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Effectiveness of Compassion-Based Therapy on Health Anxiety, Intolerance of Uncertainty, and Psychosomatic Headache in Adolescents with War-Induced Post-Traumatic Stress Disorder

Zahra. Fatahi

M.A. in Industrial and Organizational Psychology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran.

Corresponding author email address:
Zahrafatahi1995@gmail.com

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ABSTRACT

Objective: The present study aimed to investigate the effectiveness of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with war-induced PTSD.

Methods and Materials: A quasi-experimental pretest–posttest control-group design was used. Thirty adolescents aged 13 to 17 years with war-induced post-traumatic stress symptoms were selected through purposive sampling and assigned to an experimental group (n = 15) and a control group (n = 15). The experimental group received eight weekly sessions of compassion-based therapy, whereas the control group received no structured psychological intervention during the study period. Data were collected using the International Trauma Questionnaire–Child and Adolescent Version, the Short Health Anxiety Inventory, the Intolerance of Uncertainty Scale for Children, and the Henry Ford Headache Disability Inventory. Multivariate analysis of covariance and follow-up univariate ANCOVAs were used to analyze the data while controlling for pretest scores.

Findings: After the intervention, the experimental group showed marked reductions in health anxiety, intolerance of uncertainty, and headache-related psychosomatic symptoms compared with the control group. The multivariate effect of group was significant, Wilks' Lambda = 0.31, $F(3, 23) = 17.73$, $p < .001$, partial $\eta^2 = 0.69$. Follow-up analyses confirmed significant intervention effects for health anxiety, $F(1, 26) = 69.75$, $p < .001$, intolerance of uncertainty, $F(1, 26) = 70.29$, $p < .001$, and psychosomatic headache symptoms, $F(1, 26) = 70.73$, $p < .001$.

Conclusion: Compassion-based therapy appears to be an effective intervention for reducing psychological and psychosomatic manifestations of trauma in adolescents with war-induced PTSD.

Keywords: Post-Traumatic Stress Disorder, Adolescents, Health Anxiety, Uncertainty, Headache, Compassion-Focused Therapy.

Introduction

Adolescence is a particularly sensitive developmental period in which exposure to war and organized violence can produce persistent psychological, emotional, and somatic consequences. In war-affected contexts, adolescents are often exposed not only to direct traumatic events such as injury, bereavement, forced displacement, and witnessing violence, but also to chronic insecurity, disrupted education, family instability, and prolonged uncertainty regarding safety and the future. These conditions substantially increase vulnerability to trauma-related psychopathology, especially post-traumatic stress disorder (PTSD). Recent evidence suggests that war-related PTSD is highly prevalent among adolescents, indicating that trauma exposure in humanitarian settings constitutes a major public mental health concern (Zasiekina et al., 2025).

PTSD in adolescents is not limited to the classical symptom clusters of intrusion, avoidance, negative alterations in cognition and mood, and hyperarousal. Rather, it is frequently accompanied by broader emotional and behavioral difficulties, including anxiety, depressive symptoms, dysregulated affect, interpersonal withdrawal, sleep disturbance, and psychosomatic complaints (Douglas et al., 2025). In conflict-affected populations, traumatic stress may become intertwined with chronic activation of the threat system, resulting in persistent vigilance, heightened bodily monitoring, and maladaptive interpretations of internal sensations. Consequently, adolescents with war-induced PTSD may experience clinically significant difficulties that extend beyond core trauma symptoms and interfere with social, academic, and developmental functioning.

One of the important but relatively underexplored correlates of PTSD in adolescents is health anxiety. Health anxiety refers to excessive preoccupation with illness, heightened awareness of bodily sensations, and the tendency to misinterpret normal or benign physical experiences as signs of serious medical conditions (Kikas et al., 2024). During adolescence, this process may be intensified by developmental changes associated with puberty, increased self-focus, and heightened emotional reactivity. In trauma-exposed youth, bodily sensations linked to hyperarousal—such as headaches, dizziness, palpitations, muscle tension, or gastrointestinal discomfort—may be catastrophically interpreted, thereby increasing fear and reinforcing anxiety-related cognitive cycles. Longitudinal evidence has shown that health anxiety in adolescents is a meaningful clinical construct associated with maladaptive reassurance-seeking and dysfunctional health-related information processing (Svestkova et al., 2025). Therefore, health anxiety may represent an important dimension of distress in adolescents suffering from war-related PTSD.

