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Trauma and related measures one year after the 2023 earthquakes in Türkiye: post-traumatic stress, post-traumatic growth, spiritual well-being, and self-compassion

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Abstract

The 7.7- and 7.6-magnitude earthquakes that struck Türkiye on 6 February 2023 generated considerable material and moral damage. Traumas, such as earthquakes, often lead to posttraumatic stress disorder (PTSD) in individuals; however, trauma may have the effect of transforming individuals in a positive sense, promoting post-traumatic growth (PTG). Although it is not possible to prevent trauma, reducing the adverse effects of trauma and focusing on positive opportunities and outcomes may help individuals to progress in more healthy ways. This study focused on the relationship between PTSD and PTG among earthquake survivors. It examined the potential mediating roles of self-compassion and spiritual well-being and their effects on PTG. Data were obtained from 390 survivors one year after the earthquake. Participants completed scales assessing PTSD (earthquake-related), PTG, self-compassion, and spiritual well-being. The results indicated that PTSD symptoms often persisted one year after earthquake-related trauma. Individuals with high PTSD scores also had high PTG scores. Self-compassion and spiritual well-being in coping with traumatic events mediated the relationship between PTSD and PTG. Thus, while the adverse psychological effects of the earthquake often persisted a year later, high levels of self-compassion and spiritual well-being after trauma appeared to exert positive effects and reduce PTSD. The findings may help guide future efforts of mental health professionals to reduce the traumatic effects of earthquakes.

Keywords Post-traumatic stress disorder · Self-compassion · Trauma · Post-traumatic growth · Spiritual well-being

Introduction

Natural disasters can have short- and long-term effects on psychological well-being (Yzermans et al., 2005). Mental health concerns may arise due to the direct effects of the disasters and subsequent events (Fergusson et al., 2014). On the 6th of February, 2023, Türkiye experienced two major earthquakes with magnitudes of 7.7 and 7.6. These earthquakes severely affected 11 provinces and killed 45,089 people (AFAD, 2023). After the earthquakes, when losses were more significant than most expected, a report authored by mental health experts was published and presented a psychosocial support plan for survivors (Kurt et al., 2023). Earthquakes have many economic, psychological, and social impacts (Dai et al., 2016). Investigating the mechanisms underlying post-traumatic outcomes (such as post-traumatic stress disorder [PTSD], post-traumatic growth [PTG], and spirituality) in earthquake survivors may inform practical approaches or clinical interventions for survivors. Specifically, information regarding relationships and mechanisms regarding PTSD, PTG, and spirituality may help healthcare providers design more effective interventions to decrease the traumatic impact of earthquakes on people's mental health.

Trauma, whether natural or man-made, may negatively affect individuals' mental health (Chen et al., 2021). Although earthquakes are often sudden disasters with devastating consequences, few studies have investigated potential risk or resiliency factors associated with earthquakes and mental health (Wang & Liu, 2012). PTSD is a common

Extended author information available on the last page of the article

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mental disorder that negatively affects people's daily routines and well-being after trauma (Wang & Liu, 2012). PTSD is a human response to an abnormal situation resulting from exposure to a highly stressful event or series of events such as natural disasters, war, or abuse (Schiraldi, 2009). A review of studies conducted after earthquakes revealed that almost a quarter of earthquake survivors had PTSD (Dai et al., 2016). Additionally, PTSD is the most common mental disorder after an earthquake (Alipour & Ahmadi, 2020; Bromet et al., 2017; Kocyigit et al., 2024; Rowney et al., 2014). Tendencies after traumatic events often involve focusing on the adverse effects of trauma.

