

A Prospective Study of Posttraumatic Stress and Depressive Reactions Among Treated and Untreated Adolescents 5 Years After a Catastrophic Disaster

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Objective: This study evaluated 1) the natural course of posttraumatic stress and depressive reactions among untreated adolescents from two cities in an earthquake zone (Gumri and Spitak) and one at the periphery (Yerevan) who were differentially exposed to the 1988 Spitak earthquake in Armenia and 2) the effectiveness of brief trauma/grief-focused psychotherapy among adolescents from Gumri.

Method: One hundred twenty-five adolescents were assessed with the Child Posttraumatic Stress Disorder Reaction Index (CPTSD-RI) and the Depression Self-Rating Scale (DSRS) at 1.5 and 5 years post-earthquake. At 1.5 years, trauma/grief-focused group and individual psychotherapy was provided over 6 weeks to a group of students in Gumri.

Results: CPTSD-RI scores among untreated adolescents from Gumri and Spitak subsided significantly but mildly at follow-

up, with scores from Spitak, the city at the epicenter, remaining above the cutoff for a diagnosis of PTSD. DSRS scores increased mildly in both earthquake cities but only significantly in Gumri. Among treated adolescents in Gumri, improvement in CPTSD-RI scores was three times that of the untreated Gumri comparison group. The treated group also tended to improve on their DSRS scores, whereas these scores worsened significantly among untreated subjects.

Conclusions: Untreated adolescents exposed to severe trauma are at risk for chronic PTSD and depressive symptoms. Brief trauma/grief-focused psychotherapy is effective in reducing PTSD symptoms and halting the progression of depression. This study supports the implementation of mental health intervention programs in schools after disasters to reduce trauma-related psychopathology.

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The Spitak earthquake: on Dec. 7, 1988, a devastating earthquake struck northern Armenia, causing the deaths of more than 25,000 people in an area inhabited by 530,000. It caused massive destruction in four cities and numerous villages. In Spitak and Gumri, two of the most devastated cities, nearly all of the inhabitants experienced direct threats to their lives and witnessed mutilating injuries and grotesque deaths. Five years after the earthquake, only 15% of the reconstruction was completed in both cities. Living conditions were dismal, with people living in crowded, poorly insulated shacks. The omnipresence of debris and destroyed buildings served as constant reminders of the earthquake. The unemployment rate was over 70%.

Literature Review

There is a paucity of literature on the longitudinal course of posttraumatic stress disorder (PTSD) and depression among children and adolescents after disasters. La Greca et al. (1), using the Child Posttraumatic Stress Disorder Reaction Index (CPTSD-RI) (2), evaluated third- to fifth-grade students after Hurricane Andrew. Symptom severity was

moderate at 3 months and mild at 10 months after the hurricane. Shaw et al. (3), also using the CPTSD-RI after Hurricane Andrew, evaluated children ages 6 to 11. Children exposed to high levels of trauma, despite some improvement, continued to experience a moderate degree of symptoms at 21 months. McFarlane (4) evaluated "posttraumatic phenomena" with the parent and teacher questionnaires of Rutter and associates among children exposed to the 1983 bush fires in Australia at 8 and 26 months postdisaster. The prevalence of these phenomena did not change over the 18-month follow-up period.

Roussos et al. (5), using the Depression Self-Rating Scale (6), reported low levels of depression 3 months after the 1999 Ano Liosia earthquake in Greece. We, using the same instrument, reported high levels of depression among children and adolescents 1.5 and 3 years after the Spitak earthquake in Armenia (7) and 6 months after Hurricane Mitch in Nicaragua (8). Both Yule and Udwin (9) and we (7) found an increase in levels of depression over time among adolescents with chronic PTSD.

There are few treatment outcome studies among adolescents after disasters. Galante and Foa (10), using a structured classroom intervention at monthly intervals over 1

academic year after the 1980 earthquake in Italy, reported a reduction in earthquake-related fears. This study did not measure posttraumatic stress or depressive reactions, and there was no comparison group. Yule (11) reported the results of cognitive-behavior therapy among girls after the sinking of the *Jupiter*. At 5–9 months after the disaster, the treated group had lower scores on the Revised Impact of Event Scale and the Birlerson Depression Inventory. The authors did not report on the course of distress reactions among the untreated subjects.

Two years after Hurricane Iniki, Chemtob et al. (12) evaluated the outcome of four sessions of psychosocial intervention among children. Using the Kauai Reaction Inventory and a semistructured clinical interview, they found a significant, but mild, reduction of trauma-related symptoms at posttreatment. The reduction was maintained at the 10–12-month follow-up. We reported the findings among adolescents who received trauma/grief-focused group and individual psychotherapy 1.5 years after the Spitak earthquake (7). Three years after the earthquake, there was a significant decrease in posttraumatic stress symptoms and no change in the severity of depressive symptoms among treated subjects. In contrast, both posttraumatic stress and depressive symptoms worsened among untreated adolescents.

