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Trauma exposure, resilience, social support, and PTSD construct validity among former prisoners of war*

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Abstract *Background:* The aim of this study was to investigate predictors of persistent symptoms of post-traumatic stress disorder (PTSD) and to examine the construct validity of PTSD in a national sample of 270 World War II and Korean Conflict prisoners of war (POWs). *Method:* POWs were interviewed at two points in time (1965 and 1990). Predictors included PTSD symptomatology measured in 1965 by items from the Cornell Medical Index (CMI), severity of captivity trauma, resilience factors, and post-trauma social support. The criterion, symptomatology in the early 1990s,

was evaluated with the PTSD module of the Structured Clinical Interview for DSM (SCID). *Results:* The CMI provided only partial coverage of PTSD criteria and appeared to provide only a general index of distress. Clustering of SCID items in two-dimensional space via multidimensional scaling analysis offers some construct validation for the DSM's differentiation of PTSD symptoms into criterion groups, although there was not a perfect match. Trauma severity is best related to PTSD symptomatology experienced in 1990, mitigated in part by greater education level and age at the time of trauma exposure. Surprisingly, 1965 distress added only a modest amount to the prediction of current distress, while post-trauma social support added none. *Conclusions:* These findings support previous work showing the severe psychological sequelae of POW status 40–50 years after captivity, and indicate that trauma severity during captivity is the best predictor of current PTSD symptomatology. Results also add to our understanding of the conceptual differentiation of PTSD symptoms into separate and distinct symptom clusters.

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Introduction

Many studies have documented that combat veterans routinely describe a wide range of acute psychological distress and social maladjustment, including symptoms of posttraumatic stress disorder (PTSD), as well as other anxiety and depressive disorders (e.g., Engdahl et al. 1996; Frueh et al. in press; Kulka et al. 1991). In particular, it appears that former prisoners of war (POWs), whose level of trauma severity is generally acknowledged to be quite extreme, are particularly vulnerable to psychological sequelae related to their military trauma (e.g., Beebe 1975; Eberly and Engdahl 1991; Engdahl et al. 1997; Sutker et al. 1990). For example, a number of studies have found that trauma experiences in POW camps were found to be correlated with anxiety and depressive disorders (Engdahl et al. 1993; Page et al. 1991; Sutker et al. 1993; Tennant et al. 1986), as well as

cognitive deficits (Sutker et al. 1991). Furthermore, epidemiological studies have shown that while the lifetime occurrence of PTSD in combat veterans is high, at about 30% (Kulka et al. 1991), PTSD rates are approximately twice that (up to 67%) in former POWs (Kluznik et al. 1986).

It has been posited that severity of trauma exposure partially accounts for differential rates of PTSD, which likely explains why rates of PTSD are higher in POWs than in non-POW combat veterans. One study found that severity of torture and weight loss sustained in captivity were positively related to higher rates and persistence of PTSD and Generalized Anxiety Disorder in a sample of World War II American POWs (Speed et al. 1989). Nevertheless, exposure to severe military trauma, such as POW status, does not always lead to PTSD, and severity of trauma does not fully account for the likelihood of developing PTSD or associated psychopathology among combat veterans. Indeed, other factors such as pre-military trauma (Bremner et al. 1993), pre-military personality (Schnurr et al. 1993), age at exposure to trauma (Engdahl et al. 1997; King et al. 1996; Speed et al. 1989), and post-trauma social support (Engdahl et al. 1997; Keane et al. 1985) have been shown to explain part of the variance in the development of military-related PTSD. Given such persistent and extreme psychopathology in a substantial subset of POWs, studies that identify predictors of pathological stress could help practitioners identify at-risk individuals and improve our understanding of the post-trauma responses of POWs.

