

Original article

Outcome of Cognitive Behavioral Therapy in Adolescents After Natural Disaster

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Abstract

Purpose: The authors evaluated the effectiveness of cognitive behavioral therapy (CBT) among adolescents exposed to the 2004 earthquake in Bam, Iran.

Methods: Four months after the earthquake, 135 adolescents as a case group and 33 adolescents as a comparison group were evaluated with the Impact of Event Scale Revised (IES-R). Two therapists were trained in CBT in 3-day classes according to a manual provided by mental health services. After conducting CBT in the case group, both groups were evaluated again with IES-R.

Results: The severity of posttraumatic stress symptoms significantly decreased among the subjects given CBT in the case group. The improvement in posttraumatic stress symptoms was attributable to improvement in each of three-symptom categories (intrusion, avoidance, and arousal) and in the total score of posttraumatic stress disorder ($p < .05$).

Conclusions: The findings demonstrate the efficacy of CBT in alleviating posttraumatic stress symptoms among adolescents after a catastrophic disaster. © 2008 Society for Adolescent Medicine. All rights reserved.

Keywords: Earthquake; Adolescents; CBT; PTSD

On the morning of December 26, 2003, at 05:28 (local time) a major earthquake measuring 6.5 on the Richter scale struck the city of Bam, Kerman Province, southeastern Iran. The epicenter of the earthquake, with a depth of 10 km, was near the city of Bam, which was located at 180 km southeast of the provincial capital of Kerman and 975 km southeast of Tehran.

The Iranian government estimated the deaths from the earthquake at 41,000, with some figures exceeding 50,000. More than 10,000 survivors were injured.

According to the USAID Disaster Assistance Response Team (USAID/DART), 85 percent of the buildings had been destroyed in Bam and the surrounding area.

Although most of the casualties occurred in Bam itself, the impact on the surrounding rural areas was also severe.

According to a recent survey, more than 18,000 houses across 250 villages were completely destroyed. As a result of the earthquake, the electricity, water supply, and most public health services were completely disrupted.

The earthquake occurred early in the morning, when children and adolescents were asleep. Awakening to the sound of people weeping and wailing in profound despair brought their horrendous suffering home in a powerful way.

Serious and long-lasting psychiatric consequences can be found in children and adolescents following major stressor events [1,2].

Previous studies in Armenia have documented severe posttraumatic reactions and high rates of comorbid depression 18 months after the earthquake among children and adolescents in cities that were close to the epicenter [3,4].

There is accumulating evidence that these sequelae have adverse effects on their future development, including cognition and attention, social skills, personality style, self-concept and self-esteem, and impulse control [5]. Stress and

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trauma during childhood frequently interfere with core developmental tasks including formation of stable attachments, acquisition of affect regulation, development and integration of self-concepts, and socialization. It is believed that stress-sensitive “critical periods” for psychological and biological development occur during early childhood. Traumatic experiences during these critical periods appear to alter the trajectories of important developmental tasks [6–9]. Many adult psychopathological outcomes attributed to childhood traumatic experiences, for example, borderline personality disorder, dissociative disorders, somatization, self-mutilation, and suicidal behavior, can be understood in terms of traumatic disruptions in these developmental tasks. Studies find that a history of trauma in childhood is also a significant risk factor for the development of posttraumatic stress disorder (PTSD) in adulthood following exposure to a new stressor [10].

Recent studies of disaster victims have shown that increased risk for PTSD is associated with how the child experiences and interprets the event [11].

Cognitive behavior therapy (CBT) emerges as the best validated therapeutic approach for children and adolescents who experienced trauma-related symptoms, particularly symptoms associated with anxiety or mood disorders [12].

Deblinger and colleagues [13] reported that the 12-week pre- and posttest therapeutic gains for treating school-aged sexually abused children with CBT were sustained after 2 years. In that investigation, 100 sexually abuse children and their nonoffending mothers were randomly assigned to one of three experimental cognitive behavioral interventions or to a community comparison condition. They improved in externalizing behavior, depression, and PTSD, and their changes were maintained over the 2-year follow-up period [14].

Another study examined the differential efficacy of trauma-focused CBT (TF-CBT) and child-centered therapy for treating PTSD and related emotional and behavioral problems in 228 8- to 14-year-old children who have suffered sexual abuse. The results showed that children assigned to TF-CBT had significantly more improvement with regard to PTSD, depression, behavior problems, shame, and abuse-related attributions [15].

