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Original Research Article

Resilience, Trauma Cognitions, PTSD and Psychological Well-Being in Survivors of the February 6 Earthquakes in Türkiye: A SEM Analysis

SAGE Open
Vol. 16(4): 1–17
© The Author(s) 2026
DOI: 10.1177/21582440261491430
journals.sagepub.com/home/sgo
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Abstract

This study examined the direct and indirect effects of psychological resilience, posttraumatic cognitions, and PTSD symptoms on psychological well-being among adults affected by the 2023 earthquakes in Türkiye. Data from scales measuring psychological resilience, post-traumatic cognitive processes, PTSD symptoms, and psychological well-being were collected from a total of 2,415 earthquake-affected participants. Structural equation modeling was used to test the hypothesized relationships. The model demonstrated acceptable fit (RMSEA = .057, 90% CI [.056, .057]; SRMR = .064) and explained 49% of the variance in psychological well-being. All path coefficients were statistically significant. Psychological resilience is significantly associated with psychological well-being both directly and indirectly through reduced post-traumatic cognitions and PTSD symptoms. Posttraumatic cognitions positively predicted PTSD symptoms, which in turn negatively predicted psychological well-being. These findings highlight the protective role of psychological resilience in posttraumatic adjustment. Intervention programs should incorporate strategies that target both cognitive restructuring and resilience enhancement to promote well-being among trauma survivors.

Plain Language Summary

The earthquake that struck southern Türkiye on February 6, 2023 caused significant material damage as well as numerous casualties and suffering. Many survivors continue to struggle with fear, grief, and stress. This study examines how earthquakes affect the well-being of those who experience them, specifically focusing on resilience, post-traumatic negative thoughts, and symptoms of post-traumatic stress disorder (PTSD). A total of 2,415 adults affected by the earthquakes participated in the study. Participants completed questionnaires about their resilience, trauma-related thoughts, PTSD symptoms, and overall mental health. Findings indicate that resilience plays a crucial role in recovery. Individuals with higher resilience exhibited fewer PTSD symptoms and were found to be in better mental health. Resilience was found to directly support well-being, reduce negative thoughts related to trauma, and alleviate PTSD symptoms. In addition, it was determined that those who had more negative thoughts about themselves, others, or the world were more likely to develop PTSD. PTSD symptoms were found to make it difficult to feel good and be hopeful. In conclusion, this study showed that resilience can protect survivors from severe stress and help improve mental health after a disaster. It was found that nearly half of the differences in well-being among participants could be explained by resilience, negative thoughts, and PTSD symptoms. These results suggest that supporting earthquake survivors in developing resilience and coping with negative

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thoughts related to trauma may reduce PTSD risk and promote recovery. Mental health care, social support, and community strength are crucial for recovery after such a devastating disaster.

Keywords
Psychological well-being, resilience, trauma, cognition, earthquake, structural equation modeling

Received: 30 October 2025; Revised: 9 July 2026; Accepted: 7 September 2026

Introduction

Driven by the desire to achieve a better life, individuals invest in various situations that involve both material and spiritual aspects. According to the theory known as the Conservation of Resources Theory (COR-Theory), these behaviors are a biological process with an evolutionary basis that serves the individual's survival. According to the theory, every individual is motivated to acquire, protect, and develop the things they value (resources) (Holmgreen et al., 2017). According to COR-Theory, primary resources such as shelter, secondary resources such as family and friendships, and tertiary resources such as personal success and social status help the individual adapt, survive, and cope with stress. Especially in the case of major traumas such as natural disasters, the loss of resources has a greater impact than the acquisition of resources. (Hobfoll & Lilly, 1993). Research indicates that the loss of resources is the strongest predictor of stress in natural disaster traumas (Blaze & Shwalb, 2009). In this regard, the February 6th Earthquakes resulted in very serious and lasting losses across all types of resources for the earthquake victims.

Following traumatic life events, the deterioration of our mental health is one of the primary consequences. Indeed, studies in the trauma literature frequently focus on the negative consequences of trauma on mental health. In their study examining the long-term effects of disasters on mental health, Dückers et al. (2026) found that the primary effects of trauma are depression, anxiety, and PTSD. In experimental interventions conducted after trauma, researchers have also primarily focused on mental health disorders such as PTSD (Leithner et al. 2026), depression (Lenz & Hunnicutt Hollenbaugh, 2026), and psychosis (O'Connell, Lim & Bendall, 2026). While impaired mental health is a primary consequence of trauma, it can also harm an individual's overall well-being in the long term. It has been observed that individuals heavily affected by the 2001 World Trade Center attacks continued to experience poor psychological well-being one year after the attack, despite having physically recovered (Adams & Boscarino, 2005).

According to Ryff (1989), psychological well-being is a construct comprising six dimensions. The ability to feel good while being aware of one's limitations (self-acceptance), the ability to establish and maintain warm, trusting interpersonal relationships (positive relationships with others), the ability to create an environment for oneself in line with personal needs and desires (environmental mastery), maintaining a sense of personal control and personal authority while preserving one's individuality within a broad social context (autonomy), the effort to find meaning in personal endeavors and the challenges one faces (life purpose), and, finally, the individual's ability to make the most of their own talents and capacities (personal growth). Success in all these areas collectively ensures that the individual has meaningful goals, grows and develops as a person, and is able to form meaningful relationships with others (Keyes et al., 2002). Within the normal course of life, these developmental processes are generally achieved, and individuals are able to maintain their health—both physically and psychologically.

