire. In the first edition of the revised IES Weiss uses this (somewhat odd) scoring procedure (Weiss, 1996). Weiss and Marmar (1997) proposed a new method of scoring with each symptom being assessed on a 5-point scale (0-1-2-3-4) and the results on the sub-scales being expressed as the mean for responses to all items in each sub-scale.

c) *PTSD Interview – PTSD-I (Watson at al., 1991)*

The interview consists of 5 parts. The questionnaire part of the structured interview consists of 17 items which represent symptoms descriptions. The subjects assess their intensity or frequency on a 7-point scale (1-never; 7-always). Five items (part B) relate to symptoms of intrusion (ranging from 5 to 35 points), seven items (part C) refer to symptoms of avoidance (ranging from 7 to 49 points), while five items (part D) refer to hyperarousal (ranging from 5 to 35 points). In order to harmonize the interview with DSM-IV, in this application some questions are added in order to find out whether PTSD is acute, chronic or just partial, as suggested in DSM-IV.

The total scores on the scale vary in their theoretical range from 17 to 119.

d) *The questionnaire of stress and traumatic fighting experience (USTBI)*

During the validation of the PTSD measures it is important to determine their connection with the amount of the traumatic experience. Therefore, we administered an instrument for measuring traumatic experience.

The instrument, USTBI, is intended to measure the amount of stress and traumatic experience. It was developed by Bunjevac and Kuterovac-Jagodić (1996). They have taken into consideration the specific conditions and characteristics of the war in Croatia. The questionnaire includes typical fighting experience and traumatic events related to the war. It consists of 40 items to which one has to respond on a 3-point scale (1=never, 2=once, 3=several times) assessing one's experience with specific traumatic events. The theoretical range of scores varies from 40 to 120. The score can also be expressed as the sum of experienced events with the range of 0 to 40. The authors report the high internal consistency of .94.

A semi-structured questionnaire was used in order to gather the social-demographic data and anamnesis for each examinee.

RESULTS AND DISCUSSION

Psychometric properties of the total scale results

Table 1 shows some parameters of the total scale s. Cronbach alpha coefficient for all four scales is higher than .91, which makes the standard error of measurement acceptable for individual diagnostics. Because of its length the Mississippi scale has the lowest measurement error. It is shown in Table 1 that average item inter-correlation for all instruments is about .5, which shows a high homogeneity in spite of the slightly different groups of symptoms in the scales.

Table 1
Some psychometric parameters of total scale scores

PTSD measure	k	M	SD	min	max	α	r_{ij}	ndr
M-PTSD	35	90.07	29.975	36	156	.966	.460	73
Short M-PTSD	11	28.97	10.520	11	51	.930	.551	39
PTSD-I	17	63.94	24.801	17	113	.956	.567	68
IES-R	22	50.24	28.650	0	104	.914	.478	73

Note: k – number of items; min, max - minimal and maximal observed score; r_{ij} – average inter-item correlation; ndr – number of different observed total scores

The number of different observed scores varies from 39 observed scores for the Short M-PTSD to 73 observed scores for the M-PTSD and IES-R scales. This indicates a satisfactory sensitivity of the instruments. Although they differ in length, the number of observed scores is nearly the same and makes a good discrimination of individual results possible.

The Kolmogorov-Smirnov test for normality of distribution showed that the distributions of total scores did not differ from the normal distribution. The short version of M-PTSD Questionnaire showed satisfactory reliability and discrimination too.

Kean et al. (1988) report a mean of 104.5 on the M-PTSD Scale on a sample of veterans seeking help. The Croatian war veterans with a PTSD diagnosis attain the average mean of 129.8 (Radionov, 2002). On separation of the participants meeting the PTSD diagnosis criterion as measured by means of Watson's PTSD-I questionnaire, they attain the mean of 118.6. If we leave out those currently in treatment, their mean amounts to 123.5.

Item analysis

The items with the highest means in the IES-R scale are: 1. *Any reminder brought back feelings about war* ($M=2.90$), 22. *I tried not to talk about war* ($M=2.86$), and 11. *I tried not to think about war* ($M=2.85$). In Watson's

