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Enhancing recovery in post-earthquake adolescents: examining the impact of a psychoeducational intervention on traumatic stress symptoms and coping strategies

Hasan Demirci[1] · Yıldız Bilge[1] · Ekin Emiral[1] · Selçuk Şen[2]

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Abstract

Adolescents exposed to natural disasters are among the most vulnerable groups to the devastating effects of these events, including experiencing mental health issues such as Post-Traumatic Stress Disorder (PTSD), depression, and anxiety disorders. The study aims to evaluate the impact of an early-term psychoeducational intervention (2 months after the disaster) on adolescents who were exposed to the February 6th earthquakes in Turkey regarding symptoms of post-traumatic stress disorder (PTSD), depression, anxiety, and coping styles. The study employed AB experimental design with a single-group, pre-test, post-test, and follow-up test evaluation. The sample consisted of 8 individuals aged between 12 and 18, relocated to another city (Istanbul) with their families to a container camp after exposure to the earthquake. Participants underwent an 8-session (one session per week) psychoeducational program developed by researchers composed of psychologists 2 months after the earthquake. To assess the effectiveness of the psychoeducational intervention, the Child and Adolescent Post-Traumatic Stress Disorder Reaction Index, Brief Symptom Inventory, and Coping Styles Scale-Brief Form was employed at three different time points (pre-intervention, post-intervention, and 4-month follow-up). Percentage distribution and the Friedman Test for comparisons were done for the data to be analyzed. Following the psychoeducational intervention, a statistically non-significant decrease in depression symptoms was observed, but the effect of the intervention was maintained over the 4-month follow-up period. While no change in anxiety symptoms was noted after the intervention, a significant decrease was observed in the follow-up. However, no improvement was observed in PTSD symptoms. Participants showed a statistically significant increase in religious coping, whereas a non-significant increase in planning, using emotional social support, and positive reinterpretation coping styles were observed. After large-scale disasters affecting numerous individuals, early psychological interventions should be planned and tailored for specific groups and specific needs instead of including every member of the group would be more time and cost-efficient.

Keywords Earthquakes · Adolescents · Psychological intervention · Psychoeducation · Coping

Introduction

On February 6, 2023, two devastating earthquakes, with magnitudes of 7.7 and 7.6, struck 11 provinces in Turkey's Eastern and Southeastern Anatolia regions, as well as neighboring areas of Syria. The epicenters were located in Pazarcık and Elbistan (Kahramanmaraş), occurring at 04:17 a.m. and 01:24 p.m. local time, respectively, as reported by the Disaster and Emergency Management Authority (AFAD, 2023). These earthquakes significantly impacted a vast area, causing numerous casualties and extensive damage. Over 50,000 people were killed, and more than 100,000 were injured (AFAD, 2023). In response, container and tent cities were set up for the victims, with a significant number of people either relocating or being evacuated. Records indicate that by February 24, 2023, over 528,000 people had been evacuated from the affected region (AFAD, 2023).

Earthquakes lead to not only physical damage but also mental health issues, including post-traumatic stress

✉ Hasan Demirci
pskhasandemirci@gmail.com

[1] Department of Psychology, University of Health Sciences, Istanbul 34668, Turkey

[2] Istanbul Grand Airport, Istanbul, Turkey

disorder (PTSD), depression, and anxiety (Fu et al., 2013; Silwal et al., 2018; Ziaaddini et al., 2009). Particularly vulnerable to the effects of such disasters are children and adolescents, who face traumatic experiences that include loss of loved ones, displacement, and separation from families (Kolaitis et al., 2003; Sharma & Kar, 2019; Powell & Holleran-Steiker, 2017). During childhood and adolescence, traumatic experiences can lead to chronic psychiatric issues, thereby affecting an individual's functionality (Sharma & Kar, 2019). The risk of developing psychopathology, including PTSD, depression, and anxiety, is higher in adolescents exposed to natural disasters compared to other groups (Le Roux & Cobham, 2022). Following disasters, children and adolescents commonly exhibit PTSD, depression, and anxiety, as well as other mental health issues including acute stress disorder, adjustment disorder, panic disorder, obsessive symptoms, and paranoid thoughts (Fan et al., 2011; Hsu et al., 2002; Kar, 2009; Pan et al., 2015; Sharma & Kar, 2019; Silwal et al., 2018).

Prevalence studies have found that PTSD rates among children and adolescents after earthquakes vary, with figures ranging from 10.7 to 78% (Hsu et al., 2002; Kolaitis et al., 2003; López-García & López-Soler, 2014; Pan et al., 2015; Sharma & Kar, 2019; Silwal et al., 2018; Ziaaddini et al., 2009). Longitudinal research shows that PTSD symptoms can persist for a year or more after the traumatic event for children and adolescents (Acharya et al., 2018; Ayub et al., 2012; Bulut, 2010; Goenjian et al., 1997; Jia et al., 2010; Karakaya et al., 2004; McFarlane, 1987; Pan et al., 2015; Silwal et al., 2018; Ying et al., 2013).

As a protector in the face of trauma, the primary goal of psychosocial interventions is to bolster coping skills, address psychological symptoms, and aid individuals in returning to pre-disaster functioning (Işıklı & Tüzün, 2017). Research has demonstrated that not only are intense therapeutic interventions beneficial for children and adolescents with PTSD, but coping-focused interventions are also effective (Berger et al., 2007). By nature, these interventions are designed to be rapid, flexible, and cost-effective, aiming to reduce the risk of developing chronic psychopathology, thereby improving the quality of life for disaster victims (Laor et al., 2002).

One readily accessible and easy-to-implement method for intervention is psychoeducation. Psychoeducation, a key early prevention tool, provides individuals with information about symptoms, impact of the experience, and coping strategies, helping to demystify reactions to trauma (Işıklı & Tüzün, 2017; Whitworth, 2016; Najavits, 2002). Delivered in individual or group formats, psychoeducation helps individuals understand that the unusual responses they exhibit after the event are normal reactions that anyone exposed to such an incident might display (Brouzos et al., 2022; Erden & Gürdil, 2009). Psychoeducation has proven crucial for managing post-disaster mental health, especially when provided to both children and their parents (Kar, 2009).