Tedeschi and Calhoun (2004) advanced trauma research by considering positive post-traumatic effects (Updegraff & Taylor, 2021). While individuals may experience trauma-related distress, they may also realize benefits or growth related to their trauma (Blevins & Tedeschi, 2022). Indeed, PTSD has been reported to have positive outcomes, such as PTG (Chen et al., 2022; Gerstner et al., 2020; Kyutoku et al., 2020; Thapa et al., 2018). PTG involves positive changes that result from coping with major life crises (Calhoun & Tedeschi, 2014). Although PTSD and PTG may constitute opposing aspects of post-traumatic sequelae, they may coexist in traumatized individuals (Huang et al., 2019; Henson et al., 2022). Blevins and Tedeschi (2022) reported that PTG is complex and has the potential to contribute to an individual's greater sense of well-being and life satisfaction following trauma. Self-compassion and spirituality, two critical factors associated with well-being, may mediate relationships between PTSD and PTG.

Self-compassion is a resilience factor that provides individuals with cognitive and emotional resources for PTG (Yuhan et al., 2021). Self-compassion enables people to have healthy relationships with themselves in difficult times and to accept themselves with all their positive or negative emotions during stressful times. For example, hugging oneself in difficult times allows people to tolerate painful feelings better than they may have otherwise (Braehler & Neff, 2020). Self-compassion may be both a challenge and an opportunity for trauma survivors. Self-compassion may positively affect survivors with PTSD (Winders et al., 2020; Daneshvar et al., 2022; Yuhan et al., 2021; Özönder-Ünal et al., 2023). Self-compassion may contribute to the well-being of individuals who have experienced trauma by making their negative thoughts and perspectives more positive (Wong & Yeung, 2017).

Spirituality may also promote PTG (Czyzowska et al., 2021). According to Bray's (2013) model of psycho-spiritual transformation, if events that are difficult to experience and process, such as earthquakes, are well managed, they may empower the person to grow psycho-spiritually. Trauma can sometimes contribute positively to increased spirituality, thus helping individuals feel better (Aten et al., 2019). In complex and stressful situations, religious behavior such as praying can increase well-being by giving hope (Jong, 2020). Some studies show that spiritual well-being positively affects PTG (Feng et al., 2024; Gesselman et al., 2017; Sinclair et al., 2016). Individuals who have experienced trauma may seek meaning through spirituality and come to terms with what they have experienced (Cadell et al., 2003). Shaw et al. (2005) analyzed 11 experimental studies and concluded that spirituality and religious forces are helpful for individuals after trauma and that religious variables are positively related to PTG. Traumatic events sometimes increase individuals' spirituality, which may help them find personal meaning in their traumatic experiences and lives (Walker et al., 2009). Meaning-making, therefore, may promote a balanced perspective regarding life events, which may help people to be less self-critical about perceived failures in life and to see them as opportunities for growth rather than foci of negative dwelling (Khursheed & Shahnawaz, 2020).

Because PTSD symptoms often persist long (e.g., 10 years) after earthquakes (Karamustafalıoğlu et al., 2023), the effects of PTG and spirituality may also need time to develop. Indeed, PTSD and PTG effects on survivors eight years after the Wenchuan earthquake indicated that PTSD was linked to suicidal tendencies, while PTG protected against suicide (Jing et al., 2018). In this study, we investigated psychological factors one year after the recent earthquakes in Türkiye. Although one year may allow sufficient time for some to recover from the losses and process grieving, psychological symptoms may persist one year after an earthquake (Liu et al., 2011; Xu & Song, 2011; Sato & Nozue, 2023).

The psychological outcomes of earthquakes are important yet incompletely understood. Investigating factors that may promote PTG and understanding better the positive transformative power of trauma could help guide post-traumatic interventions. Improved understanding could help promote the work of mental health professionals to help people overcome traumas experienced following earthquakes. Thus, the study results could potentially help guide future interventions.

Given the conceptual framework and literature presented above, we hypothesized a positive relationship between survivors' PTSD and PTG levels one year after the Türkiye earthquakes. Additionally, the current study investigated whether self-compassion and spiritual well-being had parallel mediating effects on this hypothesized relationship. This study analyzed survivors' psychological outcomes one year after the earthquakes. The purposes of this study were (i) to examine the relationship between PTSD and PTG and (ii) to

examine potential mediating roles for self-compassion and spiritual well-being in this relationship.