However, our lives can sometimes go through difficult periods caused by various stressors, such as natural disasters, economic hardships, and wars. Hoeboer et al. (2025) suggests that nine out of 10 people have experienced a traumatic life event at least once in their lifetime. While acute or chronic stressors encountered in some of these experiences cause posttraumatic stress disorder (PTSD) or other psychopathologies, most individuals are more successful in coping with such traumatic life events. Parsons et al. (2016) explain this difference with the information-processing model of psychological resilience, which determines how individuals perceive the challenging life events they encounter and their responses to these situations. According to this model, psychological resilience is not a single personality trait, but is evaluated as the dynamic interaction of situation-appropriate cognitive strategies. This model emphasizes the importance of cognitive processes in the flexible application of cognitive processing related to the current situation (e.g., an earthquake). In the model called the mapping system, the individual evaluates the appropriateness of behaviors manifested through cognitive processes and, for behaviors that are not appropriate for the purpose, demonstrates flexibility in the cognitive processing process to develop responses that are more appropriate to the situation and purpose. According to Ehlers and Clark (2000), this situation is actually related to the perception of an event that occurred and ended in the past as a current threat due to disturbances in cognitive processes. In a sense, after a traumatic event, individuals become detached from reality; memories of the traumatic event cannot be recalled in a logical sequence and continue to be interpreted as a current threat. Lee et al. (2014) found in their

research on firefighters that perceived stress mediates the relationship between PTSD and traumatic stress. Individual resilience was also found to be a key determinant of mediation in whether or not this effect was observed. Based on the relevant research, we argue that trauma-related cognitions and PTSD are effective in determining the impact of psychological resilience on well-being, which reflects individuals' general psychological state (Figure 1).

Our research model aims to examine the psychological well-being of earthquake survivors by revealing the cognitive assessments of adults who experienced the traumatic event of the 2023 earthquake and the effect of these cognitions on the occurrence of PTSD symptoms. The direct effect of psychological resilience has also been examined within this model.

According to the APA (2025) psychological resilience is defined as an individual's cognitive, emotional, and behavioral adaptation and coping skills. Psychological resilience is a complex concept consisting of biological and psychological factors that provide protection against PTSD (Hoge et al., 2007). Psychological resilience serves as a critical resource for successful readjustment to normal life after traumatic experiences that increase the level of stress for the individuals (Horn et al., 2016). Psychological resilience is an important protective factor for mental health in children, adolescents (Arslan & Balkıs, 2016; Fincham et al., 2009; Srivastava et al., 2024), and adults (Thompson et al., 2018). Moreover, it is effective in different traumatic experiences such as abuse (Wrenn et al., 2011), motor vehicle accidents (Nishi & Kim, 2010), and earthquakes (First, 2024). There is a negative correlation between psychological resilience and PTSD (Blanc et al., 2016), it is also a protective factor against the long-term effects of trauma (Rossi et al., 2020). In a study conducted with adults immediately after the 2023 Kahramanmaraş earthquake, it was concluded that those with high psychological resilience indicated fewer PTSD symptoms (Yıldız et al., 2024). Another research result reveals that psychological resilience is an effective factor in protecting individuals' mental health both in the short term and in the long term. Psychological resilience, which includes both biological (Cathomas et al., 2019) and early environmental factors (Masten et al., 2024), functions as a critical protective resource in mental health problems. Psychological resilience and a positive thinking style after a traumatic event support psychological well-being, known as post-traumatic growth, while negative thoughts such as rumination and depressive rumination are associated with PTSD (Wu et al., 2015). According to Kukihara et al. (2014), psychological resilience is the most significant protective factor for PTSD after trauma. Within the scope of this study, individuals' psychological resilience was first examined in terms of its direct effect on their psychological well-being (Hyp.1) and trauma cognitions (Hyp.2). Additionally, the effects of psychological resilience on psychological well-being through trauma cognitions and PTSD (Hyp. 5) were examined.

Cognitive Behavioral Therapies (CBT), which are among evidence-based therapies, suggest that cognitions are one of the important determinants of an individual's mental health and consider them as an effective factor in individuals' psychological resilience. Research shows that there is a negative relationship between cognitive distortions and psychological resilience (Sapmaz, 2023; Çelikkaleli & Kaya, 2016). Cognitions containing negative evaluations of trauma also act as a mediating variable in the relationship between psychological resilience and PTSD (Zang et al., 2017). On the other hand, there are studies suggesting a positive correlation between cognitive distortions and PTSD (Barton et al., 2013; Ehlers et al., 2003; Ma et al., 2011). Based on these relationships between PTSD and cognitions, Robinaugh et al. (2011) stated that cognitive distortions related to trauma complicate the healing process of PTSD and are an important variable that should be addressed in treatments. Experimental studies on this subject reveal that changes in cognitive structure bring about changes in symptoms (LoSavio et al., 2017). Studies indicate that psychological resilience may cause cognitive differences in the evaluation of challenging life events (Moore et al., 2008; Tugade & Fredrickson, 2004). According to Parsons et al. (2016), a well-

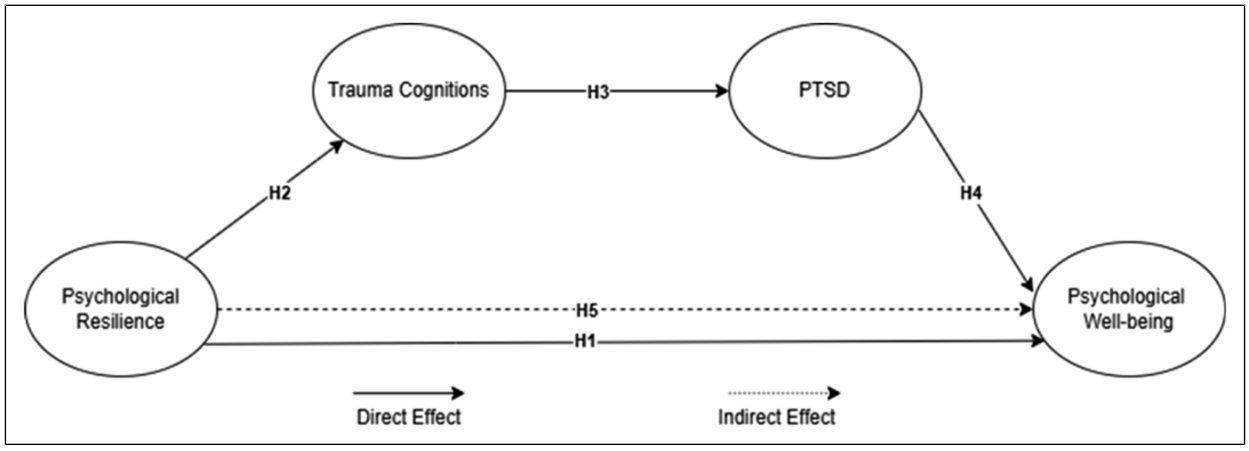


Figure 1. Basic research model

functioning mapping system protects mental health by increasing individuals' resilience to difficult life events. One of the most critical risk factors for PTSD is maladaptive cognitive structures that emerge in response to a traumatic event such as an earthquake (Bryant & Guthrie, 2007). In line with this, our study examined the direct effect of individuals' cognitive structures on PTSD following challenging life events such as trauma (Hyp. 3).