A second construct of considerable relevance is intolerance of uncertainty Fan et al. (2023) which refers to the tendency to perceive uncertain, ambiguous, or unpredictable situations as stressful, aversive, and unacceptable. IU has increasingly been recognized as a transdiagnostic vulnerability factor underlying anxiety, worry, threat anticipation, and emotion regulation difficulties. In trauma-related conditions, intolerance of uncertainty may intensify perceptions of danger, maintain anticipatory anxiety, and amplify the cognitive effects of uncontrollability and unpredictability—features that are central to war experiences. Empirical findings continue to support the role of maladaptive belief systems, including difficulty tolerating uncertainty, in the maintenance of post-traumatic symptoms (Fite & Thompson-Hollands, 2025). Moreover, recent war-related research has shown that intolerance of uncertainty can mediate the relationship between fear of war and psychological distress, highlighting its potential role in trauma-exposed populations living under chronic threat (Najem et al., 2025; Regnoli et al., 2024). For adolescents with war-induced PTSD, intolerance of uncertainty may therefore be a key mechanism sustaining both emotional distress and maladaptive coping.

In addition to psychological symptoms, adolescents with PTSD frequently manifest distress in somatic form. Among these somatic manifestations, psychosomatic headache is especially important because headache is one of the most common pain complaints during adolescence and is strongly associated with stress, anxiety, and emotional dysregulation. Contemporary research indicates that headache severity and disability in adolescents are closely linked with maladaptive stress responses and broader psychological difficulties (Proietti Checchi et al., 2024). More broadly, somatic symptoms in adolescents have been shown to correlate with anxiety and emotional distress, suggesting that internalizing difficulties often become embodied in physical

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complaints (Mahirah et al., 2025). In war-traumatized adolescents, psychosomatic headache may reflect chronic physiological arousal, muscular tension, sleep disruption, unresolved emotional stress, and persistent activation of survival-related neural systems. Accordingly, addressing headache in this group requires not only symptom management but also attention to the emotional and cognitive processes that maintain bodily distress.

Given these interconnected difficulties, interventions that target threat sensitivity, self-criticism, emotional dysregulation, and maladaptive self-relating may be particularly beneficial. One promising approach is compassion-based therapy, which aims to cultivate self-compassion, emotional safeness, and a supportive inner orientation toward distress. Compassion-based interventions are grounded in the notion that many forms of psychopathology are maintained by shame, harsh self-judgment, and overactivation of the threat protection system. By strengthening affiliative emotion regulation processes and reducing self-criticism, compassion-focused approaches may help individuals respond to suffering with acceptance, warmth, and psychological flexibility rather than fear, avoidance, and catastrophizing (Millard et al., 2023). This framework appears especially relevant for traumatized adolescents, who often struggle with shame, insecurity, heightened threat monitoring, and difficulty soothing themselves after adverse experiences.

The potential usefulness of compassion-based therapy for adolescent PTSD has received growing theoretical attention. Recent scholarship suggests that compassion-oriented interventions may be particularly suitable for adolescents because this developmental stage is characterized by heightened self-consciousness, identity vulnerability, and sensitivity to social evaluation, all of which may magnify trauma-related distress (Brinckman et al., 2024). In addition, compassion-based therapy may influence not only trauma symptoms per se, but also secondary mechanisms such as health anxiety, intolerance of uncertainty, and psychosomatic complaints. By reducing fear-based engagement with bodily sensations, fostering tolerance of uncertainty, and promoting a less threatening relationship with internal experience, compassion-based therapy may offer a broader and more integrative therapeutic pathway for war-exposed adolescents.

Despite these theoretical and clinical advantages, there remains a significant gap in the literature. Most prior studies have focused on general PTSD symptom reduction, adult trauma samples, or conventional cognitive-behavioral and trauma-focused approaches. Comparatively little attention has been paid to the effects of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache among adolescents with war-induced PTSD. This gap is important because these variables represent clinically meaningful dimensions of suffering that may shape prognosis, functional impairment, and treatment responsiveness. Therefore, the present study aimed to investigate the effectiveness of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with post-traumatic stress disorder caused by war.

Methods and Materials

Study Design

The present study used a quasi-experimental design with a pretest-posttest control group structure to investigate the effectiveness of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with war-induced post-traumatic stress disorder (PTSD). This design was selected because it allows the comparison of changes in the experimental group relative to a control group while statistically controlling for baseline differences. After the initial screening and baseline assessment, eligible adolescents were assigned to either the compassion-based therapy group or the control group. Outcome variables were assessed at two time points, including before the intervention and immediately after the completion of the treatment program.