Method

We used a multifactorial predictive correlation design to identify direct and indirect relationships between variables (Fraenkel et al., 2012). We defined PTSD as a predictor, PTG as an outcome, and spiritual well-being and self-compassion as possible mediating variables.

Procedures, participants, and ethical issues

The University Ethics Committee granted ethical approval. We conducted the study with 390 adults (59.3% female) who had personally experienced the earthquakes in southern Türkiye on February 6, 2023. Our inclusion criteria were as follows: (i) age 18 years or older as of February 2024, (ii) residence in the ten provinces affected by the two major earthquakes (M_w 7.7 and 7.6) on February 6, 2023, and the aftershocks that lasted for months; (iii) no migration to different parts of Türkiye after the earthquakes, even temporarily; and, (iv) granting of online informed consent. We conducted the study in accordance with the principles of the 2013 updated version of the Declaration of Helsinki (2013), initially developed in 1964. We collected data through an online survey between February and March 2024. We shared the link to the form through social networking communities and online forums in Türkiye (e.g., X, WhatsApp, Instagram, Facebook). Participants read the informed consent form online before providing consent and taking the survey. We did not provide any payment to participants. Participants' ages ranged from 18 to 62 years (M_{age} = 28.41, SD = 8.49, [44.1% were 18–24 years; 21.3% were 25–30 years; 15.1% were 31–35 years; 10.0% were 36–40 years; and 9.7% were 41 years and above]). Regarding the highest level of education, 3.1% of participants graduated from secondary school, 9.2% from high school, 76.2% from undergraduate school, and 11.5% from graduate school. About 41% had at least one relative who died during the earthquake. Only a small percentage of participants (3.58%) was trapped under the rubble after the earthquake and had been rescued by aid teams. Most (80.5%) of the participants resided in their own homes after the earthquakes. A sizable minority (19%) of the respondents reported that their houses had been destroyed during the earthquakes.

Measures

Post-earthquake trauma scale

The Post-Earthquake Trauma Scale (Tanhan & Kayri, 2013) quantitated post-earthquake trauma levels. The scale includes 20 items and five subdimensions (behavioral problems, excitement limitations, affective, cognitive structures, and sleep problems). High scores, with items scored along five-point Likert scales, reflected high levels of post-earthquake trauma. In the present sample, the Post-Earthquake Trauma Scale showed adequate internal consistency: Cronbach's α = 0.75 (behavioral problems), 0.87 (excitement limitation), 0.61 (affective), 0.87 (cognitive structure), and 0.87 (sleep problems) for each domain. The whole scale had an excellent Cronbach's α of 0.93. A sample item is, "I cannot go indoors because of the earthquake."

Post-traumatic growth inventory

The Post-traumatic Growth Inventory (Tedeschi & Calhoun, 1996; Kağan et al., 2012) assessed PTG. The scale consists of 21 items and three subdimensions (changes in self-perception, changes in life philosophy, changes in communication with others). The scale ranges between 0 and 5, with higher scores indicating that individuals have more positive changes in their lives in the face of traumatic life events. Using data from the present sample, the Post-traumatic Growth Inventory showed adequate internal consistency: Cronbach's α = 0.90 (changes in self-perception), 0.80 (changes in life philosophy), and 0.79 (changes in communication with others) for each domain. The whole scale had an excellent Cronbach's α of 0.93. A sample item is, "The order of prioritization of the things I care about in life has changed."

Spiritual well-being scale

The Spiritual Well-Being Scale (Ekşi & Kardaş, 2017) assessed spiritual well-being. The scale includes 29 items and three subdimensions (transcendence, harmony with nature, anomie). Given the considerable debris in the region following the earthquake, it was thought that the sub-dimension of harmony with nature could not be interpreted as intended in the post-traumatic context after the earthquake. For this reason, we included the transcendence and anomie subdimensions in our study. The items were rated on a five-point Likert scale, and the items on the anomie subscale were reverse-coded so that the higher scores reflected greater levels of spiritual well-being. In the present sample, the Spiritual Well-Being Scale showed adequate internal consistency: 0.96 (transcendence) and 0.85 (anomie) for

each domain. The whole scale had an excellent Cronbach's α of 0.91. A sample item is, "Being connected to a divine power gives me confidence."