In a school-based postwar program for war-exposed Bosnian adolescents, 55 secondary school students from 10 Bosnian schools evaluated and centered on a manualized trauma/grief-focused group psychotherapy protocol based on five therapeutic foci: traumatic experiences, trauma and loss reminders, postwar adversities, bereavement, and the interplay of trauma and grief and developmental impact. Students completed pregroup and postgroup self-report measures of posttraumatic stress, depression, and grief symptoms and postgroup measures of psychosocial adaptation and group satisfaction. The evaluation yielded preliminary but promising results, including reduced psychological distress and positive associations between distress reduction and psychosocial adaptation [16].

Yule et al. [17] showed the effects of a short-term CBT in children with PTSD symptoms following the Athens 1999 earthquake. A reduction of overall PTSD and depressive symptoms and significant improvement in psychosocial functioning was reported. Treatment gains were maintained at 4-year follow-up.

Such findings indicate the need for provision of mental health services in such disasters.

Despite the increased literature base, it is of interest to note that the majority of these studies have involved traumatized adults, for example, combat veterans or rape victims [18]. To date, there is more paucity of controlled treatment outcome studies in children or adolescents after disasters [19].

Although Iran has experienced earthquakes many times, there are no studies to evaluate the effectiveness of CBT in Iranian adolescents. Thus, the necessity of such studies is perceived. This study has evaluated the effectiveness of four sessions CBT by comparing posttraumatic stress symptoms scores, pre- and postintervention among treated and not treated adolescents in the city of Bam at 4 months after the earthquake.

Methods

Procedure

After the first institutional review board of our Mental Health Research Center approved our study, at 4 months after the earthquake, an area with low socioeconomic status was selected. At first, two residents of psychiatry conducted clinical interviews with 210 adolescents who lived in tents 1 week before the intervention. During the clinical interview the subjects who had at least one of the symptoms of PTSD according to *DSM-IV* criteria were registered in the study. At the end, 168 subjects had inclusion criteria for the study. Because of limitation in facilities and other equipments, all of the subjects could not be treated at once. The first 135 subjects of the list were selected for the intervention; the 33 remaining subjects (comparison group) were put on a waiting list, and in the future they will be placed in other treatment groups.

Subjects

All of them were between 11 and 20 years old. A demographic profile was obtained that included information regarding exposure, age (15.5 ± 2.3), gender (47.4% boys, 52.6% girls), and education (55.6% ≤ 8 years, 44.4% > 8 years). The extent of damage to their area was equivalent, and they had low socioeconomic status. All subjects had resided in Bam at the time of the earthquake and thereafter. All were exposed to serious direct threats to life, horrifying experiences of witnessing mutilating injuries and grotesque deaths, and hearing agonizing screams for help and cry of distress from victims.

None of the subjects in this study had received psychiatric treatment before the earthquake. All the subjects and their parents were informed of the evaluations and intervention program and agreed to it. The parents gave written informed consent for their child's participation.

Measures

First, the subjects were evaluated with the Impact of Event Scale–Revised (IES-R) for determining the score of posttraumatic stress symptoms [20]. This instrument is a self-report measure comprising 22 items and three subscales (intrusion, hyperarousal, avoidance). Respondents should rate each item on a scale from 0 (*not at all*) to 4 (*extremely*), according to their experience over the past 7 days. The instruments were administered in groups by trained mental health professionals. Psychometric properties of this instrument have been reported in Iran [21]. The Persian version of IES-R has a good internal consistency (Cronbach's $\alpha = 0.67$ – 0.87) and test–retest reliability ($r = 0.8$ – 0.98 , $p < .001$), and also a good convergent validity with the General Health Questionnaire-28 ($R = 0.8$). Factor analysis was conducted, and three factors solution, which explained 41.6% of the variance, was retained.

This was used in a study of war-traumatized Bosnian children [22] and with children and adolescents who sustained sporting injury or injury following a road traffic accident [23]. The Children's Revised Impact of Event Scale was used in a survey of 2976 children aged 9–14 years who had experienced war in Mostar, Bosnia [24], as well as with Bosnian refugee children living in Greece [25].