Contemporary post-disaster interventions often incorporate established techniques such as Cognitive-Behavioral Therapy (CBT; Silverman et al., 2008; Eksi & Braun, 2009; Giannopoulou et al., 2006; Pityaratstian et al., 2007; Shooshtary et al., 2008). Other methods including Eye Movement Desensitization and Reprocessing (EMDR) focus on desensitizing individuals to traumatic experiences (Adúriz et al., 2011; Fernandez, 2007; Jarero et al., 2006; Zaghrout-Hodali et al., 2008) and Narrative Exposure Therapy for children (KIDNET) aims at reprocessing personal narratives and contextualizing experiences (Schauer et al., 2017; Catani et al., 2009). Moreover, programs such as the Journey of Hope (JoH), which are grounded in CBT principles, aim to normalize emotional responses and foster coping mechanism development (Powell & Holleran-Steiker, 2017). At the core of these interventions is CBT, which underscores the importance of relaxation techniques, cognitive restructuring, future planning, and emotional regulation. This approach provides a stabilizing platform central to the effectiveness of contemporary psychological support methods (Silverman et al., 2008; İme, 2023; Cohen et al., 2018).

The psychoeducation program's content, detailed in this study's Methods section, combines various CBT tools and psychoeducation techniques, similar to those used in the JoH program (Powell & Blanchet-Cohen, 2014). Used as an example in this study, JoH is an effective program that aims to increase psychological resilience by normalizing the emotions experienced by children and adolescents after trauma and supporting the development of positive coping strategies. This is applicable to children and adolescents who have not received any diagnosis but still require an emotional support program (Powell & Holleran-Steiker, 2017; Powell & Blanchet-Cohen, 2014; Save the Children, 2009, 2019). In the present study, the intervention primarily depends on psychoeducation, coping skills, and emotional expression, with the flexibility to adapt to cultural settings (see Methods section). With the integration of CBT's commonly utilized emotion formulation (ABCs: A for antecedent, B for beliefs, and C for consequence; Ellis, 1977) into psychoeducation, emotion management and regulation were planned to be easily implemented. Building on these empirically effective techniques, the program is fundamentally based on: (a) psychoeducating adolescents about the effects of traumatic experiences following the earthquake, (b) normalizing their emotional reactions, (c) facilitating the expression of emotions, (d) developing a positive outlook for the future, and (e) supporting them in developing positive coping strategies.

Although the effectiveness of psychosocial interventions post-disaster in general populations is well-documented, their impact on adolescents forced to migrate and residing outside the earthquake zone remains less understood. Recommendations for a better understanding of children displaced after earthquakes and living outside the affected region have been raised in a recent comprehensive meta-analysis (Galvan et al., 2021). The earthquakes on February 6th led to significant relocation due to their severity and the continuation of aftershocks. One of the strengths of the current study is that it tests the effectiveness of post-disaster supportive interventions while simultaneously expanding our knowledge about the groups who have migrated in the aftermath of disasters.

In this study, we aim to answer two fundamental questions: What is the effect of early psychoeducation provided to adolescents who have been exposed to a natural disaster and subsequently forced to temporarily migrate from their homes, on symptoms of PTSD, depression, anxiety, and coping styles? Starting from the hypothesis that the intervention will reduce symptom levels, will its potential effect persist in the long term? This research aims to contribute to the growing body of literature on how early psychoeducation programs for adolescents affected by natural disasters can provide support, especially for migrated individuals.

Method

Research design

In this research, a single-subject AB experimental design was utilized to study multiple participants individually, with the effects of an intervention being assessed without the employment of a traditional control group. Pre-intervention measurements of dependent variables such as PTSD, depression, anxiety levels, and coping skills were involved in the 'A' phase, establishing a baseline for each participant. The 'B' phase consisted of post-intervention measurements, which were taken to evaluate the impact of the intervention. This design uniquely allows for changes within individuals over time to be directly observed, with shifts in dependent variables being directly attributed to the intervention. Although a control group is lacked, precise insights into the effectiveness of the intervention on psychological outcomes are offered by this approach, underlining its utility in settings where the assessment of personalized interventions is crucial (Büyüköztürk et al., 2023).

Participants

The study was conducted with adolescents who were replaced with their families in a container camp area prepared by the Istanbul Grand Airport (IGA) for the relatives of employees exposed to the earthquake on February 6. A total of 8 participants, 6 girls and 2 boys aged between 12 and 18 (mean age 14.25 ± 2.31), took part in the study. One participant had graduated from high school, 2 were high school students, and 5 were middle schoolers, all reporting their family's income level as moderate. None of the participants were trapped under debris. Three participants did not experience any close losses, but two reported the loss of their cousins, and three mentioned the loss of distant relatives. None of the participants received psychological help for any reasons before the earthquake, and all but two stated that they did not need psychological support after the earthquake. Four participants had severely damaged homes, three had moderately damaged homes, and only one had an intact home. While three participants reported being very scared during the earthquake, five said they were either not scared at all or were a little scared.

Procedures

In the assurance of participants' comprehension of the study, particularly given their age and the post-trauma context, a thorough informed consent process was implemented. Prior to participation, detailed discussions were engaged in with both the adolescents and their guardians, wherein the study's objectives, procedures, risks, and benefits were explained in a manner tailored to their understanding. It is important to note that the research team is comprised of clinical psychologists and psychiatrists, ensuring that, in the event of an emergency condition or potential re-traumatization, participants were closely monitored, and immediate support was made available. This proactive approach not only facilitated a deeper understanding but also enhanced the reliability of their consent, ensuring that they were fully informed and comfortable with their participation.