Another study of untreated school-age children evaluated 1.5 years after the Spitak earthquake revealed high rates of PTSD, depressive disorders, and separation anxiety disorder among students residing in the two heavily affected cities (13). The present study is a 5-year post-earthquake follow-up of a subgroup of those adolescents. The first objective of this study was to determine the course of PTSD and depressive symptoms among untreated subjects from three cities that were differentially affected by the earthquake. The second objective was to determine the effectiveness of trauma/grief-focused psychotherapy on these variables by comparing treated and comparison groups from one of the earthquake cities.

Method

Subjects

A total of 125 subjects were evaluated from three cities in Armenia, Spitak, Gumri, and Yerevan, each city located at increasing distances from the epicenter of the earthquake. Spitak, a city a few miles from the epicenter, was almost totally destroyed. Seventeen percent of the population died. Residents experienced extreme threats to their lives and witnessed mutilating injuries and grotesque deaths. These traumatogenic experiences persisted for days after the earthquake. In Gumri, located 20 miles from the epicenter, exposure to trauma was also severe. Destruction was uniform throughout the city, with 50% of the buildings destroyed and 90% substantially damaged. Approximately 7% of the population was killed. The severity of exposure to trauma was only slightly less than that of Spitak. In Yerevan, the capital of Armenia, located 47 miles from the epicenter, damage to buildings was less extensive, and there were no deaths attributable to the earthquake. However, residents had indirect exposure by way of con-

stant media coverage, with highly disturbing images of the death and destruction in the earthquake zone.

The initial study conducted 1.5 years after the earthquake has been described in detail elsewhere (13). Because of the multiplicity of hardships facing both the victims and the staff working in the earthquake zone, and the lack of available mental health personnel, this study focused on following a subgroup of the original group. For estimation of group size, a power analysis indicated that 21 subjects per study group was the minimum size necessary to obtain significant results (power=0.80, alpha=0.01). For the follow-up, every other untreated subject from the original study was selected. Because the number of treated subjects from the original group was small, all those who had received treatment were targeted for follow-up.

The original group from Spitak that had been previously evaluated at 1.5 years after the earthquake consisted of 63 students. Two subjects were lost at the 5-year follow-up. Thus, the group for this study consisted of 32 students (i.e., every other student from the available 61), with 12 boys of an average age of 16.6 (SD=0.5, range=16–17) and 20 girls of an average age of 16.5 (SD=0.5, range=16–17). The subjects were drawn from two schools from the two main regions of the city. None of the subjects in this group had received psychological treatment. The number of deaths of nuclear family members for the subjects from this group was 11, two of whom were from the same household.

The students from Gumri consisted of two groups: those who had received treatment and those who had not. The original treatment group consisted of 38 students. Two were lost at the 5-year follow-up, leaving 36, with 14 boys of an average age of 16.2 (SD=0.4, range=15–17) and 22 girls of an average age of 16.3 (SD=0.5, range=16–17). The number of deaths of nuclear family members for the subjects in this group was 10, each from a different family. The untreated group originally consisted of 56 students. Two subjects were lost to follow-up. Thus, the group for the present study consisted of 27 students (i.e., every other student from the available 54 students), with 11 boys of an average age of 16.4 (SD=0.5, range=16–17) and 16 girls of an average age of 16.4 (SD=0.5, range=16–17). The number of deaths of nuclear family members for this group was four, each from a different family. The schools in Gumri were selected from the four major regions of the city, where morbidity, mortality, damage, and destruction had been pervasive and uniform. The students who received treatment were from two Gumri schools that were chosen for intervention because of their proximity to our clinic. Because of a lack of clinical resources, we could not provide intervention in the other schools that were screened at 1.5 years after the earthquake in Gumri. Thus, the students in these schools served as comparison subjects for the present study. The fourth group was from Yerevan, the capital of Armenia, located 47 miles from the epicenter. Only one of the original 60 students was lost to follow-up. This group consisted of 30 students (i.e., every other student from the available 59), with 14 boys of an average age of 15.6 (SD=0.5, range=15–16) and 16 girls of an average age of 15.7 (SD=0.5, range=15–16). None of these students had received psychological treatment. There were no deaths of nuclear family members for the subjects in this group.

The principals of the schools that participated gave their approval for the study. The parents were informed of the evaluations and gave written informed consent for their child's participation. The adolescents who participated gave their assent. None declined to participate.