Self-compassion scale short form

The Self-Compassion Scale Short Form (Neff, 2003; Yıldırım & Sarı, 2018) measured self-compassion. The scale consists of 12 Likert-type items comprising a single dimension. Items 1, 4, 8, 9, 10, and 11 were reverse-coded. Higher total scores reflected higher levels of self-compassion. In the present sample, the Self-Compassion Scale Short Form showed adequate internal consistency: 0.78. A sample item is, "I try to stabilize my emotions when something upsets me."

Statistical analyses

Before conducting statistical analyses, we examined the data for normality and multicollinearity. To understand whether the data were normally distributed, we examined the skewness and kurtosis values of the variables, and the results are presented in Table 1. Absolute skewness and kurtosis < 2 indicate normal distributions (George & Mallery, 2018). To test possible multicollinearity between the independent and mediator variables, we examined variance inflation factor (VIF) values (post-earthquake trauma: 1.19, spiritual well-being: 1.12, self-compassion: 1.28). A value between 1 and 5 is considered normal (Frost, 2019). Therefore, no multicollinearity problems were evident. We applied descriptive statistics (e.g., means and standard deviations (SDs)) and correlation analyses in preliminary analyses. To determine whether there may be common method bias (CMB), exploratory factor analysis (EFA) was used. Harman's one-factor test was applied to the 75 items of the four scales. In this test, if the variance of the first factor before rotation is less than 50%, it is interpreted as not having CMB (Podsakoff et al., 2003). As a result of the unrotated principal component factor analysis, 14 factors with eigenvalues higher than one were found. Since the variance of the first factor was 17.65% in the data set, where 65.79% of the total variance was explained, it can be said that there was no CMB in the data set (Podsakoff et al., 2003). We next examined correlations between variables using Pearson product-moment correlation coefficients. For statistical significance, we defined a p-value < 0.05. Then, we conducted parallel mediation analyses using Hayes' Macro PROCESS Model 4 (Hayes, 2022). We tested indirect effects between PTSD and PTG with 5000 bootstrapping samples (reflecting a default setting in the Hayes' Macro PROCESS) at 95% confidence intervals (CIs). We determined the significance of the indirect effect according to the absence of zero (0) in the low and high CIs (Hayes, 2022). We defined the effect size using "completely standardized coefficients" proposed by Preachers and Hayes (2008) and Preachers and Kelley (2011). Then, we classified the effects into small (0.1), moderate (0.3), and large (0.5) using Cohen's standards (1988).

Results

Preliminary analyses

Table 1 presents the correlation values and descriptive statistics for the relevant variables.

PTSD was negatively and moderately associated with self-compassion and spiritual well-being (Table 1). PTG was positively and moderately associated with self-compassion and spiritual well-being. PTSD was positively associated with PTG at a low level. According to the skewness and kurtosis values, the analyzed data were normally distributed (kurtosis and skewness ≤|2|).

Parallel mediation analyses

Figure 1 presents the standardized coefficients for the parallel mediation of self-compassion and spiritual well-being between PTSD and PTG. PTSD positively predicted PTG and our hypothesis was supported (β = 0.105, t = 2.087, p = .038). The model was significant, and PTSD explained ~ 1% of the variance in PTG (p < .001, R^2 = 0.011). While PTSD negatively predicted self-compassion (β = −0.394, t = −8.456, p < .001), self-compassion positively predicted PTG (β = 0.221, t = 4.203, p < .001). PTSD negatively predicted spiritual well-being (β = −0.185, t = −3.704, p < .001), while spiritual well-being positively predicted PTG (β = 0.291, t = 5.920, p < .001).