Participants and sampling procedure

The statistical population consisted of adolescents exposed to war-related traumatic experiences who were referred to counseling centers, psychological service clinics, or community mental health settings in Isfahan in 2026. Participants were selected using purposive sampling based on the study inclusion criteria and were subsequently allocated to experimental and control

groups. Adolescents were considered eligible if they were within the age range of 12 to 18 years, had experienced at least one war-related traumatic event, showed clinically meaningful post-traumatic stress symptoms, and were willing and able to participate in the treatment sessions and complete the assessment instruments. Exclusion criteria included severe cognitive impairment, psychotic symptoms, acute suicidal risk, severe neurological disease, and concurrent participation in another structured psychotherapy program. Written informed consent was obtained from parents or legal guardians, and assent was obtained from the adolescents before data collection began.

PTSD assessment and screening

To identify adolescents with post-traumatic stress symptoms, the International Trauma Questionnaire–Child and Adolescent Version (ITQ-CA) was used. This instrument was developed to assess ICD-11 PTSD and complex PTSD symptoms in children and adolescents and is regarded as a developmentally appropriate trauma measure for youth populations (Cloitre et al., 2018). In the original line of psychometric work on the ITQ-CA and its early validation studies, the instrument demonstrated satisfactory structural validity, developmental appropriateness, and acceptable reliability for the assessment of trauma-related symptoms in children and adolescents exposed to traumatic events (Cloitre et al., 2018; Haselgruber et al., 2020). In Iran, the Farsi version of the ITQ-CA showed robust psychometric properties in a trauma-exposed sample of children and adolescents. Internal consistency coefficients ranged from 0.83 to 0.91, intraclass correlation coefficients ranged from 0.74 to 0.92, and convergent validity with the Child and Adolescent Trauma Screen was reported between 0.49 and 0.77. Confirmatory factor analysis also supported the ICD-11 two-factor higher-order model of PTSD and disturbances in self-organization (Parhoon et al., 2024). In the present study, the ITQ-CA was used to confirm clinically relevant post-traumatic stress symptoms at study entry.

Health anxiety measure

Health anxiety was assessed using the Short Health Anxiety Inventory (SHAI) developed by Salkovskis et al. (2002). The SHAI is an 18-item self-report scale designed to assess excessive worry about illness, heightened monitoring of bodily sensations, and catastrophic interpretations of physical symptoms independently of actual physical health status. In the original validation study, the Health Anxiety Inventory demonstrated strong psychometric performance and was shown to be a reliable and valid measure of health anxiety across a broad severity range; the short form was also reported to correlate highly with the full version and to function well as a brief screening instrument (Salkovskis et al., 2002). In Iran, the Persian version of the SHAI was examined by Rabiei et al. (2013), who reported satisfactory construct validity and convergent validity. In that study, confirmatory factor analysis supported the adequacy of the Persian form, Cronbach's alpha for the total score was 0.89, and significant correlations were found with the Yale-Brown Obsessive Compulsive Scale modified for body dysmorphic disorder (r = 0.45), the Obsessive-Compulsive Inventory-Revised (r = 0.51), and the DASS-21 (r = 0.70). These findings support the use of the Persian SHAI as a psychometrically acceptable instrument for measuring health anxiety in Iranian samples (Rabiei et al., 2013).

Intolerance of uncertainty scale

Intolerance of uncertainty was measured using the Intolerance of Uncertainty Scale for Children (IUSC), originally developed by (Comer et al., 2009) for use with children and adolescents. The scale was designed to assess the tendency to perceive uncertain and ambiguous situations as threatening or distressing. In the original psychometric study, the IUSC demonstrated strong internal consistency, satisfactory convergent validity with measures of worry and anxiety, and meaningful discrimination between anxiety-related clinical presentations, supporting its utility for youth assessment (Comer et al., 2009). Later factor-analytic work also supported abbreviated versions and a multidimensional structure reflecting prospective and inhibitory aspects of intolerance of uncertainty (Cornacchio et al., 2018). In Iran, Zemestani et al., (2022) evaluated the Persian version of the IUSC and found that a shortened 12-item form provided the best fit. Their study supported a correlated two-factor model and demonstrated adequate internal consistency, 4-week retest reliability, significant associations with established measures of internalizing symptoms, and the ability of the measure to distinguish clinical from community samples. Therefore, the Persian IUSC-12 was considered suitable for assessing intolerance of uncertainty in the current study (Zemestani et al., 2022).

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Psychosomatic headache measure

Psychosomatic headache was assessed using the Henry Ford Headache Disability Inventory (HDI) developed by Jacobson et al. (1994). The HDI is a 25-item self-report instrument designed to assess the functional and emotional burden associated with recurrent headache. In the original development and follow-up psychometric studies, the HDI demonstrated strong internal consistency, good construct validity, and robust short-term and longer-term test-retest reliability, supporting its use as a clinically meaningful measure of headache-related disability (Jacobson et al., 1994; Jacobson et al., 1995). In Iran, Jabbari et al. (2021) validated the Persian version of the HDI and reported strong psychometric performance. In their study, content validity indices were 0.85 for simplicity, 0.99 for relevance, and 0.97 for clarity; the content validity ratio was 1.00 for all items. Confirmatory factor analysis showed acceptable model fit, Cronbach's alpha coefficients were 0.91 for the total scale, 0.82 for the functional subscale, and 0.86 for the emotional subscale, and the intraclass correlation coefficient for the total score was 0.97. Convergent validity was also supported through significant correlations with the SF-36 domains (Jabbari et al., 2021). On this basis, the Persian HDI was used as the principal measure of psychosomatic headache burden in the present study.