Several studies of former POWs have examined the contribution of risk factors to PTSD and other psychiatric disorders, with somewhat mixed results obtained. Age and years of education at time of capture have been found to be negatively correlated with current depression (Dent et al. 1987; Engdahl et al. 1993, 1997; Eberly and Engdahl 1991) and PTSD (Speed et al. 1989). However, a positive curvilinear relationship between age of entry into military service and later PTSD for individuals who faced combat duty has also been reported (Elder et al. 1994). The recovery environment, as a post-trauma mediating factor of stress, has also been considered in a few studies. Unmarried, unemployed, and retired POWs were more likely to experience postwar depression (Dent et al. 1987). Higher levels of post-trauma social support and reintegration were related to lower severity of depression 30–40 years after captivity (Engdahl et al. 1991). Greater post-trauma social support was also associated with lower postwar traumatic stress symptoms in a Vietnam combat veteran sample (Keane et al. 1985) and in a sample of Israeli veterans of the Lebanon War (Solomon et al. 1989). Interestingly, in another study, family history of mental illness, pre-service adjustment difficulties, and trauma experiences in childhood were not related to PTSD (Speed et al. 1989).

The primary purpose of this study was to investigate predictors of persistent PTSD in a national sample of World War II and Korean Conflict POWs. Specifically,

the predictors included PTSD symptomatology measured in 1965 by items from the Cornell Medical Index (CMI; Brodman et al. 1949), severity of captivity trauma, factors of resilience, and postwar social support. Symptomatology in the early 1990s, the criterion, was evaluated with the PTSD module from the Structured Clinical Interview for DSM-III-R (SCID). This study also examined the dimensions underlying the elements comprising the PTSD module of the SCID, and the relationships of those dimensions to factor-derived scales of rationally selected items reflecting post-traumatic symptomatology from the CMI.

Subjects and methods

Subjects

The Medical Follow-up Agency of the National Academy of Sciences' Institute of Medicine has studied the health of American POWs since the early 1950s (Page and Engdahl 1994). The initial national sample was assembled in the early 1950s and consisted of Caucasian male Army veterans of World War II randomly selected from lists of all repatriated prisoners from the European and Pacific theaters and combat controls (Cohen and Cooper 1954). Subsequently, Nefzger (1970) randomly selected and added repatriated Korean War prisoners and combat controls, not limited in terms of race (12.8% of the Korean War POWs in the national sample are non-Caucasian). Follow-ups conducted in 1964–65 and in 1984–85 collected data from military and Veterans Administration (VA; now Veterans Affairs) records and questionnaires (Beebe 1975; Page et al. 1991). The present study used the national sample rosters to mail examination invitations to 2044 POWs and combat controls. After excluding 294 deceased subjects, and 254 who recently had completed a similar examination, 52.2% (779/1493) completed at least some portion of the examination. Further details of the sampling methods and response rates are provided by Page (1992). Analyses of demographic and hospitalization data did not reveal significant differences between POWs who did or did not volunteer for the exams (Page 1992). The examinations were conducted between 1989 and 1992 at 88 Veterans Affairs Medical Centers (VAMCs) and nearly all were conducted at the VAMC nearest to the veteran's home. They typically required a full day to complete and included a medical examination, a social history interview, a mental health examination (a clinical interview plus the SCID PTSD module), and four psychological questionnaires. POW groups in the present report include those captured by Japan in World War II, those captured by Germany in World War II, and those captured in the Korean War and held by North Korea and China.

Instruments

Several hundred variables have been assessed in this cohort over the last 40 years. Variable selection was guided by a review of the captivity maltreatment literature (Engdahl et al. 1997) and by preliminary data analyses. Cases and variables with missing data were dealt with in the following manner. Both were dropped if they had greater than 50% missing values. For the remaining cases and variables, multiple regression employed a subset of "nearby" predictors to predict the missing value. A predictor was entered into the regression model if it met a stringent criterion ($F > 4.0$).

Captivity trauma

The 1965 survey included a self-report of diseases suffered during captivity, including malaria, dysentery, pneumonia, tuberculosis,

intestinal worms, scabies and other skin diseases, pellagra, beriberi and other vitamin deficiency diseases, and diphtheria. A POW camp disease score was calculated by adding the number of "yes" responses for each of these 11 disease categories. The 1965 survey also provided data on months of captivity, the experience of torture, and percent body weight lost while in captivity. Several variables now known to affect POWs long-term adjustment (e.g., combat exposure, wounds and other injuries, cognitive processing factors) were not included in these surveys and therefore are not represented in the present study.