In particular, major traumatic experiences such as earthquakes can affect not only the mental health of individuals but also their general well-being with different difficulties such as loss of life and property, difficult living conditions in temporary settlements such as tent cities, and unemployment and relocation (Wang et al., 2000.) As a matter of fact, when relevant studies were examined, it was found that the improvement in PTSD symptoms of participants in PTSD treatment based on group therapy increased their psychological well-being and PTSD was a significant determinant of psychological well-being (Berle et al., 2018). In a group study conducted with refugee women, a decrease in PTSD symptoms and an increase in psychological well-being were observed in the experimental group (Ali, 2020). In the 2023 earthquake study, a negative significant relationship was found between PTSD symptoms and psychological well-being (Aka, 2024). At this point, there are studies in the relevant literature that show that there is a relationship between psychological resilience and psychological well-being and that resilience is a significant predictor of psychological well-being (Karacaoğlu & Köktaş, 2016; Pidgeon & Keye, 2014; Souri & Hasanirad, 2011). Well-being, which has dimensions such as self-acceptance, positive relationships with others, environmental mastery, autonomy, life purpose, and personal growth (Keyes et al., 2002), is expected to deteriorate after an event that affects all areas of life, such as an earthquake. In this context, our study examined the direct effect of PTSD on psychological well-being (Hyp. 4).

Current Study

On February 6, 2023, Türkiye experienced an earthquake disaster centered in the city of Kahramanmaraş with two major earthquakes of Mw 7.7 and Mw 7.6 and thousands of aftershocks, directly affecting 11 cities. These earthquakes caused the death of approximately 50,000 people and 115,000 people were injured.

The February 6 Kahramanmaraş earthquake caused extremely significant damage in physical (ITU, 2023; Kocaman, 2023), economic, health, education (Marangoz, Özkoç & İzci, 2023), and social and cultural areas. As a result of these effects, the negative psychological impacts of the earthquake on individuals increased. For example, while higher acute stress symptoms were observed in those who experienced amputation as a result of earthquake-related trauma (Özmen et al., 2024), a study conducted immediately after the earthquake found that 68.6% of participants exhibited PTSD symptoms (Yıldız et al., 2024). Taskin et al. (2025) found that earthquake survivors exhibited significant PTSD symptoms in a study conducted 12 months after the earthquake with 624 participants aged 17-66. It was observed that the rate of PTSD symptoms was higher among those who had suffered a close loss, whose homes were completely destroyed, who lost their jobs, who had no income, who felt alienated in the area where they lived, who moved after the earthquake, and who were married (Taskin et al., 2025). The February 6 earthquakes not only led to a deterioration in individuals' mental health but also had negative consequences on quality of life (Bostan & Demirtaş, 2025) and psychological well-being (Kurşun & Zubaroglu Ioannides, 2026).

In this context, it is important to understand how the psychological resilience that individuals possessed prior to the earthquake is shaped by the traumatic effects of the earthquake and to examine how this affects their psychological well-being. Within the framework of all this information, the main purpose of this study is to examine the factors affecting the psychological well-being of earthquake survivors within the framework of the literature. Thus, it is aimed to understand the development of PTSD in earthquake survivors and to ensure a resource for psycho-social interventions to be made to strengthen individuals' psychological well-being. The proposed model in current study suggests that psychological resilience will affect the development of PTSD through trauma cognitions and PTSD will in turn affect psychological well-being. In other words, psychological resilience is to explains psychological well-being through trauma cognitions and posttraumatic stress disorder. Within the framework of this main purpose, the research hypotheses (Hyp.) are as follows:

Hyp. 1. Psychological resilience predicts psychological well-being.
Hyp. 2. Psychological resilience predicts trauma cognitions.
Hyp. 3. Trauma cognitions predict PTSD.
Hyp. 4. PTSD predicts psychological well-being.
Hyp. 5. Psychological resilience predicts psychological well-being through trauma cognitions and PTSD.

Method

Research Design

The February 6 earthquakes affected millions of people in 11 different provinces in Türkiye. Most of the earthquake victims relocated to different cities after the disaster, and these relocations continued for a long time. In such a chaotic environment, it was logistically and economically impossible to reach the victims again to conduct longitudinal measurements. For these reasons, it was determined that using a cross-sectional approach to examine the direct and indirect relationships between earthquake survivors' psychological resilience, PTSD symptoms, perceptions of trauma, and psychological well-being—in line with the study's objectives—was the most appropriate and pragmatic strategy. The cross-sectional method allows for the simultaneous measurement of multiple psychological constructs within a specific time frame without exposing individuals who have experienced severe trauma to the risks of attrition associated with longitudinal designs (Malhotra, 2019; Tabachnick & Fidell, 2019). For all these reasons, our research design is a cross-sectional correlational study.

Within the scope of this study, the cross-sectional correlational method—which involves the simultaneous examination of research variables whose relationships are being investigated—also contributes to presenting a comprehensive picture of the post-disaster psychological status of earthquake survivors. By revealing how more fundamental psychological constructs (resilience) interact with cognitive assessments (trauma cognitions) and clinical symptoms (PTSD), this method allows us to explain the overall variance in positive mental health outcomes (psychological well-being) during the chronic phase of the disaster. The model examines the complex relationships chain in which multiple mediating variables interact to influence the dependent variable and accounts for measurement errors to obtain more reliable results (Hair et al., 2019).