Participants underwent an intervention program developed by the researchers, involving two 50-minute sessions per week for a total of 8 weeks in April and May 2023, starting from two months after the February 6 earthquakes. Before commencing, the camp area where the earthquake victims were accommodated was visited. An informative seminar about trauma reactions was organized for adolescents and their parents. The purpose of this seminar was facilitation of normalizing the reactions of adolescents after the earthquake and explain the psychoeducation intervention program to be implemented. Regardless of meeting PTSD criteria, all adolescents in the camp were asked if

they were willing to participate in the psychoeducation program. Then, a list of adolescents who wanted to participate in the psychoeducation program was created. There were 13 adolescents in the camp aged between 12 and 18. Nine of them agreed to participate in the study. The psychoeducation program sessions started with 9 adolescents, but one was excluded from the evaluation as they dropped out of the sessions. A pre-test was conducted before the sessions started, and group sessions began the following week. The final test data were collected in the 8th session. Follow-up data from five participants were collected in person, while the data from the remaining three individuals were obtained online due to their necessary return to their hometowns since the container city was not meant to be a permanent solution for survivors. Due to the fact that container area not being a long-term solution and the likelihood of earthquake victims leaving the area as the summer months approach, no waiting list was additionally created. Instead, all the willing adolescents were encouraged to participate the intervention.

Before, after, and during the follow-up process of the psychoeducation intervention, participants were administered the Child and Adolescent Trauma Response Scale, Brief Symptom Inventory, Coping Styles Scale-Short Form, Child and Youth Psychological Resilience Scale, and Rosenberg Self-Esteem Scale. Participants were informed that the collected data would be kept strictly confidential, and the information would not be accessible to anyone other than the researchers. Privacy and voluntariness principles were explained to ensure their cooperation. Additionally, it was clearly stated that they could leave the study at any time without providing any reason within informed consent. All participants and parents were informed about the aims of psychoeducation program and provided written informed consent. The study was approved by the Ethics Committee of the University of Health Sciences (23/487).

Assessments tools

Sociodemographic data form The sociodemographic characteristics of the participating adolescents were obtained using a sociodemographic data form developed by the researchers. This form includes information such as the age, gender, educational status, parents' education, traumatic experiences during the earthquake, relocation experience, losses, injuries, house damage status, and the history of psychiatric or psychological help-seeking both before and after the earthquake. The demographic information collected in current study was selected based on existing literature, focusing on relevant aspects pertinent to disaster-focused research. Socio-demographic questions were posed to gain a comprehensive understanding of the participant profile, aiming to provide a detailed perspective on the disaster experience.

Child Post Traumatic Stress Disorder Reaction Index (CPTS-DRI) The measure used to assess the severity of PTSD symptoms was developed by Pynoos et al. (1987). It is employed to evaluate specific stress symptoms in children and adolescents following various traumatic experiences. The scale consists of twenty items, and each item is rated on a Likert-type semi-structured scale ranging from 0 to 4. The total score of the scale is obtained by summing the scores of all items, with items 7 and 12 being reverse scored. The total score is interpreted as follows: 0–11 indicates "suspected PTSD," 12–24 indicates "mild PTSD," 25–39 indicates "moderate PTSD," 40–59 indicates "severe PTSD," and 60 and above is considered "very severe PTSD." The Turkish adaptation study conducted by this should be Erden and Gürdil (2009) reported a Cronbach's alpha coefficient of 0.75 and a test-retest reliability of 0.86.

Brief Symptom Inventory (BSI) Developed by Derogatis and Melisaratos (1983), the Symptom Checklist-90-Revised (SCL-90-R) is used to screen various psychological symptoms in adolescents and adults. The SCL-90-R consists of 53 items, and responses to the items are scored on a scale from 0 to 4 ("not at all" to "extremely"). The total scores obtained from the scale indicate the severity of psychological symptoms in individuals. A Turkish adaptation study for adolescents was conducted by Şahin Hisli et al. (2002). In current study, only items from the anxiety and depression subscales of this scale were utilized. The internal consistency coefficients obtained from the adolescent sample for the SCL-90-R range between 0.70 and 0.88. Selected subscales of the BSI were similarly employed by studies such as those by Edwards et al. (2007) and Castillo et al. (2013) to focus on specific symptoms relevant to their research topics. The 6-item subscales for depression and anxiety were chosen in the present study due to their direct relevance to the psychological impacts that were being examined in adolescents exposed to earthquakes. These subscales were not only pertinent but had also been previously validated in similar contexts, ensuring their reliability and internal consistency in accurately assessing the targeted symptoms within the research framework.

Coping styles Scale brief form (CSS-BF) The scale developed by Carver et al. (1989) was used in current study in the form of a short version consisting of 28 items, with each dimension comprising two items. Scale's adaptation to Turkish studies were conducted by Bacanlı et al. (2013). The dimensions include instrumental social support use, humor, focusing on and expressing emotions, substance use, acceptance,

giving up other activities, turning to religion, denial, cutting off interest behaviorally, cutting off interest mentally, self-limitation, positive reinterpretation, use of emotional social support, and planning. The scale items were prepared in a 4-point Likert-type format. Low scores indicate less use of that dimension, while high scores indicate more use of that dimension. The Cronbach's alpha reliability coefficient of the scale was calculated as 0.70.