Description of the intervention

The intervention used in the present study was compassion-based therapy grounded in Compassion-Focused Therapy (CFT). The theoretical foundation of this approach originates primarily from the work of Gilbert (2010), who conceptualized CFT as an intervention aimed at reducing shame and self-criticism and strengthening the soothing and affiliative emotion-regulation system. In addition to Gilbert's foundational model, the structure of the intervention in the present study was informed by later adaptations of compassion-focused work for younger populations, particularly those emphasizing children and adolescents and the role of compassion in regulating threat-based emotional responses (Brinckman et al., 2024; Carona et al., 2017).

In the current study, the intervention was adapted for adolescents with war-induced PTSD. The treatment rationale was that war-traumatized adolescents frequently experience chronic activation of the threat system, high bodily vigilance, fear of uncertainty, shame, self-criticism, and difficulty soothing themselves after distressing internal or external experiences. Accordingly, the intervention aimed to help participants understand the functions of the threat, drive, and soothing systems; develop compassionate attention toward their thoughts, bodily sensations, and emotions; reduce catastrophic interpretations of physical symptoms; enhance tolerance of uncertainty; and cultivate a compassionate inner voice. The program was delivered in eight weekly group sessions, each lasting approximately 90 minutes, by a therapist trained in adolescent psychotherapy and compassion-based interventions.

Before presenting the session plan, it is important to note that the structure below was not copied from a single manual specific to war-exposed adolescents. Rather, it was developed by adapting the central therapeutic principles of Gilbert's compassion-focused model to the clinical targets of the present study, namely health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with post-traumatic stress symptoms. Therefore, the intervention preserved the core components of compassion-based therapy while tailoring examples, imagery, exercises, and discussion topics to trauma-related bodily distress and uncertainty.

Table 1

Intervention sessions

Session	Content
1	Introduction to the group process, therapeutic rules, and rationale of compassion-based therapy; psychoeducation about trauma and the three emotion regulation systems (threat, drive, soothing); normalization of trauma-related distress.
2	Understanding the "tricky brain" and evolutionary basis of threat responses; identifying self-criticism, shame, fear, and harsh self-judgment in relation to traumatic experiences and bodily symptoms.
3	Training in soothing-rhythm breathing and grounding; introduction to compassionate attention; helping adolescents notice bodily sensations, tension, and headache-related distress without immediate catastrophic interpretation.
4	Exploring health anxiety and bodily vigilance; identifying maladaptive interpretations of physical sensations; learning to respond to bodily discomfort with compassionate awareness rather than fear and over-monitoring.

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5	Addressing uncertainty, unpredictability, and anticipatory fear; helping participants recognize how intolerance of uncertainty maintains distress; introducing compassionate self-talk in uncertain situations.
6	Working compassionately with difficult emotions, including fear, sadness, anger, helplessness, and grief; linking emotional overload to somatic symptoms such as psychosomatic headache.
7	Compassionate imagery, compassionate self, and compassionate letter writing; strengthening a supportive inner stance toward trauma reminders, bodily pain, and ambiguous future situations.
8	Review and consolidation of acquired skills; relapse prevention; development of an individualized compassion plan for coping with distress, uncertainty, and psychosomatic symptoms; posttest administration.

Procedure

Following ethical approval from the relevant institutional review board, participants were recruited from available clinical and community settings. At the first stage, adolescents were screened for study eligibility and completed the baseline assessment battery. Those who met the inclusion criteria entered the study and were assigned to experimental and control groups. The experimental group received eight sessions of compassion-based therapy, while the control group did not receive the intervention during the study period and remained on a waitlist or continued receiving routine services available in the setting. At the end of the intervention period, both groups completed the posttest measures under the same assessment conditions. Confidentiality of responses was maintained throughout the study, and participants were informed that they could withdraw from the research at any time without penalty.

Data analysis

Data were analyzed using SPSS software. Descriptive statistics, including means and standard deviations, were first computed for all variables. Prior to hypothesis testing, statistical assumptions such as normality of distribution, homogeneity of variances, and homogeneity of regression slopes were examined. To assess the effectiveness of the intervention on health anxiety, intolerance of uncertainty, and psychosomatic headache, multivariate analysis of covariance (MANCOVA) was used with posttest scores as dependent variables and pretest scores as covariates. When the multivariate effect was significant, follow-up univariate ANCOVAs were conducted for each outcome variable. The significance level was set at 0.05.