Participants and Procedure

The target population of this study consisted of adult earthquake survivors who directly experienced the catastrophic February 6, 2023 earthquakes in Türkiye. Data collection was executed one year after the disaster, between February and March 2024, utilizing a hybrid quantitative approach that combined in-person field surveys and online questionnaires.

Due to the catastrophic scale, massive geographical displacement, and complex post-disaster logistics within the affected region, a systematic cluster sampling strategy was meticulously deployed to ensure empirical rigor and population representativeness (Cochran, 1977; Sekaran & Bougie, 2016). To ensure that our sample closely represents the actual disaster-affected population, we focused our data collection on the five provinces most severely impacted by the earthquakes. Instead of gathering data randomly, we proportioned our sample according to the total affected population of each of these five provinces.

Based on this proportional distribution, field researchers visited officially designated temporary housing settlements—specifically temporary container cities—within these provinces. Data were collected on a voluntary basis from adult survivors living in these centers. By using this systematic approach, we ensured that the regional distribution of our 2,415 participants accurately mirrors the real-world weight and population density of the most affected disaster zones, significantly increasing the representativeness of the study.

Field research teams directly visited these systematically identified container clusters. Within each selected cluster, an all-inclusive recruitment approach was attempted by inviting every accessible adult survivor who met the inclusion criteria (being an adult aged 18 or above and having directly experienced the February 6 earthquakes) to participate in the study. This cluster-based field implementation successfully minimized selection bias and guaranteed that vulnerable or displaced populations who might otherwise be difficult to reach were comprehensively represented in the final macro-cohort ($N = 2,415$).

To ensure the empirical integrity of the study, the vast majority of the data ($N = 2,415$) was gathered in person via paper-and-pencil formats within temporary container cities and psychosocial coordination zones. However, a specific subsample of 276 individuals from Hatay Province was recruited via a secure online platform. This localized digital adaptation was strictly necessitated by administrative and security restrictions, as management officials in certain temporary housing centers within Hatay did not grant permission for physical field research during that period. Rather than introducing bias, this strategic online recruitment was intentionally utilized to counterbalance the regional distribution, ensuring that Hatay—one of the most severely impacted areas—was adequately represented in the final macro-pool without systematically excluding its displaced population.

The final sample size for our study reached an extremely robust cohort level of $N = 2,415$ participants. Given the considerable size of this sample—which significantly exceeded the most stringent guidelines for sample size in Structural Equation Modeling (SEM) and complex mediation pathways—an *a priori* power analysis was not deemed necessary. Our final sample size met the widely accepted general rule that there should be at least 10 to 15 participants per parameter to be

estimated (Kline, 2016) and satisfied the $N > 500$ threshold required to eliminate parameter estimation biases in multivariate analyses and ensure nearly perfect statistical power (1 - β >. 99) (Hair et al., 2019; Tabachnick & Fidell, 2019).

To ensure representativeness of our sample relative to the population (all earthquake victims affected by the February 6 earthquake), participants were carefully selected from the five most severely affected provinces identified by official disaster management authorities: Gaziantep ($n = 774$, 32%), Hatay ($n = 564$, 23%), Kahramanmaraş ($n = 369$, 15%), Malatya ($n = 439$, 18%), and Adıyaman ($n = 273$, 11%). In addition, a total of 14 million people in 11 provinces of Türkiye were affected by the earthquake. This population can be estimated based on a sample of 385 people, with a 95% confidence level and a margin of error of .05.

The general demographic structure of our research sample reflects the overall characteristics of the population in the earthquake-affected region. The gender distribution of the participants is 64% female ($n = 1,541$) and 36% male ($n = 869$). Furthermore, to prevent typical sampling errors in trauma studies, the study sample is capable of representing significant outcomes related to the disaster (such as the loss of a close relative, permanent limb loss, material losses like the destruction of one's home, etc.). 16% of our sample ($n = 389$) sustained direct injuries, 2% ($n = 41$) experienced limb loss, and 21% ($n = 504$) suffered the tragic loss of first-degree family members. In addition, 20% ($n = 479$) reported significant property damage (loss of home). Institutional review board approval was granted by XXXX University Commitee on Research and Publication Ethics in the Social and Humanities Sciences (Approval No:XXXXXX) and informed consent was obtained from all participants.

The prerequisite for participating in the research was to have experienced the earthquake and to still be living in the earthquake zone. Participants were included in the research process according to criteria determined by the criterion sampling method. Demographic data on the participants are shown in Table 1.

Table 1 presents the findings of a comprehensive survey conducted with 2,415 people in the earthquake zone. The highest rate of participation in the study was observed in Gaziantep (32%), with women constituting the majority of the study group (64%). With respect to educational attainment, the proportion of respondents who had completed high school was found to be the highest at 31%. The data indicated an even distribution of educational levels across the sample. The age range of participants is between 18 and 81. The mean participant age was found to be 38.22 years, with a standard deviation of 10.89 years.

With regard to the physical health consequences of the earthquake, 16% of participants reported injuries, and 2% reported amputations. The situation is further compounded by the loss of loved ones, with 21% of participants having lost family members and 17% having lost friends. This indicates that approximately half of the total population (48%) has experienced

Table 1. Study group

	Variable	f	%
Province	Adiyaman	273	%11
	Gaziantep	774	%32
	Kahramanmaras	369	%15
	Hatay	564	%23
	Malatya	439	%18
Gender	Male	869	%36
	Female	1541	%64
Education	Primary school	608	%25
	Secondary school	476	%20
	Highschool	740	%31
	College	557	%23
Earthquake-related morbidity	Injury	389	%16
	Amputation	41	%2
	Other	45	%2
Loss of loved ones	Family	504	%21
	Friends	418	%17
	Other	239	%10
Property damage	Home	479	%20
	Car	43	%2
	Other	182	%8
Social support	High	1668	%69
	Moderate	627	%26
	Low	72	%3

the loss of a loved one. An analysis of material losses revealed that the loss of homes accounted for the most significant material damage, amounting to 20% of the total. In contrast, the loss of vehicles was comparatively low, accounting for a mere 2% of the total material damage.