Structure of psychoeducation intervention

The psychoeducation program was planned for 8 weeks, with sessions held once a week. These sessions consisted of either two 50-minute sessions or a single 90-minute session, shaped according to content and needs. From the second session onwards, each session concluded with relaxation exercises. The main goals of the psychoeducation program were to inform adolescents about the effects of traumatic experiences following the earthquake, normalize their reactions, facilitate the expression of emotions, develop positive perspectives for the future, and support the enhancement of positive coping strategies. The group was led by an experienced psychologist specializing in children and adolescents and a clinical psychologist trained in PTSD treatment. Both psychologists hold Doctor of Philosophy degrees in Psychology and have previously served in various disasters in Turkey, with experience in conducting individual and group psychotherapy in such situations. The content of the psychoeducation program was tailored to study group, basically using CBT techniques designed to help children cope with stress factors related to disasters (e.g. Cohen et al., 2018). The program had a holistic structure, incorporating psychoeducation with fundamental CBT techniques such as relaxation exercises, the connection between thoughts and emotions, and the development of positive self-talk; taking into account the participants' needs. This approach was tailored by the questions received from adolescents and their parents during the information seminar they attended beforehand. Although present structure of the intervention was similar JoH program (Powell & Holleran-Steiker, 2017), bullying related content was not included in present intervention. Instead, techniques such as relaxation exercises, alternative thinking, and positive self-talk were used to enhance stabilization.

1st session The session began with an introduction to the adolescents, a discussion on confidentiality, active listening, and the establishment of agreed-upon rules for the psychoeducation. The objectives, scope, and schedule of the intervention were outlined. This session covered the definition of a disaster, behavioral, psychological, and mental responses during disaster and crisis periods, and trauma reactions as normal responses to abnormal situations like disasters. The aim was to help participants understand and assess the possible negative effects of their experiences.

2nd session The goal was to assist participants in calming down and taking control in anxiety-provoking situations. Breathing exercises for use in challenging times were practiced, along with practical muscle relaxation exercises aimed at alleviating stress responses.

3rd and 4th sessions The focus was on expressing emotions experienced after the earthquake, concentrating on four basic emotions: anxiety, fear, anger, and sadness. The situations that may elicit these emotions, and their physical symptoms, were explained. Emphasis was placed on becoming aware of emotions, expressing them, and developing positive coping strategies. Activities based on the ABCs of emotions (Antecedent, Beliefs, and Consequence; Ellis, 1977) were conducted. In the 4th session, participants completed "Event-Thought-Feeling Triangle" forms and were encouraged to share their examples with the group. The activities aimed at finding alternative positive expressions for the thought part of the triangle and creating solution sentences.

5th session The objective was to help participants recognize their social support resources, understand how to receive social support, and identify from whom they can seek help when needed, thereby assisting them in realizing or forming their social resources.

6th session The aim of this session was to assist participants in recognizing their social support networks: working on how they can receive social support, and identifying how and from whom they can seek help when needed. The goal was to help participants become aware of their social resources.

7th session In this session, participants discussed future goals and plans, identified their strengths and areas for development, and worked on recognizing potential challenges that may arise in the future, along with coping skills for these situations.

8th session This session focused on sharing experiences from the first seven sessions, discussing achievements related to the program, and outlining future steps. After

receiving feedback on the program, a final assessment was completed, concluding with a farewell to the adolescents.

Statistical analysis

Descriptive statistics for the data are provided, including median, standard deviation, minimum, and maximum values. Due to the small sample size (below 30), the results obtained from the scales were analyzed using the nonparametric Friedman test. After, Dunn post-hoc test is done for comparing groups. All analyses were conducted using SPSS version 25.0.

Results

The assumptions (independence of groups, paired samples, continuous data type, and sample size related concerns) for Friedman test are met in present data (Field et al., 2012). Because of small sample size and repeated nature of the study, Friedman test was the perfect fit for the analysis.

Firstly, the participants' minimum, maximum, median, and standard deviation scores were calculated from the pre-test, post-test, and follow-up test in data analysis. Although not statistically significant, it was observed that anxiety medians remained the same between the pre-test and post-test but showed a decrease in the follow-up test (3.00, 3.50, 2.50, respectively). Depression medians showed a decrease between the pre-test and post-test; however, there was an increase in the follow-up test, though this increase did not reach the level of the pre-test, and the decrease was maintained in the follow-up. (4.00, 1.50, 2.50, respectively). Additionally, while PTSD scores decreased between the pre-test and post-test, there was an increase again in the follow-up test (27.50, 24.00, 30.00, respectively; Table 1).

When each participant was individually evaluated, it was determined that, in terms of pre-intervention pre-test scores, three participants had PTSD scores in the range of 25–39, indicating a moderate level (25, 30, 35, respectively), two had PTSD scores in the range of 40–59, indicating a severe level (41 and 43), and the other three participants had PTSD scores in the range of 12–24, indicating a mild level (19, 20, 20, respectively). It was observed that the PTSD scores of the three participants with the highest scores (43, 41, and 35) were also associated with the highest anxiety scores (7, 8, and 7, respectively), and among these three participants with the highest PTSD scores (41 and 43), two participants had the highest depression scores (6 and 8). The coping scores of these three participants were observed to be close to the group average. When examined demographically, the individual with the highest PTSD score had no recent loss, had a moderately damaged house, experienced high fear during the earthquake, had a high fear of another prospective earthquake, and expressed a need for psychological support after the earthquake. The participant with the second-highest score had lost cousins, had an intact house, experienced high fear during the earthquake, had a very high fear of another prospective earthquake, and was the only participant expressing a need for psychological support after the earthquake. The participant with the third-highest score had lost cousins, had a heavily damaged house, experienced high fear during the earthquake, and had a high fear of another earthquake.

When the post-intervention post-test scores of participants were evaluated, it was observed that the participant with the highest score had a one-third decrease in PTSD score after the intervention, and this score was maintained in the follow-up. Anxiety and depression scores increased after the intervention, but a dramatic decrease was observed in the follow-up test. However, the participant with the second-highest PTSD score experienced the greatest reduction in scores in all three measures. Yet, in the follow-up test, all three scores for this participant returned to the pre-test level. For the participant with the third-highest score, PTSD scores remained unchanged in the post-test and follow-up test, while depression scores remained the same in the post-test but decreased in the follow-up test. Anxiety scores for this participant showed a decreasing trend in both the post-test and follow-up test.