Ethical considerations

Given that the target group consisted of adolescents exposed to traumatic war-related experiences, ethical sensitivity was especially important in the present study. Participation was entirely voluntary, informed consent was obtained from parents or legal guardians, and assent was obtained from the adolescents. Participants were assured that all information would remain confidential and would be used solely for research purposes. Because trauma-related assessment and treatment may evoke emotional distress, the study was implemented in a trauma-informed manner, and referral pathways for additional psychological or psychiatric support were kept available throughout the research process.

Findings and Results

Demographic findings

A total of 30 adolescents with war-induced post-traumatic stress disorder participated in the study and were randomly assigned to the experimental group (n = 15) and the control group (n = 15). The age of the participants ranged from 13 to 17 years. The mean age of the experimental group was 15.07 years (SD = 1.10), and the mean age of the control group was 15.20 years (SD = 1.01). Overall, 16 participants (53.3%) were female and 14 (46.7%) were male. In the experimental group, 8 participants (53.3%) were female and 7 (46.7%) were male, whereas in the control group, 8 participants (53.3%) were female and 7 (46.7%) were male. In terms of educational status, 9 participants (30.0%) were studying at lower secondary school and 21 (70.0%) were studying at upper secondary school. With regard to living conditions, 18 participants (60.0%) were living with both parents, 7 (23.3%) were living with one parent, and 5 (16.7%) were living with relatives or guardians due to war-related family disruption. The two groups were comparable in age, gender distribution, educational level, and living arrangement, and no statistically significant between-group differences were observed in the baseline demographic variables (p > .05).

Table 2

Means and standard deviations of the study variables in the experimental and control groups at pretest and posttest

Variable	Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Health anxiety	Experimental	34.73	4.86	21.47	4.11
	Control	33.93	5.02	32.60	4.78
Intolerance of uncertainty	Experimental	42.87	5.21	27.80	4.56
	Control	43.13	5.11	41.93	4.95
Psychosomatic headache	Experimental	48.20	6.14	30.13	5.22
	Control	47.60	5.89	46.27	5.67

As shown in Table 2, the experimental group demonstrated substantial reductions in health anxiety, intolerance of uncertainty, and psychosomatic headache following the intervention. By contrast, the control group exhibited only slight decreases in mean scores, indicating relative stability over time. These descriptive results provided preliminary support for the effectiveness of compassion-based therapy. Before conducting the main inferential analyses, the assumptions of multivariate analysis of covariance (MANCOVA) were examined. The normality of the dependent variables was assessed using the Shapiro-Wilk test, and the results indicated that the distributions of health anxiety, intolerance of uncertainty, and psychosomatic headache scores at posttest did not significantly deviate from normality in either group ($p > .05$). Homogeneity of variances was evaluated using Levene's test, and the results showed that the error variances of the three dependent variables were equal across groups ($p > .05$). In addition, Box's M test was not statistically significant, indicating that the covariance matrices of the dependent variables were homogeneous across the experimental and control groups. The assumption of homogeneity of regression slopes was also examined by testing the interaction between each covariate and the group variable, and none of these interactions reached statistical significance ($p > .05$). Therefore, all assumptions for performing MANCOVA were met, and the main analysis was carried out.

To examine the effectiveness of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache, a one-way multivariate analysis of covariance was performed. Group membership was entered as the independent variable, posttest scores of the three outcome variables were entered as dependent variables, and the corresponding pretest scores were controlled as covariates.

Table 3

Results of multivariate analysis of covariance for the combined dependent variables

Test	Value	F	Hypothesis df	Error df	p	Partial Eta Squared
Pillai's Trace	0.69	17.73	3	23	< .001	0.69
Wilks' Lambda	0.31	17.73	3	23	< .001	0.69
Hotelling's Trace	2.31	17.73	3	23	< .001	0.69
Roy's Largest Root	2.31	17.73	3	23	< .001	0.69

The multivariate test results showed that, after controlling for pretest scores, there was a statistically significant difference between the experimental and control groups on the combined dependent variables, Wilks' Lambda = 0.31, $F(3, 23) = 17.73$, $p < .001$, partial $\eta^2 = 0.69$. This result indicated that compassion-based therapy had a significant overall effect on the set of posttest outcomes. The effect size was large, suggesting that a substantial proportion of the variance in the combined dependent variables was attributable to the intervention. Given the significance of the multivariate effect, follow-up univariate analyses of covariance were conducted for each dependent variable separately.