Instruments

Posttraumatic stress symptoms were evaluated by using the 20-item self-report CPTSD-RI. Ratings of symptom frequency over the previous month are made on a 5-point Likert scale. The psychometric properties of this instrument have been reported elsewhere, indicating that among Armenian students in the earth-

TABLE 1. Child PTSD Reaction Index (CPTSD-RI) Scores Depression Self-Rating Scale (DSRS) Scores and Among Adolescents Differentially Exposed to the 1988 Spitak Earthquake

Measure	Spitak Students (N=32)		Gumri Students Who Did Not Receive Treatment (N=27)		Yerevan Students (N=30)	
	Mean	SD	Mean	SD	Mean	SD
CPTSD-RI scores						
Time 1 ^a	53.0 ^b	8.4	41.1 ^b	7.8	34.7 ^c	10.0
Time 2 ^d	47.6	14.2	35.7	11.8	27.6	10.5
Change in scores	-5.4	14.2	-5.4	10.9	-7.1	11.6
DSRS scores						
Time 1 ^e	18.7	3.3	14.0 ^b	5.2	12.9	5.2
Time 2 ^f	20.0	6.6	16.8	6.1	13.8	5.1
Change in scores	1.3	6.2	2.8	6.7	0.9	6.9

^a Significant difference of across-group comparisons of CPTSD-RI scores at 1.5 years: Spitak students > Gumri students who did not receive treatment > Yerevan students ($p<0.001$).

^b Significant difference of within-group comparisons of CPTSD-RI and DSRS scores between 1.5 and 5 years ($p<0.05$).

^c Significant difference of within-group comparisons of CPTSD-RI and DSRS scores between 1.5 and 5 years ($p<0.01$).

^d Significant difference of across-group comparisons of CPTSD-RI scores at 5 years: Spitak students > Gumri students who did not receive treatment > Yerevan students ($p<0.001$).

^e Significant difference of across-group comparisons of DSRS scores at 1.5 years: Spitak students > Gumri students who did not receive treatment and Yerevan students ($p<0.001$).

^f Significant difference of across-group comparisons of DSRS scores at 5 years: Spitak students > Yerevan students ($p<0.001$).

quake zone, 90% of those who scored 40 or above met DSM-III-R criteria for PTSD (2). Mean B (reexperiencing of the traumatic event), C (avoidance of stimuli and numbing of responses), and D (increased arousal) category scores were calculated by dividing the total score in each category by the number of items in that category. Ratings of depressive symptoms were obtained by using the 21-item DSRS. The ratings of symptom frequency over the previous 2 weeks are made on a 3-point Likert scale. Prior studies have shown that a score of 17 or above is highly associated with a diagnosis of major depression, dysthymic disorder, or adjustment disorder with depressed mood (6).

Treatment

The Psychiatric Outreach Program staff provided treatment in the Gumri schools during school hours. When indicated, family intervention with the student and parents was provided. The students received four 90-minute group psychotherapy sessions and an average of two 1-hour individual psychotherapy sessions over a 3-week period. The most symptomatic students received up to four individual sessions. The treatment provided was completed within a 6-week period.

The trauma/grief-focused treatment incorporated therapeutic techniques from the literature (14–18). An eclectic model of treatment was used that included psycho-education with interpersonal and cognitive-behavior therapy techniques. Therapy addressed five major areas related to trauma that included the following:

1. Reconstruction of earthquake-related experiences immediately before, during, and after the earthquake. This entailed co-construction of a trauma narrative reviewing features of the earthquake experience, with clarification of distortions and misattributions.
2. Identification of trauma reminders, with links made to aspects of traumatic experiences. The students were assisted with increasing tolerance for expectable reactivity to re-

mindings, increasing support-seeking behavior during and after exposure to reminders, and avoiding unnecessary exposure to distressing reminders.

3. Identification of postdisaster stresses and adversities. The students received guidance to help them cope better with changes and losses at home and at school. They were assisted in decreasing maladaptive and avoidant behaviors.
4. Assistance with grief resolution by helping bereaved students reconstitute a nontraumatic mental representation of a deceased person so as to be able to engage in positive reminiscing. The students were helped to identify and engage other individuals who could provide advice, counseling, or companionship.
5. Identification of missed developmental opportunities due to loss of family members or traumatic avoidance. The students were assisted in reengaging in activities that promoted normal developmental progression.