A further finding of the study is that the perception of social support is relatively high. The majority of participants (69%) reported perceiving a high level of social support, while only a minority (3%) reported feeling a low level of social support. The data indicates that participants have good social support resources.

Measurement Tools

Four different measurement tools were used. For each measurement tool, the validity and reliability information about the development process is summarized below. Demographic information about the participants was obtained using the Personal Information Form developed by the researchers.

Personal Information Form

A researcher-developed questionnaire was used to collect sociodemographic characteristics (province, age, gender, and educational level) and earthquake-related experiences, including physical injury, loss of loved ones, property damage, and perceived social support.

Posttraumatic Cognitions Scale (PTCS)

Originally developed by Foa et al. (1999), the Turkish adaptation was conducted by Yağcı-Yetkiner (2010). The adapted version consists of 36 items across two subscales: Negative Cognitions about Self (26 items) and Negative Cognitions about the World (10 items). Higher scores reflect more intense negative posttraumatic cognitions. The adaptation study reported excellent internal consistency ($\alpha = .95$). In the present study, Cronbach's alpha was .95. Here is a sample item for the PTCS, which is answered on a seven-point Likert scale: Item 23. *I feel isolated and set apart from others*.

Impact of Events Scale-Revised (IES-R)

Developed by Weiss and Marmar (1997) to assess posttraumatic stress symptoms, the Turkish adaptation was conducted by Çorapçıoğlu et al. (2006). The scale comprises 22 items across three subscales (avoidance, hyperarousal, and intrusion) rated on a 5-point scale (0 = not at all to 4 = extremely). Total scores range from 0 to 88, with higher scores indicating greater traumatic stress. The adaptation study reported strong internal consistency ($\alpha = .94$). In the present study, Cronbach's alpha was .94. Here is a sample item for the IES-R, which is answered on a five-point Likert scale: Item 11. *I tried not to think about it.*

Psychological Well-Being Scale (PWBS)

Developed by Diener et al. (2010) to measure socio-psychological flourishing, the Turkish adaptation was conducted by Telef (2013). This unidimensional 8-item scale uses a 7-point Likert format, with total scores ranging from 8 to 56. Higher scores indicate greater psychological well-being. The adaptation study demonstrated adequate internal consistency ($\alpha = .80$). In the present study, Cronbach's alpha was .90. Here is a sample item for the PWBS, which is answered on a seven-point Likert scale: Item 1. *I lead a purposeful and meaningful life*.

Adult Psychological Resilience Scale (APRS)

Developed by Arslan (2015) based on the Child and Youth Resilience Scale, this 21-item measure uses a 5-point Likert format (1 = does not describe me at all to 5 = completely describes me). The scale comprises four subscales: relational, individual, familial, and cultural-contextual resources. Higher scores indicate greater psychological resilience. The original study reported excellent internal consistency ($\alpha = .94$). In the present study, Cronbach's alpha was .94. Here is a sample item for the APRS, which is answered on a five-point Likert scale: Item 16. *I am aware of my strengths.*

Model Specification

As explained in the literature above, there are studies related to impact of events, posttraumatic cognitions, psychological well-being and resilience. Thus, in current study, specified structural equation model is used for explaining the causal relationships between the variables explained earlier. The model presumes that resilience (resil) has direct effect on both posttraumatic cognitions (cog) and well-being (well); posttraumatic cognitions (cog) have direct effect on impact of events (trau); impact of events (trau) has direct effect on well-being (well).

Statistical analysis

Responses from 2,415 participants were included in the analyses, and the missing data was examined. Missing data was considered negligible. The CFA's findings, as demonstrated in the "measurement tools" section, validated the scales' structure. Due to its very high item count (36 items), we only employed item parceling when performing analysis on one scale. Since there are not so many items in other scales, there is no need for item parceling. A parcel is the average or sum of scores for a group of similar items, each of which has a Likert scale. Since the mean will be in the same metric as the original items, Little (2013) advises utilizing it rather than the total score. We utilized mean scores for each parcel as a result. Additionally, three parcels were used to represent the scale in accordance with Matsunaga's (2008) guidelines.

Two-step SEM was then carried out in accordance with Anderson and Gerbing's (1988) and Kline's (2016) recommendations. Testing of the measurement model comes first in the two-step SEM, and testing of the structural model developed using the theoretical framework comes second. The statistical causal-effect relationships in the structural model are exposed through paths. Additionally, the model's fit indices and paths' significance are investigated. In accordance with Worthington and Whittaker's (2006) recommendation, the following SEM fit indices have been reported: (a) the chi-square with associated degrees of freedom, (b) the RMSEA with 90% CI, (c) the SRMR, (d) the CFI, and (e) the TLI. To assess the structure's quality of fit, the following thresholds are used: $0.85 \leq CFI \leq 1.00$; $0.85 \leq TLI \leq 1.00$; $00 \leq RMSEA \leq .08$; $00 \leq SRMR \leq .10$ (Browne & Cudeck, 1993; Hu & Bentler, 1999; Kline, 2016). Although CFI and TLI values between 0.85 and 0.90 fall below the conventional threshold of 0.90 (Hu & Bentler, 1999), several scholars (e.g. Marsh et al., 2004) have expressed reservations about the use of rigid cut-off criteria. Fit indices must be interpreted in context, taking into account model complexity, sample size and theoretical basis. The present study revealed that the model demonstrates an acceptable fit based on other indicators (e.g. RMSEA and SRMR are within the acceptable range), and the hypothesised structure is theoretically sound and parsimonious. Therefore, in light of these broader evaluation criteria, CFI and TLI values in the 0.85–0.90 range are considered acceptable.

In addition to model fit values, regression weight estimates for each path and standardized effects are reported. These reports indicate the statistical significance, direction, and size of the effects of each latent variable specified in the model. Data analysis was conducted using IBM AMOS v23 and IBM SPSS v23 softwares.

Results

The results pertaining to the measurement model, the structural model, and the descriptive statistics of the model variables will be presented under three headings.