Resilience

Several survey variables were examined as potential indicators of individual resilience to traumatic stress. Preliminary analyses of this data set showed that some theoretically relevant variables were uncorrelated with trauma response variables, possibly because distribution along these variables was skewed (i.e., base rates were extremely low). For example, less than 2% of subjects admitted to having been treated for mental illness or to a family history of mental illness; marital status was almost always endorsed as "single;" and military rank at capture was overwhelmingly "enlisted." Thus, these variables were not included in the analyses. Years of education and age at capture (reported in the 1965 survey) were more evenly distributed and were selected to indicate resilience.

Social Support

The 1965 survey contained four questions that represented social support and reintegration into civilian life: "Was it hard for you to pick up old friendships in the first year or two after the war?", "Did you find return to civilian life difficult in any respect?", "In your social and recreation activities (during the first year or two after the war) were you: always alone/often alone/sometimes alone/seldom alone?", "Do you think the Army or VA could have done more to help you return to civilian life?" Scores from these four items were summed to yield an index of social support.

Trauma response (1965) assessed via the CMI

The Cornell Medical Index is a 195-item inventory that covers a wide variety of medical problems, such as cardiac, respiratory, neurological, and skin infirmities, and some psychological difficulties, such as depression, anxiety, low self-esteem, social isolation and conflict, and anger. Individuals respond to questions with either "yes" or "no." From the item set representing psychological problems, 20 items thought to represent DSM-III-R PTSD criteria were selected for further analysis.

Trauma response (1990) assessed via the PTSD module of SCID

The SCID PTSD module is a structured interview frequently used to evaluate the presence or absence of PTSD (Spitzer and Williams 1987). It has a reported high interrater agreement (κ of 0.93; Kulka et al. 1991). It first directs the examiner to begin the interview with specific comments about trauma and its possible effects. Specific questions are then asked about possible past exposure to any trauma. The next section contains questions about military experiences and possible military trauma exposure, and the final and largest section contains questions about each of the 17 DSM-III-R PTSD symptoms, current and past. Although no special training in the SCID PTSD module was provided to the VA psychiatrist or psychologist examiners, instructions concerning its administration were included in the directives sent to all the VAMCs.

Results

Means and standard deviations on the variables of resilience, trauma, social support, trauma response in 1965, and trauma response in 1990 are presented in Table 1. These data show that the average age of the sample at the time of captivity was just short of 23 years, with an average of only about 9 years of education.

Underlying structure of the CMI was investigated by submitting responses to items on the Cornell Medical Index to a principal components analysis, with factors rotated obliquely (Table 2). A three-factor solution was called for in the effort to approximate the three diagnostic criterion groups comprising the DSM-III-R PTSD disorder. The three factors accounted for approximately 47% of the variance in the rotated matrix. Factor 1 (Irritability) tapped negative reaction to minor interpersonal and situational conflicts, and accounted for 31% of the variance. Factor 2 (Fearfulness/Anxiousness) tapped a general distress reaction to internal and external stimuli, and accounted for 9% of the variance. Factor 3 (Social Withdrawal) tapped alienation from the social world, and accounted for 7% of the variance. Only the factor intercorrelation between Irritability and Fearfulness/Anxiousness exceeded 0.20. Summed scores on the variables comprising these factors were entered as predictors of current PTSD symptomatology in regression analyses described below.

Structure of the SCID PTSD module elements (criterion groups) was examined via multidimensional scaling analysis (MDS). MDS refers to a family of geometric models that provide a spatial representation of the similarity structure of data elements. Using similarity data (correlations), the internal relationships (i.e., proximity) among data elements may be displayed geo-

Table 1 Means and standard deviations on variables of resilience, war trauma, social support, (1965) trauma response and (1990) posttraumatic stress disorders (PTSD) severity ($N = 270$)