Table 2
Means, item discrimination, convergent validity, and correlation with number of traumatic events
for items from three PTSD instruments

item	Mississippi PTSD Scale (M-PTSD) items					Impact of event (IES-R) items					Watson PTSD Interview (PTSD-I) items				
	<i>M</i>	r_{it}	$r_{i,IES}$	$r_{i,W}$	$r_{i,TR}$	<i>M</i>	r_{it}	$r_{i,LM}$	$r_{i,W}$	$r_{i,TR}$	<i>M</i>	r_{it}	$r_{i,LM}$	$r_{i,IES}$	$r_{i,TR}$
1	3.13	.516	.532	.499	.220	2.90	.691	.692	.655	.519	3.93	.809	.761	.761	.564
2	2.36	.079	.018	.101	-.105	2.51	.782	.749	.686	.465	3.60	.829	.791	.776	.552
3	3.16	.712	.667	.663	.458	1.99	.787	.802	.744	.580	2.91	.793	.728	.698	.434
4	3.14	.801	.783	.799	.462	2.34	.783	.776	.721	.538	4.03	.745	.665	.715	.423
5	1.85	.642	.522	.596	.408	2.42	.595	.371	.459	.259	4.04	.593	.475	.568	.192
6	2.26	.496	.411	.464	.244	2.18	.788	.803	.742	.535	3.86	.570	.447	.556	.181
7s	2.79	.847	.837	.857	.526	1.42	.182	.043	.114	-.019	3.19	.535	.445	.429	.260
8	1.72	.536	.446	.448	.297	2.58	.615	.438	.548	.244	3.60	.799	.733	.691	.394
9	2.20	.701	.596	.651	.459	2.42	.835	.796	.762	.524	3.41	.648	.734	.573	.489
10s	1.81	.763	.661	.609	.470	1.94	.754	.734	.707	.380	3.60	.719	.737	.595	.430
11s	3.25	.589	.585	.589	.347	2.85	.729	.498	.566	.293	3.60	.596	.572	.490	.256
12	1.94	.683	.566	.579	.448	2.31	.580	.475	.538	.364	4.25	.838	.792	.777	.531
13	2.40	.760	.678	.731	.453	1.50	.082	-.089	-.035	-.053	4.21	.779	.759	.693	.534
14s	2.37	.828	.813	.814	.478	1.47	.754	.715	.664	.495	3.96	.820	.782	.705	.444
15s	2.09	.852	.726	.737	.526	2.49	.782	.801	.734	.450	4.16	.799	.714	.690	.443
16s	2.72	.666	.618	.603	.433	1.95	.817	.840	.767	.508	3.94	.809	.771	.732	.412
17	2.72	.486	.498	.455	.182	2.56	.639	.505	.580	.192	3.66	.831	.787	.800	.418
18	2.23	.797	.688	.740	.485	2.47	.781	.807	.752	.422					
19	2.52	.655	.598	.633	.362	2.04	.764	.746	.763	.396					
20	2.57	.745	.651	.679	.438	2.44	.790	.720	.710	.513					
21	1.82	.639	.543	.593	.272	2.59	.751	.662	.611	.377					
22s	2.36	.731	.611	.636	.340	2.86	.618	.406	.509	.618					
23	2.52	.784	.683	.674	.406										
24	2.96	.738	.707	.678	.420										
25s	3.24	.695	.647	.712	.512										
26	2.68	.782	.686	.717	.511										
27	3.16	.769	.668	.691	.461										
28	2.67	.713	.629	.634	.511										
29s	2.45	.631	.598	.678	.482										
30	3.60	.411	.308	.356	.222										
31s	2.87	.747	.656	.698	.279										
32	1.83	.772	.658	.690	.377										
33	3.05	.585	.670	.682	.352										
34	2.71	.560	.484	.560	.322										
35s	2.90	.649	.598	.643	.393										

Note: correlations less than .160 are not significant ($p < .05$); s - items from Short version of Mississippi PTSD scale (Short M-PTSD); M- item mean; r_{it} - corrected item-total correlation; $r_{i,IES}$ - item correlation with IES-R scale; $r_{i,LM}$ - item correlation with Mississippi M-PTSD scale; $r_{i,W}$ - item correlation with Watson PTSD-I scale; $r_{i,TR}$ - item correlation with Questionnaire of stress and traumatic fighting experience (USTBI).

questionnaire the item with the highest mean is 12. *Have you had more difficulty falling asleep or staying asleep at times than you did the before* ($M=4.25$), then follow items 13. *Have you gotten irritated or lost your temper more at times than you did before* ($M=4.21$), 15. *Have there been times when you were more overly alert, watchful, or super-aware of manacing noises or other stimuli than you were before* ($M=4.16$), 5. *Have you ever tried to avoid thinking about (the stressor) or feelings you associate with it* ($M=4.04$), 4. *Have things that reminded you of (the stressor) sometimes upset you a great deal* ($M=4.03$).