Statistical Analyses

Skewness coefficients on all groups indicated a normal distribution of data, thereby permitting the use of parametric tests. Even though the ages of the subjects fell within a narrow range, an analysis of covariance was performed with age as a covariate. The results indicated that there was no age-by-city or time effect. Consequently, age groups were collapsed for further analyses. Analysis of variance (ANOVA) was used to analyze differences among the three groups (Spitak, Gumri, and Yerevan) that did not receive treatment on the CPTSD-RI total score, as well as B, C, and D subcategory scores, DSRS scores, and the change in scores between 1.5 and 5 years for both scales. Additionally, repeated-measures ANOVA was used to examine within-group changes over time for these variables. To examine differences on the distress measures between the two Gumri groups (treatment versus no treatment), *t* tests were used to analyze each of the distress measures. Sex differences were also analyzed with the *t* test.

Results

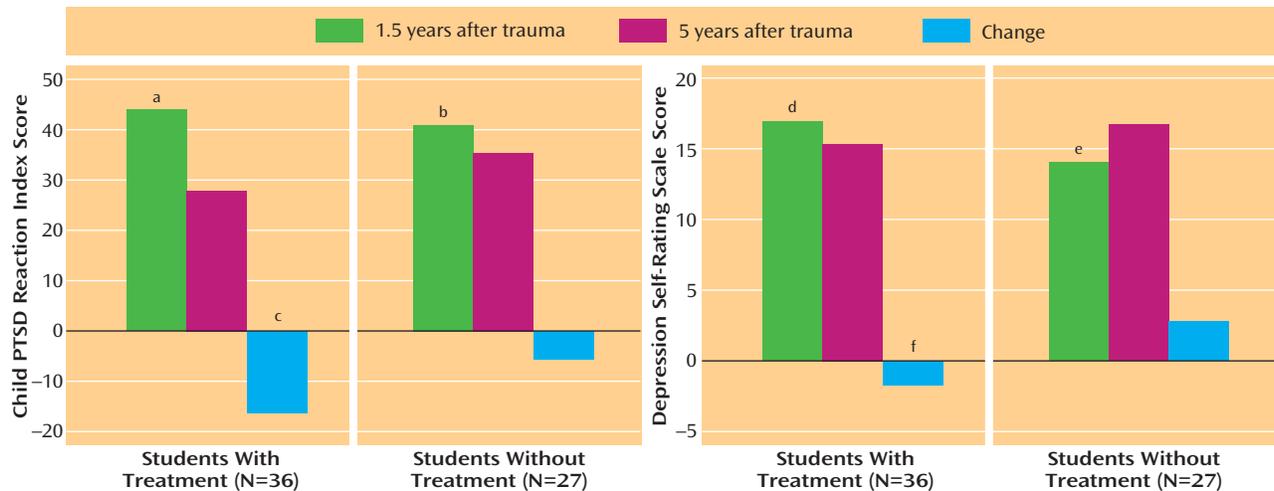
Recovery in Untreated Groups

At 1.5 years after the earthquake, mean CPTSD-RI scores differed significantly among the three groups ($F=34.6$, $df=2, 88$, $p<0.0001$) (Table 1). Bonferroni post hoc tests revealed a dose-of-exposure effect, with the Spitak group scoring significantly higher than the other two groups ($p<0.001$). The next highest was the score from the Gumri group, followed by the Yerevan group ($p=0.02$). The CPTSD-RI scores of both earthquake groups (Spitak and Gumri) were above the cutoff of 40 for a diagnosis of PTSD.

At 5 years after the earthquake, there was also a group effect ($F=20.4$, $df=2, 88$, $p<0.0001$). Bonferroni post hoc tests again indicated that the Spitak group scored higher than the other two groups ($p\leq 0.001$) and remained above the cutoff of 40. The Gumri students who did not receive treatment scored significantly higher than the Yerevan group ($p<0.05$), with both scores below the cutoff. Within-group comparisons of scores showed a significant decrease in CPTSD-RI scores in all three groups ($p<0.05$). The changes in scores between 1.5 and 5 years among the three groups were not significantly different from one another.

The combined group analysis of mean CPTSD-RI scores showed that girls scored significantly higher at both time

FIGURE 1. Child PTSD Reaction Index (CPTSD-RI) Scores, Depression Self-Rating Scale (DSRS) Scores, and Changes in Scores Between 1.5 and 5 Years Among Gumri Adolescents Differentially Exposed to the 1988 Spitak Earthquake



^a Significant decrease of CPTSD-RI scores between 1.5 and 5 years ($t=7.4$, $df=35$, $p<0.001$).

^b Significant decrease of CPTSD-RI scores between 1.5 and 5 years ($t=2.6$, $df=26$, $p<0.02$).

^c Significant difference of between-group comparison of change in CPTSD-RI scores between 1.5 and 5 years ($t=3.5$, $df=61$, $p<0.001$).

^d Nonsignificant decrease of DSRS scores between 1.5 and 5 years ($t=1.9$, $df=35$, $p<0.07$).