Descriptive Statistics of the Model Variables

Table 2 displays the variables' descriptive statistics. Multivariate normality, or multi-normality, is assumed for continuous outcome variables in the ML estimation method. This indicates that every single univariate distribution is normal. "Severely" skewed variables are defined as having a |skew index| > 3.0, and "severe" kurtosis is defined as having a |kurtosis index| > 8.0 (Kline, 2016).

The model's variables have skewness values ranging from -1.12 to 0.46 and kurtosis values ranging from -0.63 to 1.53. These results reveal that normality is maintained. Additionally, Pearson correlation coefficients between the variables were calculated. All of the variables in the structural model were found to have a statistically significant association ($p < .01$) when the correlation coefficients were analyzed.

Table 2. Descriptive statistics

Variables	Min-Max	Mean	Sd	Skewness	Kurtosis	Correlations		
						Posttraumatic cognitions	Impact of events	Well-being
Resilience	21-105	83.8	16.23	-1.12	1.53	-.19**	-.03	.64**
Posttraumatic cognitions	3-21	8.99	3.46	0.46	-0.003		.57**	-.23**
Impact of events	0-88	36.61	19.43	0.21	-0.63			-.08**
Well-being	8-56	40.44	11.36	-0.80	0.13			

n=2415; **p<.01.

Measurement Model

Each of the four unobserved variables in the measurement model—impact of events, posttraumatic cognitions, psychological well-being, and resilience—is represented by an observable variable. Three item parcels represent the posttraumatic cognitions, and three of these variables are represented by items. The CFA results ($\chi 2$=11840.14, df=1369, p<.01; SRMR=0.054; RMSEA=0.056 [90%CI:0.055-0.057]; CFI=0.86; TLI=0.85) validated the measurement model's structure. The structural model was then examined.

Structural Model

The structural model (Figure 2) includes unobserved endogenous factors (well-being, impact of events, and posttraumatic cognitions), unobserved exogenous variable (resilience), and observed endogenous variables (items and item parcels).

The model suggests that psychological resilience directly negatively affects post-traumatic cognitions, while traumatic cognitions increase the impact of traumatic events, which in turn negatively affects psychological well-being. Furthermore, psychological resilience positively affects psychological well-being both directly and indirectly.

SRMR=0.064; RMSEA=0.057 [90%CI:0.056-0.057]; CFI=0.86; TLI=0.85); $\chi 2$=11960.49, df=1371, p<.01; demonstrates that the model's fit indices were good and the model confirmed. Although the model's CFI value remained slightly below traditional cutoff points (0.86), the fact that the RMSEA and SRMR values indicate a good fit is to be expected in some cases and suggests that the model is acceptable (Lai & Green, 2016; Marsh et al., 2004). After looking at standardized regression weights (Table 3), we discovered that the data supported every path.

Table 3 presents the path coefficients and significance levels between variables in the structural equation model. The findings reveal that psychological resilience negatively affects post-traumatic cognitions, traumatic cognitions positively affect PTSD, and PTSD negatively affects psychological well-being. Table 4 shows that the total effect is equal to the sum of the direct and indirect effects.

Table 4 reveals the direct and indirect effects of psychological resilience, post-traumatic cognitions, and traumatic events on psychological well-being. The model explains 49% of psychological well-being, with psychological resilience emerging as the strongest predictor.

Resilience and impact of events explained 49% of the variance in well-being, with direct effects of.69 and -.06, respectively. Furthermore, the impact of events on well-being resulted in an indirect effect of -.03 for posttraumatic cognitions.

Posttraumatic cognitions explained 36% of the variance in the impact of events, with a direct effect of .60. Additionally, resilience had a -.16 indirect influence on the impact of events through posttraumatic cognitions.

Resilience explained 7% of the variance in posttraumatic cognitions, and it had a direct effect of -.27. It can be said that all hypotheses are accepted at this context.

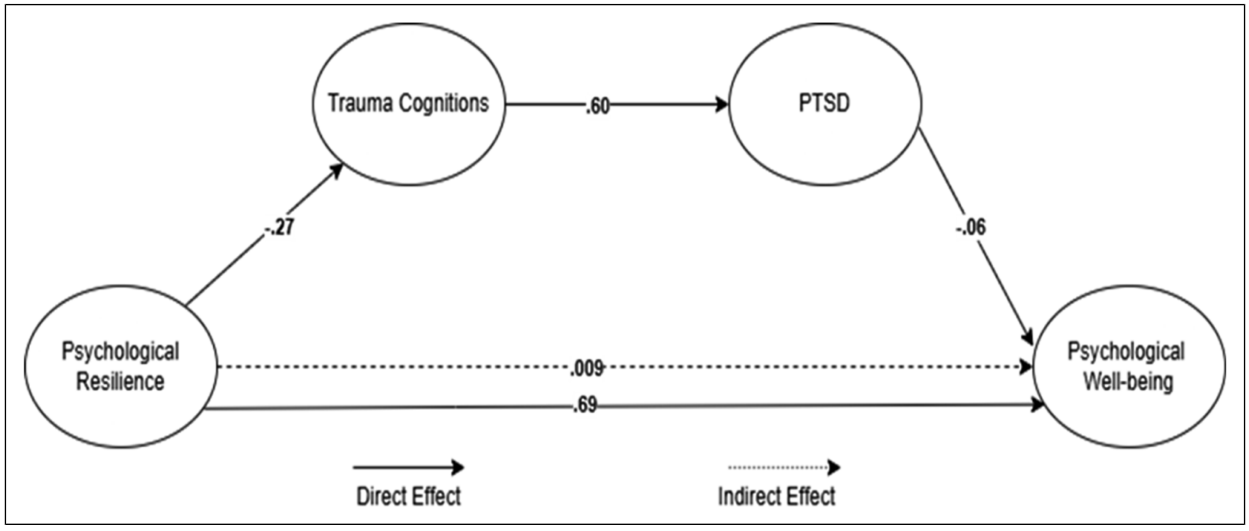


Figure 2. Structural Model

Table 3. The regression weight estimates for each path

Paths			Estimate	S.E.	C.R.	p
Resilience	→	Posttraumatic cognitions	-.389	.034	-11.395	<.001
Posttraumatic cognitions	→	Impact of events	.549	.026	21.266	<.001
Impact of events	→	Well-being	-.091	.027	-3.354	<.001
Resilience	→	Well-being	1.452	.057	25.267	<.001

Conclusion and Discussion

The aim of this study was to examine the direct and indirect effects of psychological resilience, posttraumatic cognitions and PTSD symptoms on psychological well-being in adults who experienced an earthquake. The results of the study suggested that all hypotheses were confirmed and psychological resilience determined PTSD and psychological well-being through posttraumatic cognitions.