Variable	Mean	SD	Range	
			Low	High
Resilience				
Education at trauma	9.24	2.74	1	16
Age at trauma	22.93	4.15	16	45
Trauma				
Camp diseases	22.27	3.57	17	34
Social support	4.45	0.93	2	7
1965 Trauma response (CMI)				
Irritability	14.56	1.84	8	16
Fearfulness/Anxiety	14.96	1.60	8	16
Social withdrawal	5.79	0.48	3	6
1990 PTSD severity (SCID)				
Symptoms, total	26.38	10.38	17	51
Criterion B	6.59	2.97	4	12
Criterion C	10.32	4.23	7	21
Criterion D	9.52	4.08	6	18
MDS cluster 1	9.86	4.28	6	18
MDS cluster 2	7.82	3.42	5	15
MDS cluster 3	5.62	2.43	4	12

Table 2 Factor loadings, eigenvalues, variance explained, and communalities for psychiatric symptoms assessed by the Cornell Medical Index ($N = 270$). Loadings less than 0.25 have been replaced by zero. (factor 1 = Irritability, factor 2 = Fearfulness/Anxiety, factor 3 = Social withdrawal)

Item	Factor loadings			
	Factor 1	Factor 2	Factor 3	h^2
Little annoyances get on nerves	0.69	0.00	0.00	0.49
Little things wear you out	0.68	0.00	0.00	0.56
Easily upset or irritated	0.67	0.00	0.00	0.59
Constantly keyed up & jittery	0.67	0.00	0.00	0.50
People annoy and irritate you	0.63	0.00	0.00	0.46
Considered touchy person	0.61	0.00	0.30	0.55
People misunderstand you	0.55	0.00	0.41	0.49
Considered nervous person	0.46	0.00	0.00	0.19
Frightening dreams	0.00	0.72	0.00	0.54
Break out in cold sweats	0.00	0.67	0.34	0.59
Sudden noises make you jump	0.00	0.64	-0.33	0.56
Scared at sudden movements/night	0.00	0.63	0.00	0.41
Suddenly scared for no reason	0.00	0.61	0.48	0.66
Frightening thoughts	0.00	0.60	0.25	0.48
Often shake and tremble	0.00	0.55	0.00	0.41
Go to pieces if don't control	0.32	0.41	0.00	0.42
Life looks hopeless	0.00	0.00	0.65	0.48
Alone & sad at party	0.00	0.00	0.53	0.42
On guard even with friends	0.37	0.00	0.45	0.45
Eigenvalues	6.23	1.81	1.39	
Percentage of variance	31.1	9.1	7.0	

metrically in dimensional space. Although factor analysis and MDS provide much the same information, MDS removes any large general factor that may be present from the solution, such as general psychological distress. This permits more direct examination of dimensions that serve to differentiate among a set of elements.

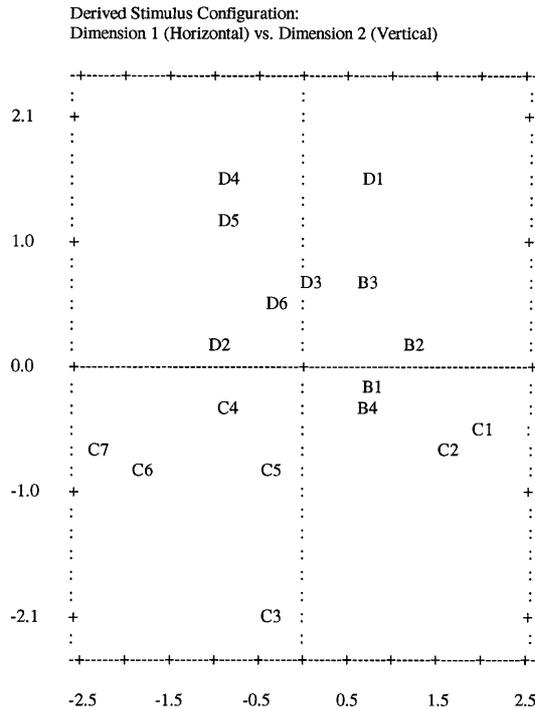


Fig. 1 Two-dimensional multidimensional scaling (MDS) solution depicting spatially the 17 PTSD criteria: criterion B variables, B1–B4; (Intrusion); criterion C variables; C1–C7; (Avoidance); criterion D variables; D1–D6; (Arousal)