^e Significant increase of DSRS scores between 1.5 and 5 years ($t=-2.1$, $df=26$, $p<0.05$).

^f Significant difference of between-group comparison of change in DSRS scores between 1.5 and 5 years ($t=2.9$, $df=61$, $p<0.01$).

periods: 1.5 years, 52 girls: mean=46.1 (SD=11.4); 37 boys: mean=39.2 (SD=11.0) ($t=2.8$, $df=87$, $p=0.005$); 5 years, 52 girls: mean=40.7 (SD=14.5); 37 boys: mean=32.3 (SD=14.0) ($t=2.7$, $df=87$, $p<0.01$). Mean change in CPTSD-RI scores between 1.5 and 5 years did not differ significantly between the girls and the boys.

At 1.5 years, DSRS scores indicated a significant group effect ($F=13.33$, $df=2$, 87 , $p<0.001$) (Table 1), with the Spitak group scoring significantly higher than both of the other groups, which did not differ from one another. The scores of the Spitak students surpassed the cutoff of 17 for clinical depression, whereas those of the Gumri students who did not receive treatment and the Yerevan students fell below the cutoff. At 5 years after the earthquake, there was also a significant group effect ($F=8.67$, $df=2$, 88 , $p<0.001$). Bonferroni post hoc tests indicated that the Spitak group scored significantly higher than the Yerevan group ($p<0.001$) but not the Gumri group. The DSRS scores for the Spitak group remained above the cutoff for clinical depression, whereas the scores for the Gumri group increased to just below the cutoff of 17. Within-group analyses of DSRS scores indicated that even though there was an increase in scores in the three groups, only the Gumri students who did not receive treatment had scores that increased significantly ($F=4.54$, $df=1.27$, $p<0.05$). The mean change in DSRS scores between 1.5 and 5 years did not differ significantly across the three groups.

The combined group analysis of mean DSRS scores showed that at both time intervals, the girls had higher scores than the boys, but the difference reached significance only 5 years after the earthquake: 1.5 years, 52 girls: mean=16.0 (SD=5.6); 36 boys: mean=14.2 (SD=4.5); 5 years,

52 girls: mean=18.5 (SD=5.9); 37 boys: mean=14.9 (SD=6.4) ($t=2.7$, $df=87$, $p<0.01$). The mean change in DSRS scores between 1.5 and 5 years did not differ significantly between the girls and the boys.

Outcome of Treatment

At 1.5 years, mean CPTSD-RI scores did not differ significantly between the two groups (Figure 1): 36 Gumri students who received treatment: mean=44.3 (SD=8.6); 27 Gumri students who did not receive treatment: mean=41.2 (SD=7.8) ($t=1.5$, $df=61$, n.s.). At 5 years, however, the scores of the Gumri students who received treatment were significantly lower than those of the Gumri students who did not receive treatment: 36 Gumri students who received treatment: mean=28.1 (SD=10.3); 27 Gumri students who did not receive treatment: mean=35.7 (SD=11.8) ($t=2.7$, $df=61$, $p<0.01$). Within-group comparisons at 1.5 and 5 years indicated that CPTSD-RI scores decreased significantly in both groups (Gumri group with treatment: $p<0.001$; Gumri group without treatment: $p<0.02$). Mean change in CPTSD-RI scores between 1.5 and 5 years in the Gumri students who received treatment was three times greater than that of the Gumri students who did not receive treatment—36 Gumri students who received treatment: mean change=-16.3 (SD=13.0); 27 Gumri students who did not receive treatment: mean change=-5.4 (SD=11.0) ($t=3.5$, $df=61$, $p<0.001$). There was no significant difference in the change of CPTSD-RI scores between 1.5 and 5 years among treated girls and boys: 22 girls, mean=15.5 (SD=13.5); 14 boys, mean=17.6 (SD=12.5).

Within-group comparisons indicated that B, C, and D subcategory scores decreased significantly between 1.5

and 5 years in the Gumri students who received treatment, whereas only the B subcategory scores decreased significantly in the Gumri students who did not receive treatment: 36 Gumri students who received treatment—B subcategory score at 1.5 years: mean=2.66 (SD=0.67); at 5 years: mean=1.44 (SD=0.72) ($t=7.8$, $df=34$, $p<0.001$); C subcategory score at 1.5 years: mean=1.96 (SD=0.63); at 5 years: mean=1.39 (SD=0.70) ($t=3.8$, $df=35$, $p<0.001$); D subcategory score at 1.5 years: mean=1.81 (SD=0.62); at 5 years: mean=1.49 (SD=0.60) ($t=2.4$, $df=35$, $p=0.02$); 27 Gumri students who did not receive treatment—B subcategory score at 1.5 years: mean=2.16 (SD=0.55); at 5 years: mean=1.69 (SD=0.80) ($t=2.9$, $df=26$, $p<0.01$). The mean changes in B and C subcategory scores between 1.5 and 5 years of the 36 Gumri students who received treatment were significantly greater than in those who did not receive treatment ($N=27$): Gumri students who received treatment B: mean=1.20 (SD=0.91); Gumri students who did not receive treatment B: mean=0.47 (SD=0.86) ($t=3.2$, $df=60$, $p<0.01$); Gumri students who received treatment C: mean=0.57 (SD=0.90); Gumri students who did not receive treatment C: mean=0.14 (SD=0.81) ($t=1.94$, $df=61$, $p=0.05$). There was no significant difference between groups for D subcategory scores.