The Friedman test conducted to determine whether there was a significant difference in the participants' pre-test, post-test, and follow-up test scale scores and it is revealed that, except for the coping style "turning to religion" (where an increase in the mean ranking was observed in the follow-up test), there was no significant difference in the mean rankings of scale scores between the pre-test, post-test, and follow-up test for any other coping styles. However, if a significance level of 0.10 is considered, an increase in the mean ranking in the follow-up test was observed for the coping styles "using instrumental social support," "positive reinterpretation," and "planning," indicating that participants utilized these coping styles more frequently (Table 2).

The post hoc analysis for turning to religion was conducted using the Dunn-Bonferroni test. According to the post hoc analysis, the difference was observed between the post-test and the follow-up test in the pairwise comparisons. However, after the Bonferroni correction, the level of significance was determined to be $p > .05$.

Table 1 Mean, standard deviation, minimum, and maximum values of pretest, post test, and follow up test scales scores

Scales		Md	SD	Min.	Max.
Child Post Traumatic Stress Disorder Reaction Index	Pretest	27.50	9.67	19.00	43.00
	Post test	24.00	6.78	17.00	35.00
	Follow up test	30.00	11.20	12.00	44.00
Brief Symptom Inventory-Anxiety	Pretest	3.00	2.60	2.00	8.00
	Post test	3.50	3.37	1.00	12.00
	Follow up test	2.50	2.76	0.00	9.00
Brief Symptom Inventory-Depression	Pretest	4.00	2.42	1.00	8.00
	Post test	1.50	4.10	0.00	12.00
	Follow up test	2.50	3.96	0.00	12.00
CSS-BF-Using Instrumental Social Support	Pretest	4.00	2.29	2.00	8.00
	Post test	2.50	2.05	2.00	8.00
	Follow up test	5.50	2.06	2.00	8.00
CSS-BF-Humor	Pretest	2.00	1.06	2.00	5.00
	Post test	2.50	2.13	2.00	8.00
	Follow up test	2.00	2.19	2.00	8.00
CSS-BF-Focus on and Venting of Emotions	Pretest	2.00	1.06	2.00	5.00
	Post test	4.00	2.48	1.00	8.00
	Follow up test	3.50	2.33	2.00	8.00
CSS-BF-Substance Use	Pretest	2.00	0.71	2.00	4.00
	Post test	2.00	1.19	2.00	5.00
	Follow up test	2.00	0.35	2.00	3.00
CSS-BF-Acceptance	Pretest	5.00	2.23	2.00	8.00
	Post test	5.00	1.99	2.00	8.00
	Follow up test	4.50	1.92	2.00	8.00
CSS-BF-Suppression of Competing Activities	Pretest	3.50	0.99	2.00	4.00
	Post test	2.00	1.16	2.00	5.00
	Follow up test	4.50	1.98	2.00	8.00
CSS-BF-Turning to Religion	Pretest	6.50	1.51	4.00	8.00
	Post test	5.50	2.66	2.00	8.00
	Follow up test	8.00	0.83	7.00	10.00
CSS-BF-Denial	Pretest	3.50	0.93	2.00	5.00
	Post test	3.00	1.25	2.00	5.00
	Follow up test	4.00	1.51	2.00	5.00
CSS-BF-Behavioral Disengagement	Pretest	2.00	1.36	2.00	5.00
	Post test	2.00	1.36	2.00	5.00
	Follow up test	1.50	1.41	0.00	4.00
CSS-BF-Mental Disengagement	Pretest	3.50	1.85	2.00	8.00
	Post test	2.50	2.47	2.00	8.00
	Follow up test	5.00	2.20	2.00	8.00
CSS-BF-Restraint Coping	Pretest	3.00	2.07	2.00	8.00
	Post test	3.50	2.20	2.00	8.00
	Follow up test	4.00	1.98	2.00	8.00
CSS-BF-Positive Reinterpretation	Pretest	4.00	2.03	3.00	8.00
	Post test	4.00	2.67	2.00	8.00
	Follow up test	7.50	1.49	5.00	8.00
CSS-BF-Using Emotional Social Support	Pretest	5.00	2.17	2.00	8.00
	Post test	3.00	2.25	2.00	8.00
	Follow up test	4.50	2.53	2.00	8.00
CSS-BF-Planning	Pretest	4.00	1.85	3.00	8.00
	Post test	5.00	2.39	2.00	8.00
	Follow up test	6.50	1.73	4.00	8.00

CSS-BF Coping Styles Scale Brief Form

Table 2 Comparison of pre-test, post-test, and follow-up test scores obtained from the scales using Friedman's two-way analysis of variance with rankings

