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Predictors of Posttraumatic Stress in Civilians 1 Year after Air Attacks: A Study of Yugoslavian Students

JELENA GAVRILOVIC,[1] DUSICA LECIC-TOSEVSKI, PH.D.,[1,2] GORAN KNEZEVIC, M.A.,[2,3] and STEFAN PRIEBE, M.D.[4]

The level of posttraumatic stress, other psychological symptoms, and potential predictors were assessed in 139 medical students 1 year after experiencing air attacks in Belgrade, Yugoslavia. Eleven percent of the students showed high levels of posttraumatic stress (scores > 34) on the Impact of Event Scale; lower degrees of intrusion symptoms were reported by 32% of the students and avoidance symptoms were reported by 45%. Although gender, distress during previous stressful events, and exposure to trauma during the attacks were all of some predictive value, distress during the attacks was the best predictor for symptoms. This association remained significant when the influence of other psychological symptoms was controlled. The type of previous stressful events interacted with the degree of exposure to trauma during the attacks in predicting avoidance symptoms, but not intrusion symptoms. The findings suggest that predictors for high and low thresholds of symptoms may be similar. The quality of previous stressful events can modify the response to subsequent trauma.

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Although numerous studies have assessed posttraumatic stress in combatants, few studies focused on frequency and predictors of posttraumatic stress in civilians who had experienced armed conflict (Abu-Saba, 1999; Michultka et al., 1998). There is wide evidence that shows more severe and longer exposure to traumatic events may lead to more posttraumatic stress (Abu-Saba, 1999; Hiley-Young et al., 1995). Previous exposure to trauma has also been suggested to increase the risk of developing posttraumatic stress after subsequent trauma (Breslau et al., 1999; King et al., 1996). The effects of traumatic events may accumulate so that previous traumatic experience increases the likelihood of exceeding an individual threshold for posttraumatic stress or makes coping more difficult (King et al., 1996; Solomon et al., 1987). The previous experience of trauma might also qualitatively change the way patients respond to further traumatic events and facilitate the development of stress reactions (Priebe et al., 1994). However, the experience of previous stressful events has also been suggested to be potentially protective. Positive experience of coping with traumatic events may help an individual adapt to stressful experiences in the future (Burt and Katz, 1987). For example, Israeli University students showed lower levels of distress after exposure to multiple traumatic events than after exposure to a single traumatic event (Amir and Sol, 1999).

A high percentage of people do not respond to traumatic events with symptoms that fulfill all criteria of posttraumatic stress disorder (PTSD). Often they show a lower degree of similar symptoms. It is unclear whether these lower levels of symptoms are subject to the same predictor variables as is full PTSD. Further, many studies on predictors of posttraumatic stress seem methodologically flawed. Often, the samples or the traumatic events in question are very heterogeneous; the samples frequently are high-risk groups, and the response rates in surveys are usually incomplete.

In this study, posttraumatic stress was assessed in a homogeneous group of medical students, with a response rate of 98.6%, 1 year after experiencing air attacks. The attacks lasted from March 24, 1999, to June 9, 1999; occurred almost every night during that period of time; and resulted in casualties among civilians throughout Yugoslavia. Estimates for the number of civilian deaths vary around 500 (Amnesty

[1] The Institute of Mental Health, University of Belgrade, Belgrade, Yugoslavia.
[2] Psychosocial Centre International Aid Network, Belgrade, Yugoslavia.
[3] Department of Psychology, University of Belgrade, Belgrade, Yugoslavia.
[4] Unit for Social and Community Psychiatry, Institute of Psychotrauma, St. Bartholomew's and the Royal London School of Medicine, West Smithfield, London EC1A 7BE, England; e-mail: s.priebe@qmw.ac.uk. Send reprint requests to Dr. Priebe.

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International, 2000). We addressed the following questions: a) what is the level of intrusion and avoidance symptoms? b) In what way do previous stressful events, the extent of exposure to traumatic experience during the air attacks, the distress caused by previous events and by the attacks at the time of the events, and gender predict the degree of symptoms? Are the predictors equivalent for high and low threshold cut-off points? c) Does the experience of previous traumatic events influence the probability of posttraumatic stress and, if so, in what way?