At 1.5 years, the mean DSRS score for the Gumri students who received treatment was significantly higher than that of the Gumri students who did not receive treatment (Figure 1)—36 Gumri students who received treatment: mean=16.9 (SD=4.3); 27 Gumri students who did not receive treatment: mean=14.0 (SD=5.2) ($t=-2.4$, $df=61$, $p=0.02$). At 5 years, there was no significant difference between the two groups: 36 Gumri students who received treatment: mean=15.2 (SD=4.0); 27 Gumri students who did not receive treatment: mean=16.8 (SD=6.1) ($t=1.2$, $df=61$, *n.s.*). Within-group comparisons of DSRS scores indicated a tendency for decreasing DSRS scores in the Gumri students who received treatment ($p<0.07$) and a significant increase of scores of the Gumri students who did not receive treatment ($p<0.05$). Of importance, the change in DSRS scores between 1.5 and 5 years differed significantly between the two groups, with the Gumri students who received treatment showing improvement and the Gumri students who did not receive treatment showing worsening symptoms: 36 Gumri students who received treatment: mean change=-1.7 (SD=5.4); 27 Gumri students who did not receive treatment: mean change=2.7 (SD=6.7) ($t=2.9$, $df=61$, $p<0.01$). There was no sex effect among the treated subjects: 22 girls: mean=1.0 (SD=4.9); 14 boys: mean=2.7 (SD=6.2).

Discussion

Longitudinal Course of Untreated Subjects

This study extends the literature on the longitudinal course of untreated posttraumatic stress reactions among children and adolescents by presenting findings at 5 years after a disaster. The mild improvement of PTSD symptoms

at 5 years in this study augments prior findings of the intractability of PTSD symptoms among untreated adolescents at the 3-year follow-up (7). At both 1.5 and 5 years, the severity of PTSD symptoms among differentially exposed adolescents followed a dose-of-exposure pattern. This type of information is important for the appropriate allocation of mental health resources after disasters.

The CPTSD-RI scores in Spitak, the city at the earthquake's epicenter, were above the cutoff score of 40 for PTSD at 1.5 and 5 years (53.0 and 47.5, respectively). These high levels of PTSD symptoms are likely attributable to the multiplicity and severity of disaster-related traumatic experiences during and for days after the earthquake. The persistence of PTSD symptoms may be related to the unremitting severe postearthquake stresses and adversities in the recovery environment, such as impoverished living conditions and a lack of food, heat, and electricity. Furthermore, the persistence of PTSD symptoms may have been related to the high levels of comorbid depression that interfered with the resolution of PTSD symptoms (13). Finally, the persistence of symptoms may have been related to the pervasive trauma reminders. Up to the 5-year follow-up, throughout Gumri and Spitak, there were numerous destroyed buildings, makeshift homes, debris, and people on the streets with earthquake-related disabilities.

Consistent with prior studies (8, 13, 19), the girls had slightly higher levels of PTSD symptoms at both time intervals than the boys. Further studies are needed to determine if girls are more willing to endorse symptoms or are at a higher risk for posttraumatic reactions. Despite this difference, the change in the PTSD score of the girls did not differ from that of the boys.

Depressive symptoms also followed a dose-of-exposure pattern at both time intervals. At 5 years, the highest severity levels of depression were found in Spitak. The severity of depression in Spitak at both 1.5 and 5 years (18.7 and 20.1, respectively) fell above the cutoff of 17 for clinical depression. This severity pattern is commensurate with levels found among adolescents in the highly exposed areas of Nicaragua 6 months after Hurricane Mitch (8) and in Armenia 3 years after the earthquake (7). The severity and persistence of depressive symptoms may have been related to a number of factors, including the extensive deaths of family members and friends, destruction and loss of residences, and chronic and pervasive postearthquake stresses and adversities, financial hardship, and unemployment. Prior studies have also indicated that depressive symptoms may be related to the persistence of posttraumatic stress symptoms (5, 7). Finally, given the traumatic circumstances of the deaths, the persistence may have been related to unresolved grief reactions. These high levels of depression underscore the need to evaluate children and adolescents for depression and to plan for the provision of specific interventions aimed at treating depression and traumatic grief. The girls scored higher at 5 years. This finding is consistent with prior findings in Nicaragua (8)

and with the results of epidemiological studies that indicated that depressive disorders show a change in sex distribution after puberty, when the rates for girls begin to exceed those for boys (20).