Table 1 Correlation values and descriptive statistics (N = 390)

Variable	Mean (SD)	Skewness	Kurtosis	r (95% CI LL/UL)			
				1	2	3	4
1. PTSD	3.03 (0.93)	−0.038	−0.568	-	−0.394** (−0.48/−0.31)	−0.185** (−0.28/−0.09)	0.105* (0.01/0.20)
2. Self-Compassion	3.12 (0.66)	−0.020	0.220		-	0.323** (0.23/0.41)	0.218** (0.12/0.31)
3. Spiritual Well-being	3.92 (0.70)	−0.976	0.818			-	0.317** (0.23/0.40)
4. PTG	2.86 (1.01)	−0.267	−0.180				-

*p < .05, **p < .01; *PTSD* post-traumatic stress disorder, *PTG* post-traumatic growth, *CI* confidence interval, *LL* lower level, *UL* upper level

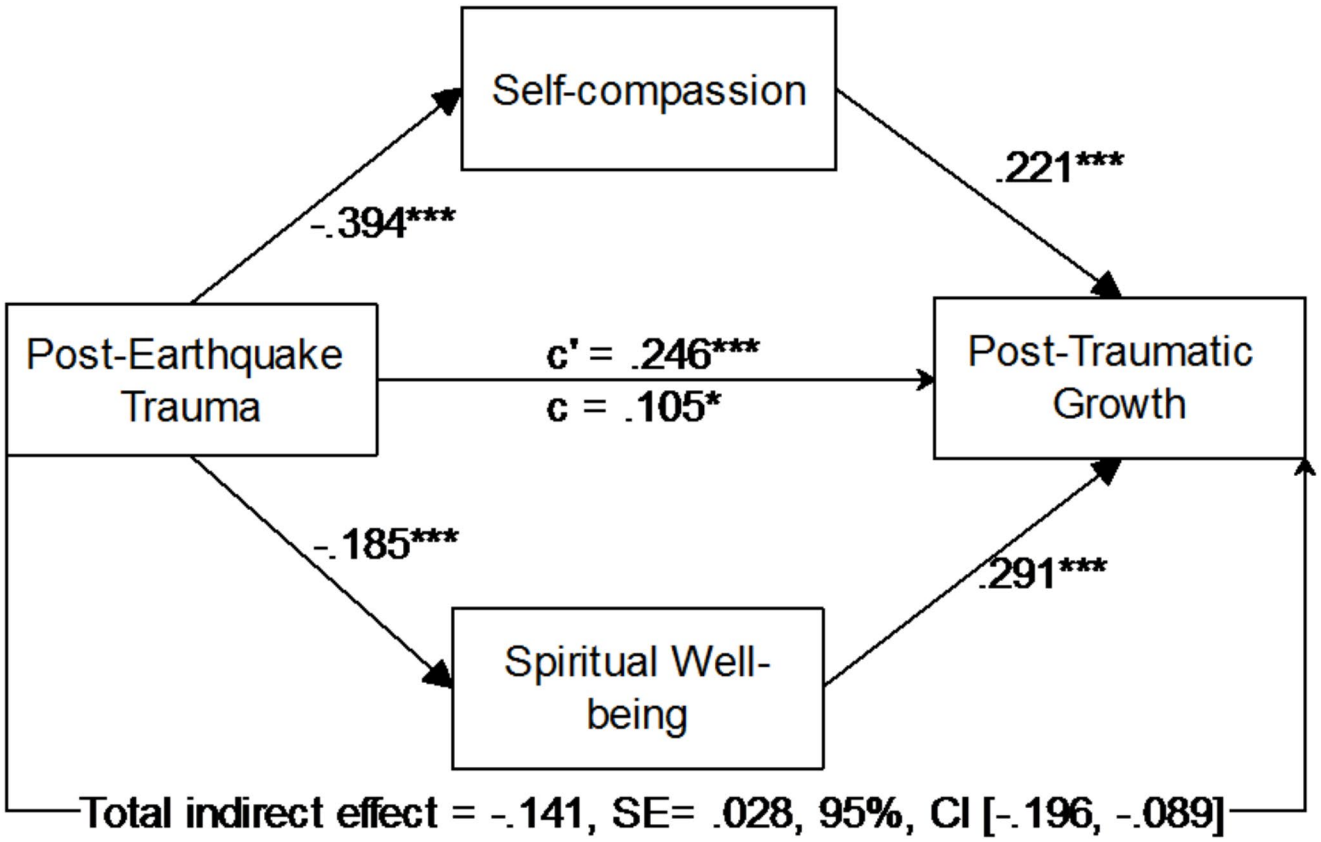


Fig. 1 Parallel mediation model ($N=390$). ($^{***}p<.001$, $^{*}p<.05$, c = total effect, c' = direct effect)