Methods

Sample

The sample consists of 139 of all 141 fourth-year medical students (95 woman, 44 men) at one teaching hospital of the University of Belgrade, Yugoslavia. All of them experienced air attacks as civilians in the spring of 1999. The ages of the students ranged from 21 to 28 years (mean = 23.8; SD = 1.3). At the time of the study in spring 2000, four lived with a partner and none had children. After complete description of the study to the research subjects, written informed consent was obtained from 139 students. Two remaining students refused to participate in the study.

Instruments

The Life Stressor Checklist-R (LSCL-R; Wolfe and Kimerling, 1997) was administered to assess previous traumatic life events. We added questions on previous war experience and previous experience of a forced migration. A cumulative score of stressful events was obtained as a measure of exposure. As a measure of distress, we took a cumulative score of distress at the time of experiencing the events.

In addition, we compiled a list of stressors (LS) that were related to air attacks. The list is based on and similar to other methods used to assess trauma exposure (*e.g.*, Weine et al., 2000). It consists of 37 items (events such as powerful detonations causing death or injury to a close person), and registers the frequency of the particular event (0 = none, 1 = once, 2 = few times, 3 = often) and how upsetting the event was (on scale from 0 to 4). A cumulative score is obtained as a measure of exposure and a cumulative distress score was obtained as a measure of distress at the time.

The Impact of Event Scale (IES; Horowitz et al., 1979) was administered to assess intrusion and avoidance symptoms, and the Symptom Checklist 90-R (SCL-90-R; Derogatis, 1983) was administered to assess self-rated general psychological symptoms on 10 subscales.

Statistical Analysis

Sum scores of exposure to and distress caused by previous stressful events, stressors during air attacks, and gender were used as predictors. Subsequently general psychological symptoms were also considered as a predictor.

With respect to posttraumatic stress scores as dependent variables, the majority of students were expected to have low IES scores, resulting in a very skewed distribution. Therefore, we decided to dichotomize IES scores to predict whether relevant levels of symptoms did or did not exist. A cut-off point of greater than 34 was used for identifying patients with a high level of symptoms (Neal et al., 1994). Because there are no overall accepted cut-off points for lower degrees of intrusion and avoidance symptoms, we asked students an open question about complaints as a result of the air attacks. The number of reported complaints was used to define lower levels of intrusion and avoidance symptoms. Thus, posttraumatic stress was determined as a dependent variable, according to three cut-off points (*i.e.*, >34 on the IES sum score and a lower score for each intrusion and avoidance symptom). Chi-square tests and *t*-tests were used for univariate prediction. For a multivariate prediction, stepwise forward logistic regressions were computed.

Two-way analyses of variance were conducted to assess whether previous stressful events and traumatic experiences during air attacks interact in predicting posttraumatic stress. The dependent variables were the continuous scores of intrusion and avoidance on the IES. Independent variables were exposure on LSCL-R and exposure on LS. Only the exposure parameters were determined because they may be assumed to be less influenced by retrospective bias than subjective distress scores. LS was dichotomized into a high-scoring and a low-scoring group, according to the median. Because the stressors assessed in the LSCL-R are more heterogeneous, we distinguished between groups qualitatively. A hierarchical cluster analysis, based on Euclidean distances among subjects, was computed for identifying groups with different types of previous stress. A discriminant functional analysis was used to confirm the groupings.

Results

Scores of the Instruments

All 139 students completed the full set of questionnaires that were analyzed in this study. The

TABLE 1
Statistical Significance of Univariate Analysis of Predictors of Different Cut Off Points on Impact of Event Scale (IES)

Predictors	IES Total ·34/>34	Statistic[a]	IES Intrusion ·5/>5	Statistic[a]	IES Avoidance ·6/>6	Statistic[a]
Gender (% female)	67.7/73.3	(.19)	65.3/75	(1.3)	59.2/79.4	(6.5)*
Objective exposure—lifetime events (mean, SD)	3.0 (2.2)/3.8 (2.2)	1.2	2.9 (2.1)/3.5 (2.6)	1.3	3.1 (2.1)/3.1 (2.5)	.05
Subjective distress—lifetime events	7.2 (5.9)/11.1 (10.3)	2.2*	6.7 (5.1)/9.6 (8.7)	2.4*	7.0 (5.2)/8.5 (7.9)	1.5
Objective exposure—air attacks	38.2 (11.5)/45.6 (9.4)	2.4*	37.0 (11.2)/43.1 (11.2)	3.0**	36.0 (11.3)/42.6 (10.8)	3.5***
Subjective distress—air attacks	37.4 (18.0)/55.3 (20.1)	3.6***	35.1 (16.3)/48.4 (21.4)	4.0***	32.6 (15.4)/47.5 (20.0)	5.0***
Global Severity Index on SCL-90-R	.46 (.33)/1.4 (.62)	8.9***	.44 (.36)/.80 (.57)	4.5***	.40 (.36)/.75 (.51)	4.6***