In the Mississippi PTSD scale the most prominent items are: 30. *I feel comfortable when I am in a crowd* ($M=3.60$), 11. *I fall asleep, stay asleep and awaken only when the alarm goes off* ($M=3.25$), 25. *Unexpected noises make me jump* ($M=3.24$), 3. *If someone pushes me too far, I am likely to become violent* ($M=3.20$).

Item discriminatnion is defined as non-spurious Pearson correlation of items with total scale scores. The results mostly correspond to the results of Keane and al. (1988), although the coefficients of item discrimination in our sample are higher. In the Mississippi scale only the second item, related to the feeling of guilt, is not correlated with the total score.

In the IES-R scale, item 13. *My feelings about war were kind of numb* and, partly, item 7. *I felt as if war hadn't happened or wasn't real* are not related with the total result. On Watson's Questionnaire all items have satisfactory discrimination indices (above .59).

Similar but systematically lower coefficients of item discrimination are reported by Marušić et al. (1998). The convergent validity of items on all three scales is defined by the correlation with the total scores on the remaining two scales. The results show a high congruency of correlations of the items with all three scale results; this suggests that all three instruments measure a similar construct.

For each item its correlation with the number of the traumatic events (USTBI) has been calculated. Most items

show a high correlation with the number of traumatic events, with the exception of the mentioned items, which do not have a high discriminative validity.

Factor structure

The principal components analysis with varimax rotation was performed on each of four item samples. In Table 3 the significant principle components (with eigenvalues greater than 1) and the percentage of the explained variance (prior to rotation) are shown. The factor analysis performed on all four correlation matrices points to one general factor, which explains between 50% (M-PTSD) and 60.1% of variance (PTSD-I). Theoretically, it is not necessary for diagnostic groups of PTSD symptoms to produce orthogonal factors. Therefore, some authors, when assessing the latent structure, use the same form of oblique rotation or some form of confirmatory factor analysis (Inkelas, Loux, Bourque, Widawski, & Nguyen, 2000).

As seen in Table 3, the analysis of 35 items of the M-PTSD scale resulted in five significant principal components according to the Kaiser-Guttman's criterion. With the exception of item 2. *I do not feel guilt over things that I did in the past*, all other items correlate significantly with the first principal component. The correlations range from .432 (*I feel comfortable when I am in a crowd*) to .872 (*I feel like I can't go on*). In order to separate the latent dimensions we decided to proceed by performing an orthogonal rotation of factors.

After varimax rotation the first factor explains 20.7% of variance, with the highest projection on this factor found in items such as 8. *When I think of some of the things I have done in the past, I wish I were dead* (.797), 10. *Lately, I have felt like killing myself* (.721) and 12. *I wonder why I am still alive while others have died* (.715). This factor describes the suicidal inclination and intrusive memories.

The second factor (16,9% of variance) is best described by items 33. *I try to avoid all things that remind me of the*

Table 3
Principal components significant according to Kaiser-Guttman's criterion and the percentage of explained variance

component	M-PTSD		Short M-PTSD		IES-R		PTSD-I	
	eigen-value	%	eigen-value	%	eigen-value	%	eigen-value	%
1	17.376	49.64	6.569	59.72	11.827	53.76	10.228	60.16
2	1.603	4.57			2.154	9.79	1.340	7.88
3	1.358	3.88			1.218	5.53	1.036	6.09
4	1.206	3.44						
5	1.180	3.37						
Total		64.92		59.72		69.09		74.13

past (.717), 25. *Unexpected noises make me jump* (.643), 4. *If something happens that reminds me of the past, I become very distressed and upset* (.641). It shows symptoms of avoidance and re-experiencing.

The third factor (12.6% of variance) is best described by items 6. *I am able to get emotionally close to others* (.651) and 1. *In the past, I had more close friends than now* (.650), and it describes symptoms of emotional insensitivity and social withdrawal.

The fourth factor (11% of variance) is best described by items such as 17. *I do not enjoy any more doing many things that I used to enjoy* (.723), or 19. *I have found it easy to keep a job* (.664). This factor can be described as difficulties in performing everyday functions.

The fifth factor explains only 3.5% of variance and relates to only one item, i.e. item 2. *I do not feel guilt over things that I did in the past* (.893). The oblique factor rotation results in a very similar structure, where the factors are in a moderate correlation ranging from .194 to .534, with the exception of the fifth factor ("guilt"), which remains orthogonal on the first four dimensions.

According to the results of the factor analysis it is obvious that M-PTSD measures a single construct (presumably PTSD). However, there is much discussion and confusion regarding the degree to which the Mississippi scale measures just PTSD, or both PTSD and depression. Lauterbach, Vrana, King, & King (1997) report a correlation of about .7 with Beck Depression Inventory, and STAI-T (State Trait Anxiety Inventory). Some of our unpublished studies show similar results.