Treatment Outcome

This study also extends the nascent treatment outcome literature on the effectiveness of brief trauma/grief-focused psychotherapy among adolescents after a disaster. The decrease in CPTSD-RI scores among the treated subjects was three times that of the untreated subjects (16.3 versus 5.4, respectively). As an example, a decrease of 16 points from an initial score of 44 on the CPTSD-RI may indicate a decrease in the occurrence of 15 PTSD symptoms from two to three times per week to once per week.

The benefits of treatment manifested themselves primarily in the improvement in B (reexperiencing) and C (avoidance and numbing) subcategory scores. The benefits in the B subcategory were most likely due to strategies used to increase tolerance for reexperiencing phenomena by repeated recounting of the traumatic experiences, cognitive reworking of earthquake-related experiences, and identification and management of psychological and physiological reactivity related to trauma reminders. The beneficial effects of therapy on C subcategory symptoms may have been due to the supportive and educational measures employed to discourage withdrawal and encourage engagement in activities with peers and family members. These findings suggest that periodic assessments of subcategory scores provide a useful metric to monitor progress and accordingly adjust the emphasis of intervention strategies. Despite the significant improvement of PTSD symptoms, treated subjects remained symptomatic 5 years after the earthquake. This indicates the need for further empirical studies that will compare the effectiveness of different modalities of treatment.

Comparisons of the change in depression scores between 1.5 and 5 years showed a significant difference, with a halting of the progression among the treated subjects and a worsening of depression among the untreated subjects. In therapy, a variety of current problems and concerns considered contributory to depression were addressed. These problems included difficulties coping with losses and interpersonal conflicts. Additionally, the students were assisted in dealing with posttraumatic stress and grief reactions, both of which may have contributed to the etiology and exacerbation of depressive symptoms.

As it was prospective, this study obviated potentially confounding methodological problems related to memory failure inherent in retrospective studies. Furthermore, the fact that the subjects were of a similar age, were not seeking treatment, and were ethnically, culturally, and religiously homogeneous reduced the possibility of confounds. The attrition rate, which is usually problematic in longitudinal studies, was low in this study group.

There are limitations to the present study. First, the measures used were self-reports and may therefore have been influenced by either the over- or underreporting of symptoms. Second, even though there was uniformity of destruction, morbidity, and mortality throughout Gumri and baseline CPTSD-RI and DSRS scores were comparable between the treatment and no-treatment comparison groups, it remains possible that factors, such as school milieu or teacher responsiveness, may have played a role in the different courses of recovery. Third, grief reactions were not measured in this study. The inclusion of a grief inventory would have allowed investigation of the extent of grief reactions and their relationship with depression. A pilot study by Cohen et al. (21) demonstrated the usefulness of a grief inventory among traumatized bereaved children.

The finding of the intractability of symptoms has important developmental ramifications. Chronic PTSD symptoms are likely to have detrimental effects on the future of these adolescents, including their conscience functioning (22), academic achievement (23), health, teenage pregnancy, and the stability they bring to family and community life (24). They may be at risk for developing other types of psychiatric disorders and for engaging in risk-taking behaviors (24). Similarly, depressive symptoms may lead to more serious future depressive disorders (25) and have a detrimental effect on their future adaptive functioning and self-esteem (26). Thus, therapy may not only have a beneficial effect on PTSD and depressive symptoms but may also avert the onset of comorbid disorders and prevent psychosocial maladaptation.

This study strongly supports the importance of initiating a comprehensive public mental health program for children and adolescents after natural disasters. The present finding of an enduring effect of treatment provided at 1.5 years after the earthquake suggests that earlier intervention, where possible, should be undertaken and evaluated. Future studies should assess the potential additional benefits of augmenting trauma/grief-focused psychotherapy with specific interventions for depression and adjunctive pharmacotherapy.