[a] χ^2 with gender, t values with all other predictors.
*$p < .05$; **$p < .01$; ***$p < .001$.

mean score of exposure on the LSCL-R was 3.1 (SD = 2.3), the mean score of distress on the LSCL-R was 7.7 (SD = 6.5), the mean score of exposure on the LS was 39.0 (SD = 11.6), and the mean score of distress on the LS was 39.3 (SD = 19.1). The cluster analysis identified four groups. The distinction was consistent with the results of the discriminant functional analysis, which correctly classified 97.1% of cases. Previous stressful experiences of the four groups were characterized by accidents and by loss of a close person (55 students), violence in the family (23), and experience of war and/or forced migration (27). The fourth group (34) reported no or very few previous stressful events.

Exposure and distress scores for the LSCL-R (Pearson's $r = 91$, $p < .001$) and the LS ($r = .75$, $p < .001$) were highly correlated. Exposure on the LSCL-R and LS ($r = .16$, $p = .06$) and distress on the LSCL-R and LS ($r = .18$, $p < .05$) were weakly associated, as were distress on the LSCL-R and exposure on the LS ($r = .22$, $p < .05$). There was no significant correlation between exposure on the LSCL-R and distress on the LS ($r = .01$).

The IES total mean score was 13.6 (SD = 14.2). For the subscale intrusion, the mean score was 5.3 (SD = 6.8), and the mean score for avoidance was 8.3 (SD = 8.8). When different low cut-off points on the IES subscales were tested for their discriminating abilities concerning the number of present complaints students reported in response to the open question, greater than 5 for intrusion ($t = 2.2$, $df = 137$, $p < .05$) and greater than 6 for avoidance ($t = 2.9$, $df = 137$, $p < .01$) were determined to be the most suitable cut-off points. Fifteen (10.8%) students had total score of greater than 34, 44 (31.7%) students scored greater than 5 on intrusion and 63 (45.3%) students scored greater than 6 on avoidance.

Mean scores on the SCL-90-R varied between .29 (psychoticism) and .80 (obsessive-compulsive). The global severity index was, on average, .56 (SD = .47).

Univariate Prediction

Table 1 shows the univariate prediction of the three dependent variables. Higher degrees of exposure to stressful events during air attacks and of distress at the time of the attacks predicted more symptoms, according to all three cut-off points. Previous life stressors were of no predictive value for any cut-off point. Greater distress caused by previous events predicted a greater likelihood to have a score of greater than 5 on the intrusion subscale. Women were more likely to have symptoms above the cut-off point on the avoidance subscale. A higher severity index on the SCL-90-R predicted a greater probability of having symptoms greater than each of the three cut-off points. This also applied to each of the 10 SCL-90-R subscales.

Multivariate Prediction

When all variables were tested as predictors (without SCL-90-R scores) in a multivariate analysis (logistic regression), distress on the LS was the only significant predictor for each cut-off point. Odds ratios were 1.05 (95% confidence interval [CI] = 1.02 to 1.08) for the greater than 34 cut-off point, 1.04 (95% CI = 1.02 to 1.06) for low intrusion, and 1.05 (95% CI = 1.03 to 1.07) for low avoidance cut off points. When, in a next step, the SCL-90-R scales were entered, distress on the LS remained a significant predictor with an odds ratio of 1.05 (95% CI = 1.01 to 1.03) for the higher cut-off point, 1.03 (95% CI = 1.01 to 1.05) for the intrusion cut-off point, and 1.04 (95% CI = 1.01 to 1.06) for the avoidance low