Table 2 The bootstrapping results for the proposed parallel mediation model ($N=390$)

	Model Paths	β	SE	95% bootstrapping CI	
				Lower	Upper
Standardized Indirect Effects	PTSD →SC→ PTG	−0.087	0.023	−0.133	−0.045
	PTSD → SW→PTG	−0.054	0.017	−0.089	−0.024

PTSD post-traumatic stress disorder, *SC* self-compassion, *SW* spiritual well-being, *PTG* post-traumatic growth, *SE* standard error, *CI* confidence interval

As shown in Fig. 1, PTSD directly predicted PTG positively through self-compassion and spiritual well-being (β = 0.246, t = 4.862, $p<.001$). The model was significant, and PTSD, self-compassion, and spiritual well-being together explained approximately 17% of the variance in PTG ($p<.001$, $R^2 = 0.167$). The indirect effect coefficients and 95% confidence intervals are shown in Table 2.

As shown in Table 2, the indirect path coefficient of self-compassion did not include zero values among the confidence intervals, and the mediating effect of self-compassion was supported (β = −0.087, SE = 0.023, 95%, CI [−0.133, −0.045]). There was no zero value among the CIs of the indirect path coefficient of spiritual well-being, and the mediating effect of spiritual well-being was confirmed (β = −0.054, SE = 0.017, 95%, CI [−0.089, −0.024]).

Discussion

In this study, we first analyzed the relationship between PTSD and PTG. We found that the PTSD levels of individuals who survived one year after the earthquake statistically positively predicted PTG at a low level (i.e., 1%). This finding may reflect more robust effects of the mediating variables (self-compassion and spiritual well-being). In line with these results, multiple variables, especially self-compassion and spiritual well-being, may impact individuals experiencing post-traumatic stress to emerge from these difficulties with strength over time. Moreover, self-compassion and spirituality were found to be significant mediators of the association between PTSD and PTG; however, the mediation effects size were relatively small (Spirituality Cohen r: 0.05; Self-compassion Cohen r: 0.08, Total Cohen r: 0.14). Notably, PTSD was inversely related to both self-compassion and spirituality, and each was positively related to PTG, suggesting that self-compassion and

spirituality may help overcome what would have possibly been more negatively impactful effects of trauma. While a negative relationship between PTSD and PTG may have been expected, Tedeschi and Calhoun (2004) argued that the courses of PTSD and PTG are different for traumatic and stressful events. Multiple studies have found positive relationships between PTSD and PTG (Thapa et al., 2018; Gerstner et al., 2020; Chen et al., 2022; Kyutoku et al., 2020). Guo et al. (2018) reported that individuals with low social support and low PTG had more significant suicidal tendencies among Wenchuan earthquake survivors, and Jin et al. (2014) reported that PTG reduced suicidal tendencies in survivors with PTSD. These studies show that even years after an earthquake, survivors' negative psychological symptoms persist, PTSD and PTG are seen together (Zhou et al., 2016), and transformative mechanisms such as PTG may have positive protective effects on coping with these adverse events (Nishi et al., 2010).