Scales		Mean Ranks	χ2	df	*p*
Child Post Traumatic Stress Disorder Reaction Index	Pretest	2.13	0.267	2	0.875
	Post test	1.88			
	Follow up test	2.00			
Brief Symptom Inventory-Anxiety	Pretest	2.06	1.355	2	0.508
	Post test	2.25			
	Follow up test	1.69			
Brief Symptom Inventory-Depression	Pretest	2.44	2.786	2	0.248
	Post test	1.88			
	Follow up test	1.69			
CSS-BF-Using Instrumental Social Support	Pretest	1.88	**5.583**	**2**	**0.061**
	Post test	1.56			
	Follow up test	2.56			
CSS-BF-Humor	Pretest	1.63	4.00	2	0.135
	Post test	2.25			
	Follow up test	2.13			
CSS-BF-Focus on and Venting of Emotions	Pretest	1.75	1.391	2	0.499
	Post test	2.25			
	Follow up test	2.00			
CSS-BF-Substance Use	Pretest	1.94	0.500	2	0.779
	Post test	2.13			
	Follow up test	1.94			
CSS-BF-Acceptance	Pretest	2.13	0.364	2	0.834
	Post test	2.00			
	Follow up test	1.88			
CSS-BF-Suppression of Competing Activities	Pretest	1.94	4.56	2	0.102
	Post test	1.56			
	Follow up test	2.50			
CSS-BF-Turning to Religion	Pretest	1.81	**6.583**	**2**	**0.037**
	Post test	1.56			
	Follow up test	2.63			
CSS-BF-Denial	Pretest	2.00	0.077	2	0.962
	Post test	1.94			
	Follow up test	2.06			
CSS-BF-Behavioral Disengagement	Pretest	2.19	4.083	2	0.130
	Post test	2.31			
	Follow up test	1.50			
CSS-BF-Mental Disengagement	Pretest	2.13	3.714	2	0.156
	Post test	1.50			
	Follow up test	2.38			
CSS-BF-Restraint Coping	Pretest	1.75	1.043	2	0.593
	Post test	2.13			
	Follow up test	2.13			
CSS-BF-Positive Reinterpretation	Pretest	1.81	**5.25**	**2**	**0.072**
	Post test	1.63			
	Follow up test	2.56			
CSS-BF-Using Emotional Social Support	Pretest	2.00	1.923	2	0.382
	Post test	1.69			
	Follow up test	2.31			
CSS-BF-Planning	Pretest	1.81	**5.643**	**2**	**0.060**
	Post test	1.56			
	Follow up test	2.63			

CSS-BF Coping Styles Scale Brief Form

Discussion

In this study, the effect of a psychosocial intervention following disasters was examined, with a focus on adolescents who have been displaced due to February 6th earthquakes. It was observed that post-disaster intervention efforts in Turkey are not sufficiently widespread, lacking in well-structured and ready-to-implement programs. Inspired by the flexible structure of interventions, as exemplified by JoH, it was deemed beneficial to develop an intervention program that could serve as the foundation for a practice guide for use in subsequent disasters. In this context, a program for adolescents was developed, utilizing techniques from CBT such as relaxation exercises, the ABCs of emotions technique, coping skills, and emotional expression, akin to those used in JoH. This intervention program aimed to reduce symptoms of PTSD, depression, and anxiety among adolescents and to enhance their coping skills. The study employed a pre-test, post-test, and four-month follow-up assessment without a control group, using an AB experimental design to explore these aspects.

A decrease in adolescents' PTSD scores was observed between the pre-test and post-test; however, there was an increase in the follow-up test, though it did not reach the pre-test level. This result suggests that the psychoeducation intervention did not have a lasting impact on adolescents' PTSD symptoms. Several reasons could explain this outcome. Firstly, we did not use any cutoff value to select adolescents for the psychoeducation program. We included all adolescents who applied and obtained parental consent to participate in the program. This means that adolescents with mild and moderate levels of PTSD symptoms, according to the scale scores, were also included in the study. It was not expected that the symptoms of participants who already had low PTSD symptoms would decrease further after the intervention. Another reason is that the content of the psychoeducation intervention did not solely focus on trauma symptoms. Moreover, through the psychoeducation program, adolescents might have become more aware of their psychological issues, leading them to answer the scales more objectively in the post-test and follow-up test. Lastly, a different but explanatory reason could be that the adolescents moved away from the migration area shortly after the intervention, which might not allow for a significant differentiation in measurements due to rapid improvement. Therefore, it is possible to mention that the act of moving away from a disaster environment, which means migration, had a protective effect.

In the present study, although the average anxiety scores of adolescents before and after psychoeducation were similar, we observed a statistically non-significant decrease in these scores at the follow-up test. Similarly, there was a

decrease in the average depression scores of participants from before to after the psychoeducation, and this decrease was maintained at the follow-up test, though it was not statistically significant. Various studies on earthquake-affected adolescents have shown that depression and anxiety are the most common psychological issues following PTSD (Fan et al., 2011; Sharma & Kar, 2019; Silwal et al., 2018). Significant research by Pan et al. (2015) on middle school students three years after the 2008 Wenchuan earthquake in China found that PTSD, depression, and anxiety were prevalent, with exposure to the earthquake being associated with symptoms of PTSD, depression, and anxiety. Factors such as witnessing the death of a family member, serious injury, or the death of close friends, and experiencing fear were identified as significant predictors for PTSD. Similarly, witnessing serious injury and feeling scared were significant predictors for depression and anxiety (Pan et al., 2015). It has been suggested that adolescents exposed to severe trauma and left untreated are at risk for chronic PTSD and depressive symptoms (Goenjian et al., 2005). In a study conducted six months after the 1999 Athens earthquake involving children exposed to the earthquake, a significant portion of the children exhibited symptoms of PTSD and depression. Additionally, severe or moderate symptoms of PTSD were associated with high depression scores (Kolaitis et al., 2003). Based on these findings in the literature, we posit that the decrease, however insignificant, in depression and anxiety symptoms in adolescents in present study, and their maintenance in the follow-up period, could act as a protective factor against the risk of developing PTSD.

Considering the results in terms of reducing PTSD symptoms, current findings contrast with numerous studies indicating the effectiveness of psychological interventions for PTSD following disasters. The results of a meta-analysis by Newman et al. (2014) demonstrate that psychological interventions for PTSD in children and adolescents affected by both natural and human-made disasters are effective in alleviating PTSD symptoms. Similarly, a meta-analysis and systematic review by Brown et al. (2017) examined psychosocial interventions applied to children and adolescents affected by natural and human-made disasters. Their results showed significant reductions in PTSD symptoms with psychological interventions, indicating that spontaneous remission was less effective than structured interventions. They also found no significant difference in the efficacy of treatment among different psychological intervention methods. Additionally, a comprehensive meta-analytic review by Le Roux and Cobham (2022) associated psychological interventions for children exposed to natural disasters (regardless of the type of intervention) with statistically significant and sustained decreases in PTSD symptomatology. In a study (Goenjian et al., 1997) conducted six months after the 1988 Armenia earthquake, adolescents who received short-term psychotherapy experienced a significant decrease in PTSD and depressive symptoms, and these improvements were maintained over the long term, while those who did not receive psychotherapy showed a significant increase in the severity of these symptoms. Following the 1999 Athens earthquake, a short-term CBT intervention was applied to 20 children aged 8–12 with PTSD symptoms. After the intervention, a statistically significant reduction in PTSD and depression symptoms was reported (Giannopoulou et al., 2006). A group format CBT applied to adolescents diagnosed with PTSD four months after the 2003 Iran earthquake demonstrated a significant improvement in PTSD symptoms (Shooshtary et al., 2008). Even a short post-disaster psychoeducation intervention has been found to be effective in improving children's psychological problems (Fukuchi et al., 2019).