GhQ-28 is a screening instrument for evaluating mental health [26]. This scale has four subscales, including somatic symptoms, anxiety, social function, and depression. A score of 23 and over has been suggested as the most efficient cutoff point. The internal consistency of the scale in the Iranian population was high (Cronbach's $\alpha = 0.88$) [27].

After this evaluation, 135 of them received CBT, while 33 adolescents were not treated with psychotherapy as the comparison group. The CBT was tailored to the age/educational level of the subjects. Treatment was provided in 14 groups. Each group included 8–10 boys and girls. Clinicians followed a format for all of the clients. The two residents of psychiatry had taught CBT via 3-day classes by a manual provided by mental health services [28,29]. They participated in similar groups and observed the process of treatment; after that, they administered it. CBT involved education about trauma reactions, breathing retraining, progressive muscle relaxation training, learning self-talk exercises to manage anxiety-producing situations, prolonged imaginal and *in vivo* exposure, and cognitive therapy. Duration of each session was 2 hours, and children were strongly encouraged to attend the sessions by giving them toys, clothes, books, and pencils. Summary of the applied techniques are observed in Table 1.

After treatment, which lasted 4 weeks in four sessions, the subjects in the treatment and comparison group were reevaluated for scores of posttraumatic stress symptoms with the same instrument. All subjects who received treatment completed the entire course of therapy.

Statistical analysis

Demographic characteristics and IES-R scores of the two groups were compared by using an independent *t*-test. Effects of treatment on IES-R scores were assessed by using repeated-measures analysis of variance (ANOVA), with intervention as the between-group factor and IES-R score as a within-group factor. Differential effects of treatment on mean scores for the PTSD symptom categories were evaluated by using repeated-measures ANOVA, with intervention as a between-group factor and symptom category as a within-group factor.

Results

The mean age of the sample was 15.50 ± 2.30 ; the mean age in the intervention group was 15.30 ± 2.70 , and in the comparison group it was 16.20 ± 2.24 ; there wasn't any meaningful statistical difference ($t = -1.96$, $df = 166$, $p > .05$). Other characteristics of the variable is shown in Table 2.

The mean score of IES-R and its subscales is shown in Table 3. There was no statistical difference in baseline score of IES-R and its subscales as measured by multiple ANOVA (Wilk's lambda = 0.95, $F = 2.57$, $df = 3$ and 164, $p > .05$).

Four repeated-measures ANOVAs were conducted, one each for hyperarousal, avoidance, intrusion, and total score; in all of the four analyses Munchly's test of sphericity was not significant, and therefore sphericity assumed was used for interpretation of result.

For avoidance subscale repeated-measures ANOVAs shows a significant within-subject main effect, time ($F = 133$, $df = 1,166$, $p < .001$) and significant between-subject effect, group ($F = 13.07$, $df = 1,166$, $p < .001$), and an interaction of time \times group ($F = 115.64$, $df = 1,166$, $p < .001$).

For the hyperarousal subscale, repeated-measures ANOVAs shows a significant within-subject main effect, time ($F = 150.53$, $df = 1,166$, $p < .001$) and significant between-subject effect, group ($F = 29.20$, $df = 1,166$, $p < .001$), and an interaction of time \times group ($F = 131.36$, $df = 1,166$, $p < .001$).

For the intrusion subscale, repeated-measures ANOVAs shows a significant within-subject main effect, time ($F = 104.40$, $df = 1,166$, $p < .001$) and significant between-subject effect, group ($F = 19.35$, $df = 1,166$, $p < .001$), and an interaction of time \times group ($F = 101.98$, $df = 1,166$, $p < .001$).

For the total score, repeated-measures ANOVAs show a significant within-subject main effect, time ($F = 206.83$,