Self-compassion mediated the relationship between PTSD and PTG, consistent with findings reported by Nabilah and Kusristanti (2021). Self-compassion after traumatic events may reduce autonomic hyperarousal (Germer & Neff, 2015). Self-compassion may strengthen individuals' coping mechanisms through positive reframing by reducing tendencies to over-identify with the resulting negative emotions (Munroe et al., 2022). Individuals with high levels of self-compassion may interpret adverse events as less catastrophic, which may facilitate their coping with trauma and PTG (Allen & Leary, 2010). Self-compassionate perspectives for negative life events may also influence perspectives on pain (Braehler & Neff, 2020). Scoglio et al. (2018) found that PTSD symptom severity was negatively associated with self-compassion in a clinical population with severe and recurrent interpersonal traumatic experiences. Self-compassion-based intervention programs may also reduce PTSD levels (Hiraoka et al., 2015; Winders et al., 2020). Self-compassion may be a mechanism that supports people to reduce tendencies to over-identify with negative emotions related to traumatic events (Monroe et al., 2022) and may serve a buffering-protective role in mitigating against PTSD (Vettese et al., 2011). Considering the positive relationships between self-compassion and mental well-being (Zessin et al., 2015), self-compassion may contribute to PTG. Liu et al. (2021), in their study of adolescents who survived the Jiuzhaigou earthquake, found that self-compassion was negatively correlated with PTSD and positively correlated with PTG. Wong and Yeung (2017) also found that self-compassion was positively related to PTG.

In addition to self-compassion, the present study revealed that spiritual well-being also mediated the relationship between PTSD and PTG. PTG can be described as a healing process that increases hope by positively reframing events after traumatic events (Bernstein & Pfefferbaum, 2018). Therefore, when an individual has high levels of spiritual well-being, the individual is likely to have better PTG. Following the February Kahramanmaraş earthquakes in Türkiye, several studies have investigated mental health in relation to the events. Kerkez and Şanli (2024) found that spiritual well-being mediated the relationship between psychological distress and resilience among earthquake victims. Karataş and Tüccar (2024) found a significant relationship between post-earthquake trauma levels and spiritual well-being, highlighting the potential of including spiritual support in disaster management and mental health interventions. Similarly, İme (2024) found that spiritual well-being mediated the relationship between social support and resilience in earthquake survivors. Karaağaç et al. (2024) found that hope and psychological resilience had a therapeutic effect on earthquake survivors in reducing obsession with death in their study of post-earthquake survivors in Turkey. These studies resonate with the current research findings. Given these studies, spirituality may help transform negative perspectives related to traumatic life events, such as earthquakes, in more positive directions.

Spiritual well-being may act as a mechanism that promotes PTG. Prior studies have suggested that spiritual well-being positively affects PTG (Feng et al., 2024; Gesselman et al., 2017; Sinclair et al., 2016). Individuals may be both weakened and strengthened by the traumas they experience. They may develop greater appreciation for what they have, becoming more grateful for life in the present moment and showing more compassion (Shaw et al., 2005). In the aftermath of stressful events, individuals are often confronted with forces of change, and maintaining life "as is" may become challenging. Individuals may engage in meaning-making activities that involve the negotiation of existential and spiritual issues that enable the construction of new and challenging life narratives (Bray, 2010). Jung and Han (2023) found that individuals who had experienced an earthquake accepted the earthquake as an inevitable fate. Therefore, they accepted that even surviving was a great opportunity, and they experienced gratitude for their lives. Thus, surviving negative experiences may be considered as opportunities to continue living and potentially thriving, and being grateful for what one has in the flow of life may help to promote healing after trauma.

Studies conducted after earthquakes have examined the relationships between PTSD and PTG (Andrades et al., 2020; Beaglehole et al., 2022; Seo & Lee, 2020). However, the present literature lacks information regarding potential mechanisms involved in the association between PTSD and PTG. The present findings help to fill this gap in the literature by showing that self-compassion and spirituality are two

potential mediators of the association between PTSD and PTG. After understanding possible mechanisms underlying associations between PTSD and PTG, healthcare providers or related stakeholders may help promote PTG for earthquake survivors. Specifically, programs aimed at enhancing self-compassion and spirituality could be designed for this population to facilitate PTG.