Table 4

Results of univariate ANCOVAs for posttest health anxiety, intolerance of uncertainty, and psychosomatic headache

Dependent variable	Source	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Health anxiety	Pretest	118.42	1	118.42	8.96	.006	0.25
	Group	921.68	1	921.68	69.75	< .001	0.72
	Error	343.63	26	13.22			
Intolerance of uncertainty	Pretest	126.55	1	126.55	7.84	.009	0.23
	Group	1134.72	1	1134.72	70.29	< .001	0.73
	Error	419.74	26	16.14			
Psychosomatic headache	Pretest	144.33	1	144.33	6.95	.014	0.21
	Group	1468.51	1	1468.51	70.73	< .001	0.73
	Error	539.83	26	20.76			

As shown in Table 4, after controlling for pretest scores, the intervention had a statistically significant effect on health anxiety, $F(1, 26) = 69.75$, $p < .001$, partial $\eta^2 = 0.72$. This finding indicates that adolescents in the experimental group reported significantly lower health anxiety at posttest than those in the control group. The effect size was large, suggesting that compassion-based therapy was highly effective in reducing health anxiety.

A significant group effect was also found for intolerance of uncertainty, $F(1, 26) = 70.29$, $p < .001$, partial $\eta^2 = 0.73$. This result demonstrates that, after adjusting for baseline scores, the adolescents who received compassion-based therapy showed significantly lower levels of intolerance of uncertainty at posttest compared with the control group. The effect size was again large. Similarly, the effect of the intervention on psychosomatic headache was statistically significant, $F(1, 26) = 70.73$, $p < .001$, partial $\eta^2 = 0.73$. Adolescents in the experimental group experienced significantly lower psychosomatic headache scores at posttest than adolescents in the control group, even after pretest differences were controlled. This result indicates that compassion-based therapy was also highly effective in reducing psychosomatic headache symptoms. To facilitate the interpretation of group differences after controlling for pretest scores, adjusted posttest means were calculated for each dependent variable.

Table 5

Adjusted posttest means and standard errors of the dependent variables by group

Variable	Group	Adjusted Mean	Standard Error	95% CI Lower	95% CI Upper
Health anxiety	Experimental	21.72	0.94	19.80	23.64
	Control	32.35	0.94	30.43	34.27
Intolerance of uncertainty	Experimental	28.06	1.04	25.92	30.20
	Control	41.67	1.04	39.53	43.81
Psychosomatic headache	Experimental	30.48	1.18	28.05	32.91
	Control	45.92	1.18	43.49	48.35

As indicated in Table 5, the adjusted posttest means of the experimental group were substantially lower than those of the control group across all three outcome variables. These adjusted means confirm that the observed post-intervention differences were not merely due to initial baseline variation, but rather reflected the effect of the therapeutic intervention. The results of the present study demonstrated that compassion-based therapy was effective in reducing health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with war-induced PTSD. After adjustment for baseline scores, the experimental group scored significantly lower than the control group on all outcome measures at posttest. The multivariate effect of group was statistically significant, and the subsequent univariate analyses confirmed significant treatment effects for each dependent variable separately. The corresponding effect sizes were large, indicating the clinical and statistical significance of the intervention.

Discussion and Conclusion

The present study examined the effectiveness of compassion-based therapy on health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with war-induced post-traumatic stress disorder (PTSD). The findings indicated that compassion-based therapy significantly reduced all three outcome variables in the experimental group compared with the control group. More specifically, adolescents who participated in the intervention reported lower levels of health anxiety, lower intolerance of uncertainty, and lower psychosomatic headache severity at posttest. These findings suggest that compassion-based therapy may be an effective intervention not only for trauma-related emotional distress but also for trauma-linked cognitive and somatic manifestations in war-affected adolescents. This overall pattern is consistent with recent evidence showing a substantial burden of war-related PTSD in adolescents and a growing need for effective, developmentally appropriate psychological interventions for youth exposed to armed conflict (Douglas et al., 2025; Zasiekina et al., 2025).

The reduction in health anxiety can be understood in light of both trauma theory and compassion-based models of emotional regulation. Adolescents with war-induced PTSD often become highly vigilant to bodily sensations because trauma-related arousal states, including muscle tension, autonomic activation, sleep disturbance, and pain, may be interpreted as signals of danger. In such cases, ordinary physical sensations may be catastrophically misread as signs of illness or loss of control. Contemporary literature conceptualizes health anxiety as a pattern involving excessive illness concern, hypervigilance to bodily changes, catastrophic interpretation, and reassurance seeking (Kikas et al., 2024). In adolescence, this process may be particularly intensified because developmental bodily changes and heightened emotional reactivity make internal sensations more salient and sometimes harder to interpret accurately. Recent longitudinal evidence has also shown that health anxiety in adolescents is clinically meaningful and dynamically related to maladaptive health-related information processing (Svestkova et al., 2025). Within this framework, compassion-based therapy may reduce health anxiety by weakening threat-based appraisal of bodily sensations and by replacing fear-driven self-monitoring with a more accepting, soothing, and non-catastrophic stance toward internal experience.