The latent space of the shorter version of the M-PTSD questionnaire (11 items) is defined by one principal component which explains 59.7% of variance. Saturation of items with the first principal component ranges between .671 and .876.

The assessment of construct validity for M-PTSD did not always give consistent results. Keane et al. (1988) found six factors 1. intrusive memories and depressive

symptoms (9 items) 2. interpersonal adjustment problems (5), 3. liability of affect and memory (3), 4. ruminative features of PTSD (3), 5. other interpersonal problems (3) and 6. sleep problems (2).

The factor analysis performed on 22 items of IES-R resulted in three significant principal components, which explain 69% of variance. In this case, too, most items have high projections on the first factor (.605 to .870). Only items 7. *I felt as if war hadn't happened or wasn't real* and 13. *My feelings about war were kind of numb* do not correlate with the general factor.

After the orthogonal varimax rotation, symptoms of intrusion and hyperarousal define the first factor, while the second and third represent symptoms of avoidance. Items 7 and 13 describe the third factor. The oblimin rotation results in a very similar structure and the third factor, defined by the two mentioned items, doesn't correlate with the previous two.

Seventeen items from Watson's Questionnaire also define the space of three significant principal components, which explain 74% of variance. All items have a high saturation with the first principal component (above .570). Rotation in this case doesn't offer an interpretable solution, except for the third factor described in three items which refer to the symptoms of avoidance. This factor correlates with the Avoidance sub-scale in the IES-R questionnaire (.526).

In conclusion, all three instruments used on our sample have a tendency towards defining the general factor, while in the latent space the dimension of avoidance is separated and seems to offer some additional information. In the case of restriction of variance, i.e. analysis on the selected sample of highly traumatized participants, there is a possibility of getting a higher number of significant factors.

Intercorrelations among scales and sub-scales

The major results of this study are presented in Table 4. It is obvious that all four instruments correlate above .866,

Table 4

Intercorrelations among four measures of PTSD

	M-PTSD	IES-R	Watson PTSD-I	Short M-PTSD
M-PTSD	.998*	.874	.900	.970
IES-R	.898	.995*	.866	.868
Watson PTSD-I	.906	.883	.999*	.892
Short M-PTSD	.977	.893	.901	.999*

Above the main diagonal are the intercorrelations of total scores.

Bellow the main diagonal are the correlations of the first principal components.

*The main diagonal: correlation between total score and first principal component.

Table 5
Intercorrelations of sub-scales

	1	2	3	4	5	6	M-PTSD	Short M-PTSD	IES-R	PTSD-I
1. IES-R-avoidance	1	.568	.643	.589	.592	.563	.511	.506	.816	.627
2. IES-R-intrusion		1	.895	.810	.719	.821	.891	.897	.932	.840
4. W-intrusion (B)				1	.751	.851	.816	.805	.820	.908
5. W-avoidance (C)					1	.802	.810	.785	.757	.928
6. W-arousal (D)						1	.879	.879	.839	.953

i.e., that they share more than 75% of common variance, which suggests that total results measure the same construct.

If correlations of the first principal components are calculated, then this connection is even stronger. The short version of the Mississippi scale correlates with the rest of the Mississippi scale of 24 items (.932).

Table 5 shows that the measures used express an unexpectedly high degree of covariability. The only exception is the Avoidance sub-scale, which moderately correlates with other PTSD measures. An explanation of this high congruence of results can be partially sought in the characteristics of the sample, which obviously covers a wide range of reactions to the conditions of war trauma. Besides that, the sample was chosen so as to exclude the participants whose PTSD symptoms were covered with other clinical diagnoses, and all data were collected in one session without a time interval between the administrations of different scales.

Comparable data in the available literature are not always consistent. If we compare the obtained correlations with the results of similar studies, we can generally conclude that they point to larger correlations among different measures of posttraumatic reactions than the data reported in the literature. However, results mostly depend on the sample structure and the structure of trauma. Watson et al. (1994) report a correlation of .84 between M-PTSD and PTSD-I on a sample of 80 veterans. The correlation of PTSD-I (and Mississippi PTSD Scale) with the MMPI-PTSD scale is .79 (Mississippi .88) and with DIS Questionnaire .86 (Mississippi .76). Wilson, Tinker, Becker and Gillette (1994) report a correlation of .85 between PTSD-I and the IES scales if assessments are made for the past seven days. When the assessment is made for the past period without time limitation, the correlation is only .54. Watson et al. (1991) report a biserial correlation of .94 between the PTSD-I and DIS (Diagnostic Interview Schedule) questionnaires.