Study limitations exist. First, only adults were included in the present study. Therefore, determining PTG levels in different populations and investigating underlying phenomena in adults may help to identify the needs of adults surviving natural disasters and to create adaptive intervention programs in this area (Amiri et al., 2021). Second, this cross-sectional study was conducted with survivors one year after the earthquake. Therefore, longitudinal studies should be conducted to examine the long-term effects of earthquakes on individuals over time. Given the cross-sectional study design, no causality can be inferred. Third, possible biases exist in the present data because self-reports were used for data collection. Therefore, social desirability and/or recall biases cannot be eliminated. Fourth, one self-report measure (i.e., affective subscale in the Post-Earthquake Trauma Scale) had relatively low internal consistency ($\alpha = 0.61$). However, the low internal consistency may be due to the few items in the subscale as fewer items may result in lower internal consistency. In the original scale, the Cronbach α of the affective subscale was 0.61 (Tanhan & Kayri, 2013). This measure's relatively low internal consistency is in the low acceptable range, comparable to that in the original scale (Tanhan & Kayri, 2013). Fifth, the present study did not investigate other positive health psychology constructs (e.g., resilience, grit), which warrant investigation in the relationship between PTSD and PTG. Sixth, there is a lack of demographic analyses based on age and gender, which may reveal different experiences of trauma and PTG. Seventh, this study did not analyze specific factors that could promote trauma, and these could impact outcomes. Factors such as the death of relatives, loss of a home, or experiences of violence could impact individuals differently. In future studies, serial mediation effects could be examined by adding different mediation variables that may influence the models. Eighth, information relating to cultural contexts was not collected. Future studies should collect such information to facilitate comparisons across cultural contexts and jurisdictions. Additionally, omitting the harmony with nature scale of the spirituality construct may have limited gaining a greater understanding of holistic spiritual well-being in the relationship between PTSD and PTG.

Conclusions

This study aimed to investigate the factors mediating the relationship between PTSD and PTG levels in survivors one year after the earthquakes in Türkiye. Self-compassion and spirituality were identified as significant mediators in the positive relationship between PTSD and PTG and were directly related to PTG. Regarding the relatively weak positive correlation ($r = .105$, $p < .05$, CI Lower Level = 0.01, Upper Level = 0.20) found between PTSD and PTG, self-compassion and spirituality were significant mediators, demonstrating more robust direct relationships with PTG. Therefore, developing self-compassion and spiritual well-being following traumas may effectively promote PTG. We found that people were still experiencing PTSD symptoms one year after the earthquakes; therefore, it is important to help them address PTSD and increase PTG. Future studies focusing on different PTG mechanisms and investigating the effects of individual or group psychotherapy based on self-compassion and spiritual well-being may help people recover and thrive. When planning mental health interventions in regions such as Türkiye, where earthquakes are likely to re-occur, studies that increase self-compassion and spiritual well-being may play a protective and preventive role. Based on the results of the study, psychoeducational studies should be considered to reduce the adverse effects of trauma, such as PTSD, and promote PTG.

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Data availability "The original form and data of this study are available from the corresponding author upon reasonable request."

Declarations

The authors report no conflicts of interest with respect to the content of this manuscript. MNP has consulted for Opiant Therapeutics, Game Day Data, the Addiction Policy Forum, Boehringer Ingelheim and Idorsia Pharmaceuticals; has been involved in a patent application with Yale University and Novartis; received research support from Mohegan Sun Casino, Children and Screens and the Connecticut Council on Problem Gambling; participated in surveys, mailings, or telephone consultations related to drug addiction, impulse-control disorders, or other health topics; consulted for legal and gambling entities on issues related to impulse control, internet use and addictive disorders; performed grant reviews for multiple funding agencies; edited journals and journal sections; given academic lectures in grand rounds, CME events, and other clinical/scientific venues; and generated books or chapters for publishers of mental health texts. The other authors report no disclosures. The views presented in this manuscript represent those of the authors and not necessarily those of the funding agencies.

Ethics approval and Consent to participate All procedures performed in studies involving human participants were by the ethical standards

of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical approval was granted by the Gaziantep University Ethics Committee (Ethics Number: 429521).

Consent for publication Not applicable.

Informed consent Informed consent was obtained from all individual participants included in the study.

Competing interests The authors declare no conflicts of interest concerning the research, authorship, and/or publication of this article.

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