When examining the general demographic characteristics of the group from which the data was obtained, it is observed that perceptions of social support are quite high. 69% of participants have a high perception of social support. This situation may stem from the general cultural values of the Turkish people, who value mutual aid and solidarity. Examples of mutual aid that go beyond social support alone have had positive psychological effects in the 2020 Izmir earthquake (Çalışkan & Kaya, 2021). Solidarity in Turkish culture is also evident in rituals such as weddings, funerals, and holidays. Condolence visits, made to show support for the relatives of the deceased, are a beautiful example of solidarity in Turkish society (Okur Çakıcı & Çakıcı, 2020). Although the vast majority of earthquake victims have high perceptions of social support, when the cut-off point of the Event Impact Scale is taken into account, the rate of those indicating signs of PTSD is similarly high (60.2%).

According to the findings, psychological resilience positively and moderately determines the psychological well-being of adults exposed to earthquake. Thus, the first hypothesis of the study "Psychological resilience predicts psychological well-being" was confirmed. This finding of the study is aligned with previous research the literature (Pidgeon & Keye, 2014; Souri & Hasanirad, 2011, 2011zçetin et al., 2019). Psychological well-being has a protective function for mental health in human life. It contributes significantly to coping with traumatic life events and ensuring the psychological development of the individual (Breitbart et al., 2015; Weiss et al., 2016). Psychological resilience is an individual's ability to adapt and continue his/her development in the face of negative experiences and difficulties (Arslan, 2015). Psychological resilience contributes significantly to the protection of psychological health by improving individuals' self-awareness, strengthening protective mechanisms against stressful life events, and increasing individuals' psychological well-being levels (Thomas & Revell, 2016; Üzar-Özçetin & Hiçdurmaz, 2017). Earthquakes are one of the traumatic life events that can severely disrupt individuals' mental balance and cause serious damage to their psychological well-being. Psychological resilience can mitigate the destructive effects of trauma and protect psychological well-being in earthquake-affected adults. Resilient individuals can re-establish psychological balance and maintain psychological well-being through their ability to find meaning in life, maintain positive emotions and preserve developmental potential despite the difficulties experienced after the earthquake.

Another hypothesis of the study is that psychological resilience determines trauma cognitions. Psychological resilience of adults exposed to earthquake negatively and moderately predicts trauma cognitions. Results of the research on psychological resilience and trauma cognitions in the literature are consistent with the results of the current study (Peterman Cabano, 2021). Posttraumatic cognitions refer to the negative thoughts and perceptions that a person develops after experiencing a traumatic event. These cognitions usually manifest as self-blame, perceiving the world as dangerous, and negative thoughts about the future (Foa et al., 1999). These three types of cognitive structures play a role as dysfunctional mechanisms in processing traumatic events and contribute to the persistence of posttraumatic stress symptoms (Dalgleish, 2004). When psychological

Table 4. Standardized Direct, Indirect, and Total Effects

Outcome	$R^{(2)}$	Determinant	Direct Effect	Indirect Effect	Total Effect
Well-being	.49	Resilience	.687	.009	.696
		Imp. of events	-.057	-	-.057
		T. cognitions	-	-.034	-.034
Impact of events	.36	T. cognitions	.600	-	.600
		Resilience	-	-.162	-.162
T. cognitions	.07	Resilience	-.269	-	-.269

resilience is considered as a "healing process", it is associated with less involvement in negative cognitive processes (Bonanno, 2004; Zang et al., 2017). The results indicate that psychological resilience is an indicator for adaptive beliefs and abilities that can protect the individual against negative events. Resilient individuals are less likely to hold negative beliefs about themselves or blame themselves for traumatic events, thus showing fewer posttraumatic symptoms (Peterman Cabano, 2021). Healthy cognitive functioning has a significant place in intervention programs to improve psychological resilience (Gillham et al., 2006; Shochet et al., 1997). These findings suggests that psychologically resilient individuals tend to think less negatively after traumatic experiences.

Trauma cognitions determining PTSD constitutes the third hypothesis of the study and was confirmed as a result of the analyses. Trauma-related cognitions of adults exposed to earthquakes positively and moderately predicted PTSD symptoms. This finding is in line with previous studies in the literature (Barton et al., 2013; Brown et al., 2019; Ma et al., 2011). In individuals who experience natural disasters such as earthquakes, cognitive structures play a key role in posttraumatic recovery. Negative changes in posttraumatic cognitions are strongly related to the development of PTSD in literature. In the formation of this relationship and in the chronicization of PTSD symptoms, distorted beliefs such as "the world is a completely dangerous place" and "they are completely incompetent" and "the future is …" that are formed in individuals after traumatic experiences play a central role (Foa et al., 1999; Foa & Rothbaum, 2001). For example, in addition to evaluations about traumatic events such as "A new earthquake can happen at any moment; I am no longer safe anywhere", negative evaluations about the consequences of the trauma such as "I will never be able to cope with this trauma; I will never be the same again" can be seen. Dysfunctional cognitive processing in the form of distorted appraisals is considered very important in the emergence of psychological disorders. Posttraumatic negative cognitions plays a central role in the development, persistence and treatment of PTSD. These cognitions contribute to the individual's sense of "present threat" and increase the vulnerability to develop PTSD (Hyland et al., 2015; Mills et al., 2014). As a matter of fact, one of the vital stages in CBT-based intervention processes for PTSD is aimed at recovery by intervening in cognitions related to trauma.