Table 1
Summary of techniques that were used for the treatment group

Psychological debriefing	1–Introduction: purpose of meeting. 2–Facts: participant’s concrete experience. 3–Thoughts: early, late thoughts, important decisions. 4–Sensory impression. 5–Reactions: early, later, and current (emotional, behavioral, somatic). 6–Normalization.
Intrusion	1–Introducing the group: reactions to the stresses of disaster: normalizing and educating. 2–Make a list of traumatic events and traumatic reminders with contributions from the group. 3–Establishing a safe place in their imagination. 4–Imagery techniques: <ul style="list-style-type: none"> • screen technique: to imagine the image as if on a TV • hand and distance technique: to imagine the image as if on the palm of therapist’s and then the partners’ hand • framing: put a frame around the image • positive counter image: to imagine a positive image within frame, superimposed on the intrusive image • locking away the image: the intrusive image is framed, then hidden • imaginary helpers: can be used to change the content, the action or the outcome of the image 5–Kinaesthetic techniques: use of touch, message and movement. 6–Dual attention tasks: deliberately recall the traumatic image with the eyes open while simultaneously tracking with the eyes the side to side rhythmical movement of the therapist’s hand. This is derived from EMDR technique. 7–Dream work: examples; dream restructuring, rehearsal relief. 8–Homework.
Avoidance	1–Home work review. 2–Introducing the group: talk about reminders and behavioral avoidance, good and bad avoidance. 3–Grading traumatic reminders. 4–Imaginal exposure. 5–Drawing, writing, and talking. 6–Homework.
Hyperarousal	1–Home work review. 2–Introducing the group: connection between feeling scared and bodily sensations. 3–Muscle relaxation. 4–Breath control. 5–Positive self statements. 6–Sleep hygiene: examples; regular routine before bed, avoid caffeine, relaxation before sleep. 7–Home work.
Cognitive components	Normalizing and educating traumatic events, normalizing reactions, traumatic reminders.

Children and Disaster, Teaching Recovery Techniques; Patrick Smith, Atle Dyregrov, William Yule. Institute of psychiatry, London, England; Center for crisis psychology, Bergen, Norway, in cooperation with Leila Gupta, Sean Perrin, Rolf Gjes.

$df = 1,166$, $p < .001$) and significant between-subject effect, group ($F = 23.87$, $df = 1,166$, $p < .001$), and an interaction of time \times group ($F = 185.37$, $df = 1,166$, $p < .001$).

Discussion

This is a study to compare posttraumatic stress symptoms among subjects who were and were not treated with CBT after a catastrophic natural disaster by using pre- and postintervention assessments scores. The findings demonstrate an effect of CBT in alleviating posttraumatic stress symptoms.

The significant reduction in severity of overall posttraumatic stress symptoms among subjects treated with CBT was attributable to improvement in all three PTSD symptom categories. The benefit with regard to intrusion symptoms is most likely explained by the trauma focus of the intervention, in which strategies were employed to increase tolerance of reexperiencing phenomena and reduce physiologic

and psychological reactivity to traumatic reminders. Using projective drawing and storytelling, which contain reference to the traumatic event, provides a systematic mechanism for discussing the traumatic event and responses to it, clarifying misconceptions about the experience, exploring feelings of fear, self-blame, and revenge, identifying coping strategies, promoting support from others with shared experiences, and providing referrals for more intensive evaluation and treatment as indicated [30]. Therapeutic efforts were directed at assisting subjects to reduce their reactivity.

The beneficial effects of therapy on avoidance symptoms may have been because of multiple factors within the group therapies. Subjects were encouraged by the therapists and their peers to express themselves, to engage in activities with their families and peers, and to seek support from family members at times of renewed distress.

Improvement in the symptom categories of intrusion and arousal may have also contributed to the reduction of avoidance symptoms. Reduction of avoidance symptoms may have been due to the values placed on a tightly knit family

Table 2
The characteristic of intervention and comparison group

Significance	Degree of freedom	χ^2	Control group	Intervention group	Group variable
NS	1	0.408	13 (39.40%)	64 (47.40%)	Gender
			20 (60.60%)	71 (52.60%)	Male
NS	2	2.48	5	30	Female
			13	63	Age
			15	42	11–13
$p < .05$	2	6.04	26 (78.80%)	75 (55.60%)	14–16
			7 (21.20%)	59 (43.70%)	7–20
			0 (0.00%)	1 (0.70%)	Education
NS	1	0.86	27 (81.80%)	100 (74.10%)	1–8 y
			6 (18.20%)	35 (25.90%)	9–11y
NS	1	0.12	14 (42.40%)	52 (39.10%)	>12 y
			19 (57.60%)	81 (60.90%)	Losing the family member during earthquake:
NS	1	0.11	10 (30.30%)	45 (33.30%)	Yes
			23 (69.70%)	90 (66.70%)	No
					Buried under debris
					Yes
					No
					Injury
					Yes
					No

structure and community involvement that are inherent in the culture, which discourages isolation and promotes interpersonal interaction. However, this factor would apply to the comparison group as well as the treated group, so it would only explain overall changes over time, not between group differences in the rate of recovery.