Lauterbach et al. (1997) found the correlation of the Civilian Version of M-PTSD with IES (not revised) Scale to be .36 and .52 with the Purdue PTSD questionnaire. The authors state a higher correlation of PTSD Scale with measures of depressions and anxiety than with the other measures of posttraumatic reactions. Also, for Civilian M-PTSD Devilly and Spence (1999) found the correlation with IES to be .51 and .69 with PTSD-I.

On a sample of refugees Marušić et al. (1998) found the correlation of Civilian Version of the Mississippi Scale with Watson's Questionnaire to be .70, while the correlation of the longer and shorter versions of the Mississippi scale was .924. Watson and associates (1990) and McFall et al. (1990) report on the correlations of M-PTSD with other measures of PTSD as follows: .65 with SCID and .53 with IES. The Intrusion sub-scale on IES is moderately related with the Mississippi scale (.56), while the correlation of the Avoidance sub-scale is only .29.

Correlation between scales and traumatic experience

The quantity of traumatic events is measured by the USTBI questionnaire and the results represent the number of experienced traumatic events. The range on the investigated sample is between 0 and 31 events with the arithmetic mean of 17.2.

The largest number of the participants stated that they had witnessed people getting wounded, 85% had been exposed to sniper fire, 80% had helped the wounded person

Table 6

The correlations of results with the Questionnaire of the traumatic experience (USTBI)

	M-PTSD	IES-R	PTSD-I	Short M-PTSD
USTBI	.565	.544	.538	.568

and participated in saving them, and the same number of the participants stated that they had found themselves in situations in which they believed they would be killed, or they had faced the death of a close fellow soldier. As one can see from Table 6, the number of traumatic events explains about 30% of variances in the total scores in the questionnaires. Out of the sub-scale results, the Avoidance sub-scale has the lowest correlation with the number of traumatic events – .28; this suggests that the influence of the intensity of trauma on this group of symptoms is lower than the influence of some personal characteristics. The correlation between M-PTSD and the Combat Exposure scale is reported by Keane et al. (1988) to be .25.

In our study we could not establish correlations between the sub-scale results and the participants' education status, age or with the time spent in combat.

Concordance of PTSD diagnosis

According to the results on Watson's Questionnaire, 34.9% (50 examinees) of the 147 participants meet the diagnostic criteria for PTSD. The results on the Mississippi questionnaire for 64.5% of these participants are higher than 107; this means that they would be diagnosed with PTSD. The results for the rest (35.5%) of the participants range from 73 to 105 points on the Mississippi scale, thus do not exceed the score indicative of PTSD.

Based on the M-PTSD criterion of 107 points, 38 participants (27%) meet the criteria for the PTSD diagnosis. Out of 38 examinees, based on the results of the PTSD questionnaire, 31 (81.6%) are also identified as belonging to the PTSD category, while 18.4% do not fulfill these criteria.

It seems that M-PTSD is a more rigid procedure in establishing the diagnosis than the structured questionnaire, although the structured questionnaire offers additional information for the clinical diagnosis.

As expected, the results show that moving the cut-off score on M-PTSD leads to a higher concordance with the PTSD-I questionnaire.

The PTSD-I questionnaire offers additional possibilities, such as the categories of "former PTSD", "partial PTSD", "high level of symptoms but without a traumatic event", which could lead to a PTSD diagnosis by the questionnaire measures.

As far as the IES-R questionnaire is concerned, Weiss emphasizes that defining cut-off results for diagnostic purposes is not in line with the design and purpose of the instrument. It indicates the amount of problems without aiming at providing diagnoses according to formal criteria.

SUMMARY AND CONCLUSION

The psychometric analyses show a high convergent validity of four PTSD measures. The lowest correlation of .866 between IES-R and PTSD-I still represents 75% of the common variance and results in congruent rank of participants. As these measures show a tendency towards defining one general factor, we checked the correlations among four first principal components. These correlations are even somewhat higher than the correlation of the total scores and show a common latent space. An analysis of the results obtained on a sample of 156 war veterans indicates that the instruments used measure a latent dimension that can be assumed to be a measure of the reaction to traumatic experience. Symptoms of avoidance and feeling of guilt are exceptions and tend to form partly separate clusters.

The use of the shorter 11-item version of the Mississippi scale shows an exceptional congruence with the original 35-item version and very similar correlations with other criteria.

Because of all this, the shorter version can be recommended for use when it is necessary to make screening in a short time or when it is necessary to measure the level of the posttraumatic reaction.

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