The fourth hypothesis of the study is that PTSD determines psychological well-being. This hypothesis, which was confirmed in the analyzes, indicates that PTSD symptoms negatively and weakly predict psychological well-being. This finding aligns with other studies in the literature (Aka, 2024; Ali, 2020; Berle et al., 2018). People with PTSD often reveal symptoms such as avoidance behaviors, hyperarousal, and re-experiencing, which negatively affect their quality of daily life and general well-being. PTSD symptoms are often associated with lower well-being and PTSD interventions can lead to improvements in both symptoms and well-being (Berle et al., 2018; Radstaak et al., 2022). Traumatic experiences can damage an individual's environmental dominance, positive relationships and autonomy (Weber et al., 2021).

In addition to direct effects, indirect effects were also examined in the study. The results obtained reveal that indirect effects between variables can explain important mechanisms. This finding of the study coincides with other studies investigating indirect effects in literature (Kaye-Tzadok & Davidson-Arad, 2016; Zang et al., 2017). The indirect effect of posttraumatic cognition on well-being is low. However, it may be crucial in terms of explaining the way cognitions affect well-being. This effect means that negative posttraumatic cognitions indirectly reduces well-being by increasing the perceived impact of traumatic events. In other words, negative thoughts and interpretations about traumatic events (e.g., "the world is a completely dangerous place" or "I am completely incompetent") exacerbate the subjective impact of these events and thus impair well-being. The indirect effect of psychological resilience on PTSD symptoms (-.16 indirect effect) highlight key implications for how the protective mechanism of psychological resilience works. Resilience mitigates the perceived impact of traumatic events by reducing the negative quality of posttraumatic cognitions (direct effect of -.27). This finding suggests that resilient individuals are able to evaluate traumatic events in a less distorted cognitive framework and, as a result, the subjective impact of the events is less negative.

Clinical Implications and Psychological Mechanisms

Our findings highlight some important clinical implications for the treatment of significant mental health problems such as PTSD in adults exposed to earthquakes. Our first finding reveals that psychological resilience acts as a protective factor for earthquake survivors, both directly and indirectly. We can conclude that intervention programs targeting PTSD should prioritize components that enhance resilience, such as adaptation skills, meaning-making processes, and support for positive self-perception. Additionally, the mediating role of post-traumatic cognitions is significant, as it involves addressing dysfunctional, distorted, and overly negative cognitive structures in trauma interventions. Cognitive structures containing negative assessments of oneself, the world, and the future intensify the personal impact of traumatic events such as earthquakes, making individuals more vulnerable to PTSD symptoms. This also reduces overall psychological well-being. This mechanism is consistent with cognitive-behavioral models that argue that distorted cognitive evaluations increase PTSD. Clinically, these findings support the use of evidence-based approaches such as trauma-focused CBT to modify dysfunctional cognitions and reduce ongoing threat perception. Furthermore, the observed link between PTSD symptoms

and reduced well-being suggests that interventions promoting social support and emotional regulation, rather than symptom-focused care interventions, accelerates post-earthquake recovery. Our findings suggest that strengthening resilience, addressing trauma-related cognitive distortions, and integrating general well-being-focused strategies collectively improves clinical outcomes for adults affected by earthquakes.

Future Studies

In the light of the findings, several suggestions can be made for future research. First, similar models can be tested in different types of trauma (such as natural disasters, violence, accidents, epidemics) to better understand the interaction mechanisms between posttraumatic cognitions, psychological resilience and well-being. However, considering that responses to trauma may be affected by cultural context, cross-cultural comparative studies will contribute to the identification of universal and culture-specific mechanisms. In addition, longitudinal studies should be conducted to examine the long-term effects of these variables in order to understand the dynamic nature of posttraumatic processes. Finally, developing and testing the effectiveness of intervention programs that increase psychological resilience and target negative posttraumatic cognitions will be a major step to support the well-being of trauma victims.

The findings of the study suggest that psychological resilience predicts PTSD and psychological well-being directly and through posttraumatic cognitions. The research contributes to understanding the complex effects of traumatic experiences (earthquake) on psychological processes. By revealing the relational dynamics of psychological resilience, posttraumatic cognitions and PTSD symptoms on psychological well-being, it offers a new perspective on posttraumatic adjustment models. The study contributes to the literature by substantial implications for intervention approaches. Instead of only increasing psychological resilience or only targeting posttraumatic cognitions, it suggests that a holistic approach should be adopted, considering that these variables interact with each other. For example, adding CBT-based interventions that support psychological well-being to physical rehabilitation practices for amputees who have lost limbs due to earthquakes will contribute to improving individuals' quality of life after amputation. Approaches that directly target negative cognitions, such as Cognitive Behavioral Therapy, indirectly improve the perceived impact of traumatic events such as amputation and ultimately enhance individuals' well-being.

Limitations

Despite its contributions, this study has several limitations. The research sample is limited to Turkish adults who have experienced an earthquake, and generalizability for different cultural contexts, types of trauma and age groups is limited. Data were collected both online and face-to-face, as the situation permitted. The fact that participants have good social support resources may be a cultural limitation. To reduce the impact of these limitations, multi-group SEM or longitudinal designs should be used for future studies.

Acknowledgements

This research was produced from the project numbered 223K166 supported by Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK). First, we would like to thank TÜBİTAK for its support to our research project. We would also like to thank the earthquake survivors who participated in our research and answered the measurement tools sincerely, the project fellows who contributed to the data collection process by personally visiting the earthquake zone, and the mental health specialists working in container cities, which are temporary settlement units, and the managers of container cities.

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Ethical Considerations

This study was conducted in strict accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The research protocol was formally reviewed and approved by the Gaziantep University Social and Human Sciences Ethics Committee (Decision Date: [18.12.2023], Reference/Approval Number: E-73628654-604.01.01-426125).

Consent to Participate

Informed consent (covering study purposes, data confidentiality, voluntary participation, and the right to withdraw) was obtained online and/or in written format from all individual participants prior to their inclusion in the study. No participant data was collected without explicit consent.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by Türkiye Bilimsel ve Teknolojik Araştırma Kurumu under project number 223K166.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The research data were uploaded to the site and the web link to the data was shared. https://tinyurl.com/3sy9kftn.

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