However, there are also studies that show similarities with the present results. An intervention program consisting of six modules was implemented for children aged 11–14 approximately one year after the Indian Ocean earthquake and tsunami on December 26, 2004 (Vijayakumar et al., 2006). In this study, which included a control group, it was observed that the psychological intervention did not have an effect on PTSD symptoms, similar to current findings. It is noteworthy that Vijayakumar et al.'s study had a control group and a larger number of participants, unlike the present study. However, the absence of a control group and the limited number of participants in the present study were due to camp conditions. In their study, Vijayakumar et al. (2006) suggested that a significant portion of children were resilient and could cope with psychological problems after the disaster. In the study by Bianchini et al. (2013), significant changes were not observed in the hyperarousal and re-experiencing dimensions of PTSD before and after the intervention, while significant differences were detected in the avoidance dimension and total scores. Pityaratstian et al. (2015) argued that the sole use of CBT was insufficient; although the difference in PTSD levels before and after the intervention was significant, it showed only a small effect size. However, when self-monitoring and daily homework practices were used in conjunction with the intervention, CBT was found to be more effective in reducing PTSD in children and adolescents, showing a greater effect size. Additionally, it can be said that there are adolescents who might be naturally resilient, specifically to PTSD, after a disaster. It is known that after a natural disaster, although many children initially show some psychological symptoms, with the support of family, friends, and the school environment, they enter a natural healing process (Lisa et al., 2021). In a recent meta-analysis evaluating psychoeducation interventions for PTSD symptoms in adults (Brouzos

et al., 2022), it was concluded that the overall effectiveness of psychoeducation in reducing PTSD symptoms is found to be small.

There are various models that emphasize the different coping methods individuals use in the face of stressful situations (e.g., Lazarus & Folkman, 1984; Endler & Parker, 1990). One of the most foundational theories is Lazarus and Folkman's (1984) transactional theory of stress and coping, according to which, humans are not passive beings; their responses and coping strategies can vary depending on how they appraise the situation. In the present study, when examining the impact of the psychoeducation program on coping styles, a significant increase in the average score for religious coping was observed. Although not statistically significant, there was an increase in the sub-scales of using instrumental social support, positive reinterpretation, and planning. When evaluated through Lazarus and Folkman's model, which emphasize the active interaction between individuals and their environment, the uncontrollable nature of earthquakes suggests that emotion-focused coping styles, such as religious coping, become more prominent. This implies that religion serves as a compensatory refuge for the helplessness brought on by the disaster. However, the coping style used by an individual can be either adaptive or maladaptive. For instance, choosing emotion-focused coping instead of problem focused ones might lead to anxiety and depression when the situation is controllable (Biggs et al., 2017). Conversely, in situations where external reality cannot be controlled, such as during an earthquake, it can be argued that such coping indicates adaptation.

In a study with adolescents conducted after the 2015 Nepal earthquake (Sharma & Kar, 2019), it was found that despite the high prevalence of a religious coping style among those with PTSD, the effectiveness of this coping style in overall coping ability was not significant. Similarly, the study by Bianchini et al. (2013) observed that adolescents utilizing planning/problem-solving, and religiosity as coping styles showed greater improvements in their PTSD symptoms. The increase in the sub-scales of positive reinterpretation, using instrumental social support, and planning may have resulted from the impact of the psychoeducation program. The present study's psychoeducation program included sessions specifically targeting these coping styles. Sharing traumatic experiences with parents, friends, and teachers is a common method adolescents use to cope with traumatic experiences (Sharma & Kar, 2019). The sessions in present study provided participants with the opportunity to share their experiences, which may have contributed to these positive coping styles. Active coping skills, such as problem-solving, serve as a protective factor against potential psychological problems after a disaster (Wadsworth et al., 2009).

Considering that dysfunctional coping strategies further increase the likelihood of PTSD (Adhikari Baral, 2019), the findings in current study suggest that these coping styles may reduce the risk of chronic PTSD symptoms in adolescents. Conversely, the decrease in PTSD and depressive symptoms may contribute to the development of coping skills in children after an earthquake (Goenjian et al., 1997). There seems to be a mutual interaction between coping styles and symptoms of PTSD, depression, and anxiety in adolescents. The decrease in depression and anxiety symptoms in present study may have increased the coping skills of adolescents.

Supporting the perspective that participants generally provided positive evaluations for psychoeducation (Powell & Holleran-Steiker, 2017; Pratt et al., 2005), adolescents were observed to eagerly participate in the sessions and look forward to the next session with excitement. Feedback received from participants in the final session indicated a better understanding of their emotions, an improved ability to express them well, and also to externalize their emotions. It was mentioned that they could not open up to their parents, as they did not want to make them unhappy due to their parents already being sad. One participant described the process as, "We stay here with friends, I know all of them, but I didn't know they had similar fears as me, after each session I felt more relaxed". Activities and drawings were mentioned to be liked by another participant, who said that the relaxation exercises were also beneficial. Considering these self-assessments by the participants, the lack of a decrease in PTSD symptoms, as mentioned above, may have resulted from the adolescents becoming more aware of their distress by discussing their unspoken emotional states in the sessions, which could have influenced their PTSD scores. Additionally, the presence of activities such as children's parties organized by the IGA in the camp setting may have also reduced the impact of the earthquake. Furthermore, this study presents an observation by the researchers that moving away from the earthquake zone right after the disaster had a healing effect on the victims. This observation was also made in another (Bilge et al., 2023) study conducted with a group of adult women in the same camp by the researchers. This discovery is considered to contribute to the literature, as it may suggest that even simply moving away could be beneficial for disaster victims.