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References

1. La Greca AM, Silverman WK, Vernberg EM, Prinstein MJ: Symptoms of posttraumatic stress in children after Hurricane Andrew: a prospective study. *J Consult Clin Psychol* 1996; 64:712-723

2. Steinberg AM, Brymer MJ, Decker KB, Pynoos RS: The University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index. *Curr Psychiatry Rep* 2004; 6:96–100
3. Shaw JA, Applegate B, Schorr C: Twenty-one-month follow-up study of school-age children exposed to Hurricane Andrew. *J Am Acad Child Adolesc Psychiatry* 1996; 35:359–364
4. McFarlane AC: Posttraumatic phenomena in a longitudinal study of children following natural disaster. *J Am Acad Child Adolesc Psychiatry* 1987; 26:764–769
5. Roussos A, Goenjian AK, Steinberg AM, Sotiropoulou C, Kakaki M, Kabakos C, Karagianni S, Manouras V: Posttraumatic stress and depressive reactions among children and adolescents after the 1999 earthquake in Ano Liosia, Greece. *Am J Psychiatry* 2005; 162:530–537
6. Asarnow JR, Carlson GA: Depression Self-Rating Scale: utility with child psychiatric inpatients. *J Consult Clin Psychol* 1985; 53:491–499
7. Goenjian AK, Karayan I, Pynoos RS, Minassian D, Najarian LM, Steinberg AM, Fairbanks LA: Outcome of psychotherapy among early adolescents after trauma. *Am J Psychiatry* 1997; 154:536–542
8. Goenjian AK, Molina L, Steinberg AM, Fairbanks LA, Alvarez ML, Goenjian HA, Pynoos RS: Posttraumatic stress and depressive reactions among Nicaraguan adolescents after Hurricane Mitch. *Am J Psychiatry* 2001; 158:788–794
9. Yule W, Udwin O: Screening child survivors for posttraumatic stress disorder: experiences from the “Jupiter” sinking. *Br J Clin Psychol* 1991; 30:131–138
10. Galante R, Foa D: An epidemiological study of psychic trauma and treatment effectiveness for children after a natural disaster. *J Am Acad Child Psychiatry* 1986; 25:357–363
11. Yule W: Post-traumatic stress disorder in child survivors of shipping disasters: the sinking of the “Jupiter.” *Psychother Psychosom* 1992; 57:200–205
12. Chemtob CM, Nakashima JP, Roger S, Hamada S: Psychosocial intervention for post-disaster trauma symptoms in elementary school children. *Arch Pediatr Adolesc Med* 2002; 56:211–216
13. Goenjian A, Pynoos RS, Steinberg AM, Najarian LM, Asarnow JR, Karayan I, Ghurabi M, Fairbanks LA: Psychiatric co-morbidity in children after the 1988 earthquake in Armenia. *J Am Acad Child Adolesc Psychiatry* 1995; 34:1174–1184
14. Horowitz MJ: *Stress Response Syndromes*, 2nd ed. New York, Jason Aronson, 1986
15. Lyons JA, Keans TM: Implosive therapy in the treatment of combat related PTSD. *J Trauma Stress* 1989; 2:137–152
16. Pynoos RS, Nader K: Psychological first aid and treatment approach to children exposed to community violence: research implications. *J Trauma Stress* 1988; 1:445–473
17. Raphael B: *When Disaster Strikes: How Individuals and Communities Cope With Catastrophe*. New York, Basic Books, 1986
18. Saigh PA: In vitro flooding of an adolescent’s posttraumatic stress disorder. *J Clin Child Psychol* 1987; 16:147–150
19. Vernberg EM, La Greca AM, Silverman WK, Prinstein MJ: Prediction of posttraumatic stress symptoms in children after Hurricane Andrew. *J Abnorm Psychol* 1996; 105:237–248
20. Costello EJ: Developments in child psychiatric epidemiology. *J Am Acad Child Adolesc Psychiatry* 1989; 28:836–841
21. Cohen JA, Mannarino AP, Knudsen K: Treating childhood grief: a pilot study. *J Am Acad Child Adolesc Psychiatry* 2004; 43:1225–1233
22. Goenjian A, Stillwell BM, Steinberg AM, Fairbanks LA, Galvin MR, Karayan I, Pynoos RS: Moral development and psychological interference in conscience functioning among adolescents after trauma. *J Am Acad Child Adolesc Psychiatry* 1999; 38:376–384
23. McFarlane AC, Policansky SK, Irwin C: A longitudinal study of the psychological morbidity in children due to a natural disaster. *Psychol Med* 1987; 17:727–738
24. Kessler RC: Posttraumatic stress disorder: the burden to the individual and to society. *J Clin Psychiatry* 2000; 61(suppl 5):4–12
25. Aalto-Setälä T, Marttunen M, Tuulio-Henriksson A, Poikolainen K, Lönnqvist J: Depressive symptoms in adolescence as predictors of early adulthood depressive disorders and maladjustment. *Am J Psychiatry* 2002; 159:1235–1237
26. Aronen ET, Soininen M: Childhood depressive symptoms predict psychiatric problems in young adults. *Can J Psychiatry* 2000; 45:465–470