The present finding regarding health anxiety is also theoretically consistent with the mechanisms emphasized in compassion-focused interventions. Compassion-based approaches aim to reduce self-criticism, shame, and hyperactivation of the threat system while strengthening affiliative and soothing regulatory processes (Gilbert, 2010). Recent meta-analytic evidence indicates that compassion-focused therapy is associated with significant improvements in compassion-related processes and reductions in clinical symptomatology across clinical populations (Millard et al., 2023). Related evidence also suggests that self-compassion-focused interventions can reduce self-criticism and emotional distress, which is especially relevant when bodily discomfort is interpreted through a lens of fear and helplessness (Wakelin et al., 2022). In the context of the present study, it is plausible that compassion-based therapy reduced health anxiety by helping adolescents reinterpret bodily sensations more safely, decrease catastrophic internal dialogue, and increase tolerance for distressing somatic cues.

Another important finding of the present study was the significant reduction in intolerance of uncertainty among adolescents who received compassion-based therapy. This result is noteworthy because intolerance of uncertainty is increasingly recognized as a transdiagnostic process involved in anxiety, worry, threat anticipation, and maladaptive coping. For adolescents exposed to war, uncertainty is not an abstract cognitive problem but a lived reality involving unpredictability about safety, family stability, displacement, loss, and the future. Under such conditions, chronic uncertainty may intensify hypervigilance and anticipatory fear and may contribute to the persistence of trauma-related symptoms. Recent studies have shown that fear of war is associated with poorer mental health outcomes and that this relationship is mediated, at least in part, by intolerance of uncertainty and future-oriented anxiety (Najem et al., 2025; Regnoli et al., 2024). Therefore, the observed decline in intolerance of uncertainty in the present study suggests

that compassion-based therapy may have helped participants relate to ambiguity and unpredictability with greater emotional safety and less defensive overcontrol.

This finding can also be explained through the structure of compassion-based therapy itself. Compassion-based interventions do not seek merely to eliminate distress; rather, they help individuals cultivate a caring and courageous stance toward distress that makes uncertainty more tolerable. Instead of reacting to ambiguity with panic, avoidance, or catastrophic forecasting, participants are encouraged to develop emotional grounding, soothing-rhythm breathing, compassionate imagery, and a kinder internal dialogue. In trauma-exposed adolescents, such skills may reduce the urgency of control-seeking and diminish the perceived unbearable nature of uncertainty. The present result is therefore conceptually aligned with broader compassion-based research showing that such interventions enhance emotional regulation and reduce maladaptive reactions to internal threat (Fan et al., 2023; Millard et al., 2023). In adolescent PTSD specifically, Brinckman et al. (2024) argued that compassion-based therapy may be especially promising because it directly addresses shame, self-judgment, and fear-based self-relating, all of which may intensify post-traumatic suffering during adolescence.

The third major finding was that compassion-based therapy significantly reduced psychosomatic headache in adolescents with war-induced PTSD. This result is clinically important because trauma-related distress in adolescents frequently manifests not only in emotional and cognitive symptoms but also in somatic complaints. Headache, in particular, is one of the most common and functionally impairing pain complaints during adolescence. Recent evidence indicates that somatic symptoms in adolescents are strongly associated with anxiety, depression, and life stressors (Mahirah et al., 2025). Similarly, research on adolescents with migraine has shown that more disabling headache patterns are linked to maladaptive coping responses to stressful events and broader emotional burden (Proietti Checchi et al., 2024). Taken together, these studies support the idea that headache in adolescence is deeply intertwined with psychological processes, especially in contexts of chronic stress and dysregulated emotional arousal. In the present study, the reduction in psychosomatic headache may reflect a decrease in physiological tension, autonomic overactivation, catastrophic body monitoring, and stress-related amplification of pain following the intervention.

The effect of compassion-based therapy on psychosomatic headache may also be understood through its potential influence on the body–mind relationship. Trauma-exposed adolescents often experience the body as a source of threat rather than safety. Compassion-based interventions can gradually reshape this relationship by fostering nonjudgmental bodily awareness, reducing internal fear, and promoting a sense of safeness in response to pain and distress. When bodily discomfort is met with compassion rather than alarm, the cycle linking stress, muscular tension, hypervigilance, and symptom escalation may weaken. This interpretation is supported indirectly by evidence that compassion-based and self-compassion interventions can reduce anxiety and depression and improve emotion regulation across a range of populations (Han & Kim, 2023; Millard et al., 2023). Although headache was not always the primary outcome in those studies, the underlying mechanisms of reduced self-threat, improved regulation, and increased self-soothing are highly relevant to psychosomatic symptoms.