A two-dimensional scaling solution was obtained, which represents spatially the interrelations among the 17 PTSD criteria (see Fig. 1). The adequacy of fit of the resulting spatial configuration generated for the similarity matrix is assessed by calculated stress values (Kruskal and Wish 1978) and interpretability of the dimensional solution. A near-zero stress value indicates that the number of dimensions defining the solution space adequately accommodates the observed relations among the variables. In contrast, a high value indicates more dimensions are required to represent adequately the relations among elements. For these data, a two-dimension solution produced a stress value of 0.304, reflecting its adequacy in accounting element interrelationships. A three-dimensional solution produced a slightly lower stress value of 0.296, but the geometric arrangement of elements was more difficult to interpret.

Visual inspection of the geometric display suggested three interpretable clusters of variables. The first cluster included the four criterion B (intrusion) variables and the first two criterion C (avoidance) variables that represent direct efforts to avoid any cues associated with the traumatic event. The second cluster included four of remaining five criterion C variables (excepting C3), reflecting general disengagement from life and its people and activities. The third cluster included all criterion D (arousal) variables, except for D1, indicating increased arousal. Summed scores on variables comprising these three clusters were entered as indicators of current PTSD symptomatology in the following regression analyses.

Finally, a series of regression analyses were undertaken to determine whether resilience, war trauma, social support, 1965 symptomatology, and interactions

between war trauma and resilience and social support predicted current PTSD. Current PTSD, the criterion, was operationalized in three ways:

1. As a global measure consisting of a summation of the 17 DSM-III-R criteria
2. As a construct differentiated into the three a priori criterion clusters set forth by the DSM-III-R: intrusion (criterion B), avoidance (criterion C), and arousal (criterion D), and
3. As a construct differentiated into three a posteriori clusters as generated by the above MDS analysis

Predictors were entered as blocks hierarchically into the series of analyses in a sequence representing relative time of occurrence. That is, resilience factors (education and age at time of trauma) and war trauma were causally earliest and therefore entered first. Next, social support experienced in the years just following return to civilian life was entered. Third, 1965 symptomatology, represented by the three CMI factors, was entered. Finally, interactions between war trauma and the three variables potentially mitigating trauma response, education and age at time of trauma, and social support, were entered last.

Seven regression models were built around the criterion of PTSD. The first analysis defined PTSD as a global measure (see Table 3); the second through fourth analyses differentiated PTSD symptomatology into intrusion (B), avoidance (C), and arousal (D), respectively, to investigate differential prediction of the a priori criteria sets. Likewise, the fifth through seventh analyses differentiated PTSD symptomatology into intrusion/direct avoidance, disengagement, and arousal, respectively, to investigate differential prediction of the a posteriori-derived symptom clusters. All seven analyses produced essentially the same results, and therefore only the first set of analyses are reported here (Table 3). The first block of predictors, resilience and war trauma, accounted for approximately 22–33% of the variance in current post-traumatic stress, however it was defined. Social support failed to predict PTSD symptomatology at all. Trauma response in 1965 and the interactions of

war trauma with resilience factors and social support respectively each explained about 2% of the variance in PTSD.

Discussion

The series of regression analyses investigating the prediction of current PTSD (1990 SCID) from resilience (education and age at time of war trauma), war trauma (disease index), social support, past distress (1965 CMI), and interactions of resilience and social support with war trauma all revealed, with some variation, that, in decreasing order of importance, war trauma and resilience best predicted current PTSD symptomatology. Surprisingly, 1965 distress and the interactions added only a modest amount to the prediction of current stress, and post-trauma social support provided none. Thus, a cautious interpretation of these results is that severity of traumatic events is best related to distress experienced 40–50 years later, mitigated in part by greater education level and age at the time of trauma. The fact that 1965 distress added little explanation to variation in current distress may be in part due to its late entry into the regression model after much variance was captured by war trauma. It may also represent the possibility that intensity of PTSD fluctuates considerably over time, making prediction of distress at time B from distress at time A problematic. The lack of relationship between social support and current distress is disappointing, given conventional wisdom that networks of social support ease reactions to trauma. An examination of the social support variable items suggests that this construct is not well tapped by the items. Unfortunately, we were limited by the survey's item pool. Addition of explained variation by the interaction terms was small, indicating that differential distress linked by attribute by trauma interactions was not significantly operative in this sample.