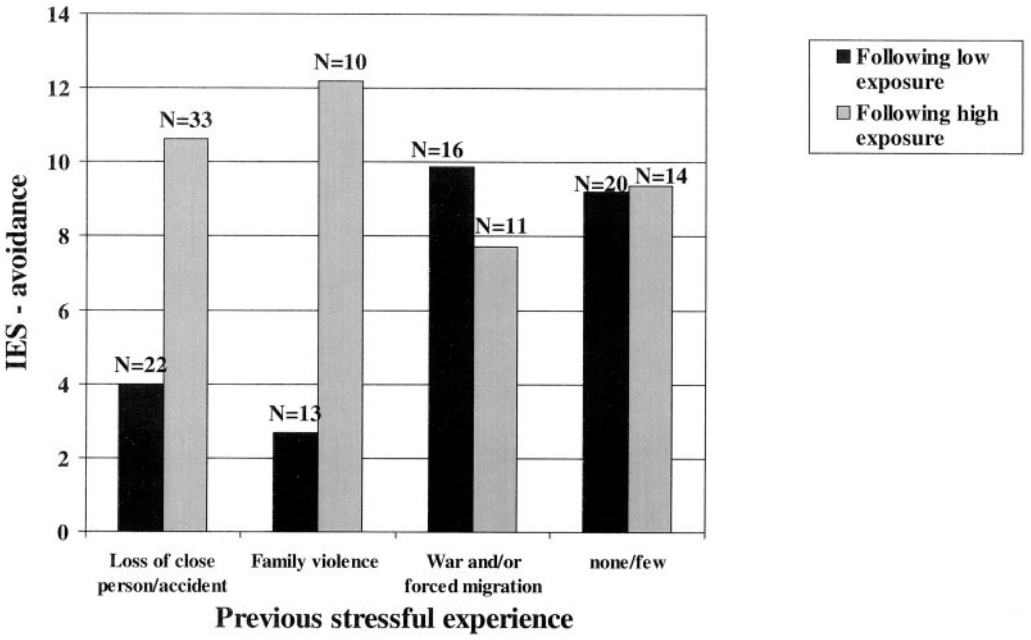

FIG. 1. Avoidance scores for four groups of students with different types of stressful experience before air attacks.

cut-off point, but some SCL-90-R scores also significantly contributed to the predictive equation. These were interpersonal sensitivity (odds ratio = 4.17, 95% CI = .84 to 20.6) and depression (odds ratio = 4.82, 95% CI = 1.3 to 17.3) for the greater than 34 cut-off point on the combined IES, and anxiety for each of the lower intrusion (odds ratio = 3.6, 95% CI = 1.6 to 8.1) and avoidance thresholds (odds ratio = 6.27, 95% CI = 2.35 to 16.5).

Interaction of Previous Stress and Traumatic Experience During Attacks

The two-way analysis of variance with the IES intrusion score as a dependent variable did not show any significant main or interaction effect. When the avoidance score was taken as a dependent variable, there was a main effect of LS ($F = 5.3$, $df = 1$, $p < .05$) and a significant interaction between the LS and LSCL-R groups ($F = 2.9$, $df = 3$, $p < .05$). This means that the type of previous stress did not have a direct impact on posttraumatic stress, but modified the way the degree of exposure to traumatic events during air attacks influenced avoidance symptoms. Figure 1 shows avoidance symptoms in students with low and high exposure in the four groups with distinct previous experiences of stress.

In students with previous experience of accidents/loss of a close person and of family violence, a higher degree of exposure was associated with more avoidance symptoms. Such an association was not found in students who had experienced war/forced migration or only few previous stressful events.

Discussion

Stressful experience before the air attacks and traumatic events during the attacks were assessed retrospectively in this study. In some studies, retrospective accounts of traumatic events have been shown to be influenced by current posttraumatic stress (Harvey and Bryant 2000; Roemer et al., 1998), whereas other studies have found retrospective reports to be relatively accurate (Henry et al., 1994; Wagenaar and Groenweg, 1990). Such a retrospective distortion might bias reports of distress at the time of traumatic events more than reports of exposure. Data in this study are likely to have been affected by retrospective memory bias. However, a very strong and systematic influence would probably have a uniform effect on reports of both previous traumatic experience and events during air attacks, resulting in a high correlation between the two. However, the correlation between the LSCL-R and the LS is rather weak and does not explain more than 5% of the variance, even for the distress variables, so that the influence of a systematic generalized memory distortion was probably limited.