The beneficial effects of therapy on arousal symptoms may have resulted from several components of the intervention. These include the use of reexposure techniques under supportive circumstances, assistance with identification of traumatic

Table 3
The mean score of Impact of Event Scale–Revised (IES-R) in interventional and comparison group before and after intervention

Postintervention		Preintervention ^a		PTSD symptom category
Mean	SD	Mean	SD	
1.60	.49	2.26	.66	Intrusion
2.42	.67	2.43	.56	Treated
				Not treated
1.46	.50	2.11	.62	Avoidance
2.17	.64	2.19	.63	Treated
				Not treated
1.40	.36	2.73	.65	Hyperarousal
2.59	.84	2.63	.77	Treated
				Not treated
4.48	1.10	7.10	1.74	Total score
7.18	2.02	7.20	1.80	Treated
				Not treated

^a There isn't any significant statistical difference between treated and nontreated group before indication the intervention: (intrusion $t = -1.33$ $df = 166$ $p > .05$); (Avoidance $t = 0.68$ $df = 166$ $p > .05$); (Hyperarousal $t = 0.75$ $df = 166$ $p > .05$).

Total score $t = 0.65$ $df = 0.65$ $p > .05$.

reminders, and utilization of relaxation techniques at times of renewed distress, especially at bedtime. The literature suggests that desensitization, relaxation, and other behavioral techniques are beneficial in treating children with PTSD [31].

One research showed that anxiety management training, a coping skills treatment similar to systematic desensitization, in comparison to implosive therapy, an exposure-based treatment, were similarly effective in reducing the frequency and intensity of intrusions and avoidance [32]. Identification of interpersonal conflicts and exploration of appropriate coping skills, including the management of aggression, may have contributed to improvement in sleep, which in turn, may have improved daytime concentration and reduced irritability. Reduction of intrusive symptoms may have resulted in improvements in certain arousal symptoms and vice versa.

In one study, 39 children ages 6 to 17 years old with childhood traumatic grief (combination of posttraumatic symptoms and unresolved grief symptoms) received the modified 12-session protocol of CBT-CTG. After the intervention, children reported significant improvement in CTG, PTSD, depression, and anxiety [33].

The positive effects of CBT have been shown especially in sexually abused children. In one study 82 sexually abused children ages 8–15 years old and their primary caretakers were randomly assigned to TF-CBT or nondirective supportive therapy delivered over 12 sessions. Intent to treat and treatment completer repeated-measures analyses were conducted. Intent to treat indicated significant group \times time effects in favor of TF-CBT on measures of depression, anxiety, and sexual problems. Among treatment completers, the TF-CBT group evidenced significantly greater improve-

ment in anxiety, depression, sexual problems, and dissociation at the 6-month follow-up and in PTSD and dissociation at the 12-month follow-up [34]. The benefits of therapy may extend beyond those of symptom reduction to encompass areas of adjustment, emerging personality, and a variety of aspects of proximal and distal development. For example, reduction of posttraumatic stress may improve children's ability to cope with postdisaster stresses and adversities. Abatement of symptoms may also have beneficial effects through reduction of distress among parents, thus rendering them more available and supportive.

Longitudinal studies across a spectrum of disasters would help to further clarify factors that mediate the onset and course of untreated posttraumatic stress symptoms.

Remediation of PTSD symptoms may help to prevent or curtail academic decline and, in so doing, may minimize consequent loss of self-esteem, family disturbance, and peer rejection.

Limitations

One of the most important limitations of this study was the lack of randomization or any other systematic comparable methods. We should state that the comparison group had lower education; it might influence response to treatment. Posttraumatic symptoms were measured only shortly after the termination of the intervention; halo and placebo effects might be considered as potential threats to understanding of the results.

Other traumatic experiences in the subject's life were not asked; it might confound the results, because it is possible that some of the PTSD symptoms may be attributable to other traumatic experiences, before or after the earthquake. The last limitation is not to use any measure of exposure.

In conclusion, this study demonstrates that CBT is effective in reducing the severity of posttraumatic stress symptoms among adolescents exposed to a major disaster. These findings indicate the need to incorporate CBT interventions, within a comprehensive disaster recovery program for children and adolescents.

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