Clustering of SCID items in two-dimensional space offers some construct validation for the DSM's differentiation of PTSD symptoms into three criterion

Table 3 Prediction of (1990) PTSD severity ($N = 270$) from resilience, war trauma, social support, and (1965) trauma response (*Cum* cumulative, *Cha* change)

	Step entered	r	R	Cum R^2	Cha R^2	df	p
Resilience	1		0.54	0.29	0.29	3,266	0.00
Educ. at trauma		-0.26					
Age at trauma		-0.30					
Trauma (Camp diseases)		0.45					
Social support	2	-0.02	0.54	0.29	0.00	4,265	0.45
1965 Trauma response	3		0.56	0.32	0.03	7,262	0.02
Irritability		-0.26					
Fear/Anxiety		-0.41					
Social withdr.		-0.23					
Interactions	4		0.58	0.34	0.02	10,259	0.04
Educo * Diseases		-0.04					
Age * Diseases		0.04					
SocSup * Diseases		0.26					

groups, although the match between empirical clustering and conceptual grouping is not perfect. The clustering of the intrusion items (Bs) with the first two avoidance items (C1 and C2) reveals a causal relationship between re-experiencing trauma and the immediate coping response of avoiding very specifically any cues triggering re-experiencing. However, the remainder of criterion C avoidance items cluster away from this intrusion-avoidance cluster. Inspection of the items comprising the second cluster indicates that these items reflect a more general disengagement with the environment in ways not specifically linked to the traumatic events. The third cluster items fairly closely match the arousal symptoms of criterion D. Two individual criteria, C3 (inability to recall an important aspect of the trauma) and D1 (difficulty falling or staying asleep) stand as outliers from the clusters for reasons not readily determined. Although clustering of SCID items demonstrates support for DSM's grouping of symptom criteria, further work is necessary to clarify any underlying dimensions explaining the arrangement of items. The two dimensions of this MDS solution need to be regressed on to other scales of PTSD to assist in interpretation of the meaning of these empirically derived dimensions.

Items of the Cornell Medical Index (CMI) provide only partial coverage of the DSM PTSD criteria, and therefore do not adequately represent the construct of PTSD. A three-component solution forced upon the 20 rationally selected items yielded two easily interpreted components of Irritability and Fearfulness/Anxiousness, and a third component more difficult to interpret, Social Withdrawal. Although all of these components tap distress, they do not directly represent the specific features of PTSD. In other words, there is not a one-to-one correspondence to PTSD symptoms. Nor did they successfully describe the three clusters of SCID items mapped in two-dimension space. Thus, at this point, the CMI's utility may be restricted to providing some index of general distress, rather than a direct estimate of PTSD symptoms.

Several limitations hampered production and interpretation of findings. The sample, of course, consists of living individuals, who may be hardier in some ways than those who died in captivity. However, previous studies suggest that POWs are more impaired than their non-POW cohorts. Next, this archival data set limits analysis to the information collected. Many key variables bearing upon war-related trauma response were not measured in earlier waves of data collection, thus making model specification incomplete. For example, intensity of combat exposure and wounds sustained were not assessed adequately, yet these variables would be expected to account for significant variation in current PTSD symptomatology. Also not measured were cognitive processes mitigating trauma response as well as pre-trauma personality styles that may predispose an individual to withstand or falter in the face of extreme stress.

Conclusions

Despite limitations, these findings support previous work showing the severe psychological sequelae of POW status 40–50 years after captivity, and they indicate that trauma severity during captivity is the best predictor of current PTSD symptomatology. Results also add to our understanding of the conceptual differentiation of PTSD symptoms into separate and distinct symptom clusters.

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