Overall, the present findings are congruent with the broader literature on compassion-based interventions and trauma-related distress. Recent reviews have suggested that compassion-based therapy may hold particular promise for adolescent PTSD because adolescence is a period characterized by heightened self-consciousness, increased sensitivity to social evaluation, and vulnerability to shame and self-criticism (Brinckman et al., 2024). In addition, recent meta-analyses have demonstrated beneficial effects of compassion-focused and compassion-based interventions on depression, anxiety, self-compassion, and related psychological outcomes (Fan et al., 2023; Millard et al., 2023). The current study extends this literature by suggesting that compassion-based therapy may also influence trauma-linked constructs that are often overlooked in adolescent PTSD research, namely health anxiety, intolerance of uncertainty, and psychosomatic headache. In this sense, the present findings contribute to the growing view that trauma treatment in war-affected youth should address not only core PTSD symptoms but also broader systems

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of bodily threat monitoring, uncertainty intolerance, and self-relational distress.

From a clinical perspective, the findings of the present study have several implications. First, they suggest that compassion-based therapy may be a useful adjunct or alternative for adolescents who struggle with trauma-related shame, emotional overload, somatic distress, or fear-based engagement with internal experiences. Second, the intervention may be particularly valuable in war-affected or humanitarian settings, where adolescents often experience chronic stress and limited access to specialized mental health care. Recent evidence indicates that psychological and psychosocial interventions can reduce post-traumatic stress symptoms in children and adolescents in humanitarian crises and that interventions delivered by non-specialists may also be beneficial (Douglas et al., 2025). Within such contexts, a structured compassion-based protocol may offer a scalable and developmentally sensitive option for addressing both emotional and somatic consequences of trauma.

Despite its contributions, the present study should be interpreted in light of several limitations. First, the sample size was relatively small, which may limit statistical power and the generalizability of the findings. Second, the use of self-report instruments may have introduced response bias or shared method variance. Third, the absence of a long-term follow-up assessment makes it impossible to determine whether the observed gains were maintained over time. Fourth, because the intervention was tested in adolescents with war-induced PTSD within a specific sociocultural setting, caution is warranted in generalizing the results to other trauma populations or contexts. Finally, although the findings are theoretically consistent with compassion-based mechanisms, the present study did not directly assess mediators such as self-compassion, self-criticism, shame, or fears of compassion, and therefore the mechanisms of change remain inferential rather than empirically confirmed. These limitations are important in view of the fact that the broader literature is still developing regarding how compassion-based interventions operate in adolescent trauma populations (Brinckman et al., 2024; Millard et al., 2023).

Future research should therefore examine the long-term effects of compassion-based therapy on trauma-related cognitive, emotional, and somatic outcomes in larger and more diverse adolescent samples. It would also be valuable to compare compassion-based therapy directly with trauma-focused cognitive behavioral therapy, acceptance-based interventions, or other evidence-based approaches in war-affected youth. In addition, future studies should investigate mediating variables such as self-compassion, shame, self-criticism, body vigilance, and emotion regulation in order to clarify the pathways through which compassion-based therapy exerts its effects. Given the growing evidence for the relevance of health anxiety, somatic symptoms, and intolerance of uncertainty in adolescents, these constructs should increasingly be included as clinically meaningful treatment targets rather than peripheral symptoms (Kikas et al., 2024; Mahirah et al., 2025; Svestkova et al., 2025).

In conclusion, the findings of the present study suggest that compassion-based therapy is an effective intervention for reducing health anxiety, intolerance of uncertainty, and psychosomatic headache in adolescents with war-induced PTSD. These results support the view that compassion-based approaches may be especially valuable for trauma-exposed adolescents whose distress is shaped not only by core post-traumatic symptoms but also by bodily hypervigilance, uncertainty-related fear, and psychosomatic manifestations of stress. By helping adolescents respond to internal pain and external unpredictability with greater warmth, safeness, and emotional regulation, compassion-based therapy may offer a clinically meaningful pathway for improving psychological adjustment in war-affected youth. Given the high prevalence of war-related PTSD in adolescents and the complexity of its emotional and somatic sequelae, integrating compassion-based interventions into adolescent trauma care deserves serious consideration in both clinical practice and future research (Brinckman et al., 2024; Douglas et al., 2025; Zasiekina et al., 2025).

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contribute to this study.

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