Limitations and future research directions

Significant findings were yielded by this study, yet certain limitations were faced. Notable limitations in data collection were encountered primarily due to logistical challenges with the adolescent participant group, who were only available for sessions on Saturdays and began resuming normal

life activities as conditions improved. The ability to conduct more than one follow-up or mid-term assessments was hindered by this situation. Additionally, the frequency of data requests was minimized to preserve the positive dynamic between practitioners and adolescents, potentially affecting the depth of analysis. The potential methodological concerns arising from the transition to online follow-up were effectively mitigated by the small size of the participant group and the seriousness with which the study was approached by them. Prior to the online follow-up, participants were proactively contacted, provided with the necessary links and instructions, which likely enhanced the reliability of their responses.

PTSD symptoms were evaluated using self-report scales instead of structured clinical interviews, representing another limitation. The results might differ in a study with adolescents diagnosed with PTSD. The absence of a control group due to camp conditions and the limited number of participants in the treatment group is another limitation. All of the adolescents who sought psychosocial education were included given the nature of the situation. The choice to include those seeking psychosocial education in a control group and delaying assistance was not an ethical option given the magnitude of the trauma experienced. The absence of a comparable control group makes it challenging to assess whether psychosocial education is more effective than other methods. It is uncertain whether the significant improvements observed in children in this study resulted from natural recovery processes rather than a response to treatment, since there was no control group without psychosocial education. The data could have been enriched with information and observations from the adolescents' families. However, due to the parents' work schedules and locations, creating such an infrastructure in the environment where the study was conducted was not possible. The group that received psychosocial education consisted of earthquake survivors placed in Istanbul. The experiences of adolescents who continued to stay in disaster areas could present more challenges when post-earthquake assistance difficulties are considered. These limitations could be potential focuses for future research, which should examine the program's effectiveness using controlled designs and different samples. With these limitations in mind, the findings of this study should be interpreted cautiously. Current study's participants consisted of individuals who had not suffered major damage from the earthquake (very few of the families living in the camp had their homes destroyed). Moreover, only two adolescents displayed severe PTSD symptoms. Conducting various studies that take into account the uniformity in the severity of symptoms, organize psychoeducation sessions for parents, and vary the time between the disaster and intervention could contribute to the literature. In our study, aside from the changes in adolescents' coping skills, there were some elements that were not detected by the scales but were noticeable during the sessions. The collective nature of Turkish culture, strong social connectedness, helpfulness, culture of solidarity, seeking religious support, and various group activities organized by the teams managing the camp, such as gift distribution, listening to music, and watching movies, are thought to have served as resources for the adolescents' post-disaster coping skills. Noteworthy is the fact that although the participants did not report psychological distress, in the event that such a situation arose, it was planned that participants would be conducted, allowing researchers to implement an intervention. Additionally, in the follow-up study, the participants provided very positive feedback about the sessions, and their more active and participatory attitudes also indicated an improvement in their coping skills. Future studies should consider having larger sample sizes, incorporating comparison groups, taking cultural differences into account, using qualitative research designs, and employing more comprehensive and long-term approaches when possible.

Conclusion

Following the psychosocial education intervention, an increase in coping scores and a decrease in anxiety and depression scores were observed among adolescents. However, there was no significant change in PTSD scores. Except for one participant, all others had experienced damage to their homes and were all of them forced to relocate from their hometowns. Although there were no statistically significant changes in symptoms after the psychosocial education intervention and during the follow-up period, as support providers, we recognized the importance of being in contact with adolescents in the camp area. Adolescents, especially after traumatic experiences, need attention and supervision, a secure environment, and strong support. Therefore, social support, opportunities for self-expression, and normalization of stress reactions likely made significant contributions to their resilience. The most significant risk factor for children is unfavorable conditions that weaken basic human protective systems for development (Caffo & Belaise, 2003). To facilitate faster coping and recovery, it might be necessary for them to leave the stressful environment (Kar, 2009). One of the most important outcomes of this study is the researchers' observation regarding the positive effects of relocation after the earthquake, and future studies are expected to obtain data confirming this observation. In addition, protective factors that aid in recovery depend on fundamental human protective systems functioning in their favor in the environment (Caffo & Belaise,

2003). The camp area where the work is conducted consisted of adolescents who were placed with their families in a container camp prepared by IGA management for the earthquake-affected relatives of the employees. Hence, family integrity was maintained, and, as far as we observed, they were in a secure environment. Additionally, it was observed that the communal structure of Turkish culture led to almost familial-level sharing and solidarity in the camp established after the earthquake.

Finally, after large-scale disasters affecting many individuals, psychological interventions in the early stages need to be planned for specific groups in terms of cost and time. In this context, the mental processes of children and adolescents, known as particularly sensitive groups, should not be overlooked in disaster preparedness planning before earthquakes. It is important to inform children, adolescents, and their parents about the psychological symptoms that can be observed after disasters through educational activities and to provide continuous, sufficient individual and/or group-based support for those in need. Turkey experiences numerous natural disasters, and as preparations are made for potential future earthquakes, we hope this study provides insights into managing psychosocial interventions.

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Yıldız Bilge: Conceptualization, preparation of data tools, application of intervention, analysis of data, proofreading.
Ekin Emiral: Conceptualization, preparation of data tools, application of intervention, translation of the text from Turkish into English, proofreading.
Selçuk Şen: Operational preparations, logistics, supporting intervention program.

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Declarations

Ethical publication We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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