The level of intrusion and avoidance symptoms 1 year after the air attacks remained significant, but is lower than in other surveys of groups after exposure to trauma (Centers for Disease Control and Prevention, 1988; Nadar et al., 1990). Approximately 11% of the students showed high degree of posttraumatic stress. This prevalence rate was not influenced by selection because only 2 of all 141 fourth-year medical students did not take part.

Low degrees of intrusion and avoidance symptoms were more frequent, although still reported by less than 50% of the research subjects. Their less severe symptoms are clearly below the threshold for fulfilling criteria B and C of PTSD according to DSM-IV, but might nonetheless be distressing. One can only speculate as to what extent the symptom levels found in this study can be generalized to civilians in similar conflicts elsewhere. It may be noteworthy that Zeidner and Ben-Zur (1994) reported only weak effects of missile attacks in civilians in Israel 3 months after exposure in 1991. Medical students are likely to be a relatively resilient group, and other groups might have shown more severe stress symptoms after exposure to the same events.

The group investigated in this study was fairly homogeneous. This was an advantage for the analysis of predictive associations because there was no need to control for the influence of potentially confounding factors such as education, age, social status, and marital status, which did not vary in the group.

Univariate analyses identified several predictors for posttraumatic stress, as defined by higher and lower cut-off points. The best predictor, apart from concurrent symptomatology, was distress at the time of the attacks. In multivariate analyses, it was the only predictor that remained significant. This underlines the central role of subjective perception in relation to trauma for developing posttraumatic stress symptoms, which has also been emphasized by other studies (Marmar et al., 1996; McFarlane et al., 2000).

Posttraumatic stress was significantly correlated with other psychological symptoms that are self-rated on the SCL-90-R. This is partly because of an overlap of what is assessed on the SCL-90-R and on the IES. When the influence of other psychological symptoms on IES scores was controlled for in the multivariate analysis of prediction, the predictive association between reported distress at the time of the attacks and present posttraumatic stress remained. This suggests a specific impact of distress during traumatic events on present symptoms of intrusion and avoidance, which goes beyond an association with general symptomatology. This specific influence determines not only a high degree of symptoms of posttraumatic stress but also the presence of lower levels of symptoms that do not reach the threshold of a clinical diagnosis.

Although predictors for intrusion and avoidance symptoms are not necessarily identical (McFarlane 1992), low symptom levels seem to be predicted by similar factors as marked symptoms.

How did previous stress modify the response to traumatic events during air attacks? As previously noted, previous experience of stressful events and exposure, as well as distress at the time of attacks, may be cautiously regarded as independent predictors. Previous stress did have some predictive value, which disappeared when the influence of stress at attacks was also considered. Thus, distress at the time of attacks captured the predictive variance of previous stressful experience, despite the weak direct correlation.

However, the type of previous stress interacted significantly with exposure in predicting the degree of avoidance symptoms. Experience of previous non–war-related stress seems to enable students to cope better with low exposure to trauma. With high exposure, this protection appears insufficient and the otherwise successful coping strategy fails. When students lacked the experience of previous stress or had been exposed to war and/or forced migration, the degree of response to trauma did not depend on the level of exposure. Their response may be more determined by the quality of the experience than its degree, so that the extent of exposure to potentially traumatic events does not necessarily predict the severity of posttraumatic symptoms. This seems to apply only to avoidance and not to intrusion. In interpretation of this finding, it should be taken into account that the range of traumatic experience by medical students during air attacks in Belgrade in 1999 may have been limited in comparison with civilians in other armed conflicts with direct and prolonged exposure to combat.

Conclusion

A significant number of civilians show some symptoms of intrusion and avoidance 1 year after being exposed to air attacks. Severe symptoms are reported by approximately 11%. Distress at the time of the traumatic events is the most powerful predictor of posttraumatic stress and is the sole predictor that remains significant in a multivariate analysis. Although predictors of intrusion and avoidance symptoms are not identical, high and low levels of symptoms appear to be predicted by similar factors. With due caution, research on predictors of clinical PTSD may be generalized to lower threshold symptom scores.

In conclusion, previous life stressors can modify the response to subsequent trauma, but the interaction can be complex and the type of previous stress may have to be considered, rather than its mere degree. In future research, a taxonomy with validated categories for different types of stressful

events needs to be developed for assessing the relevant aspects of life time trauma. This may facilitate a better understanding of precisely how previous exposure to stressful events impact on the response to subsequent trauma.

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