



Place attachment of earthquake victims residing in Antakya (Hatay) after the Kahramanmaraş earthquakes on February 6, 2023

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Abstract

People affected economically, environmentally, physically, and psychologically by the earthquake may be reluctant to move to safer and more comfortable places for various reasons. Investigating the factors that influence people's place attachment after devastating earthquakes will enable the creation of sustainable communities and cultures. This study examined the impact of earthquake experience, preparedness, place-protective behavior, social support, insecurity, price increase, the surrounding environment, self-efficacy, and risk perception on place attachment among earthquake victims in Antakya following the February 6, 2023, Kahramanmaraş earthquakes. Data were collected via surveys from 453 earthquake victims in the Antakya region of Hatay (Türkiye) province, one year after the earthquakes. Eleven ordered logistic regressions revealed the strength and direction of the factors affecting place attachment. Earthquake victims who were injured, lost relatives, were not evacuated, and were not disturbed by the rubble had higher place attachment. Earthquake preparedness, formal social support, post-earthquake insecurity, post-earthquake price increase, self-efficacy, and earthquake risk perception did not affect place attachment. Sustainability and place-protective behavior increased place attachment. Furthermore, place attachment was higher among men and those who lived longer in Antakya. This study is expected to guide managers, disaster experts, and non-governmental organizations who develop strategies to increase people's place attachment in disaster-affected regions.

Keywords Place attachment · Earthquake · Risk perception · Place-protective behavior · Earthquake experience

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1 Introduction

Place attachment refers to the emotional bonds individuals establish with their physical or emotional environment (Manzo and Devine-Wright, 2013; Ujanga and Zakariya, 2015). It is a psychological relationship individuals form with places where they choose to stay and where they feel safe and peaceful (Hernández et al. 2007). This bond shapes an individual's sense of identity and influences their behavior (Manzo and Devine-Wright, 2013). Emotional bonds with places determine many social and environmental issues, such as migration, intergroup conflicts, civic participation, social housing policies, urban transformation processes, natural resource management, and global climate change (Manzo and Perkins 2006). The place attachment of a community ensures that individuals show sensitivity to local problems, and it contributes to the well-being of the region (Manzo and Perkins 2006).

Disasters negatively affect people's attachment to the region they live in (Zheng et al. 2019). They can force people to migrate because they destroy the physical environment and social order (Huang et al 2023). Disaster-related displacement causes anxiety and distress (Siver and Grek-Martin, 2015). It can lead to behavioral disorders, illness, stress, learning disabilities, academic failure, problems with social relationships, and cultural disruption, especially in children and adolescents (Scannell et al. 2016). After displacement due to a disaster, people prefer to return to their previous places. For example, 70% of those who migrated after the 2010 Haiti earthquake returned due to place attachment, social relations, and inadequate temporary living spaces (World Bank, 2014). Similarly, more than half of the individuals displaced after the 2015 Nepal earthquake returned within eighteen months (International Organization for Migration, 2015).

Place attachment increases people's trust in government organizations and community organizations, and people with high place attachment have higher social satisfaction (Ma et al. 2022). It enhances social benefits, individual quality of life, personal identity, and sense of trust (Swapan and Sadeque 2021). High place attachment increases people's neighborly relationships and social cooperation (Depari and Lindell 2023). It encourages people's participation in community-based disaster management efforts (Peng et al. 2020) and increases disaster preparedness (Xu et al. 2018). Individuals with high place attachment appear to be more resilient and adaptable to post-disaster risks (Qing et al. 2022). Particularly in disaster-prone areas, it makes significant contributions to both the preservation of cultural heritage and ensuring sustainability (Misra et al., 2010). Place attachment leads people to accept risks in their local area (Domingues et al. 2021) and leads them to continue living in high-seismic risk areas (Chen 2020).

Social, economic, cultural, and environmental factors that influence community place attachment should also be considered in the post-disaster reconstruction process (Alkan and Özgen 2025). To better prepare for disasters and facilitate post-disaster reconstruction efforts, disaster risk reduction policies should include people's thoughts and feelings about their place (Anacio et al. 2016). Understanding place attachment allows individuals, households, and communities to better prepare for disasters and recover more quickly following disasters (Stancu et al. 2020).

This study aims to identify the factors affecting place attachment among earthquake victims residing in the Antakya region of Hatay Province, one year after the February 2023 earthquakes in Türkiye. Ordinal logistic regression analyses will reveal whether earthquake experience, preparedness, place-protective behavior, social support, post-earthquake inse-

curity, post-earthquake price increase, the surrounding environment, self-efficacy, and earthquake risk perception are correlated with place attachment. The study will also reveal the impacts of the earthquakes and the attitudes and opinions of earthquake victims in Antakya regarding these variables. The results will contribute to studies that aim to mitigate the effects of the earthquakes in Antakya and enhance the recovery of the community and the environment. This study will guide policies implemented by scientists and disaster managers at the local and national levels to increase place attachment among disaster victims during the post-disaster reconstruction process.

2 Theoretical background of hypotheses and research model

This study will test nine main hypotheses (Fig. 1). The factors affecting place attachment were determined according to scientific studies investigating people's willingness to move from disaster-prone areas (Zhou et al. 2021; Xue et al. 2022; Xu et al. 2017; Mızrak and Turan 2023; Özdemir and Mızrak 2023) and place attachment (Zheng et al. 2019; Ortiz et al. 2023; Depari and Lindell 2023; Anacio et al. 2016; Peng et al. 2020; Clarke et al. 2018; Greer et al. 2020; Chen 2020). For example, Ozdemir and Mızrak (2023) investigated whether earthquake experience, earthquake insurance, satisfaction with the city, self-efficacy, risk perception, social support, post-earthquake insecurity, and price increases affected residents' willingness to relocate in an earthquake-affected region. Zhou et al. (2021) investigated the effects of livelihood capital, earthquake experience, house structural resilience, and risk perception on evacuation and relocation decisions. Zheng et al. (2019) investigated the impact of perceived risk, negative emotions, and coping mechanisms on place dependence and place identity after a disaster. Greer et al. (2020) found that social participation, exposure, and risk perception are related to place dependency following a disaster. Based on these studies, independent variables that may be related to place attachment were identified.

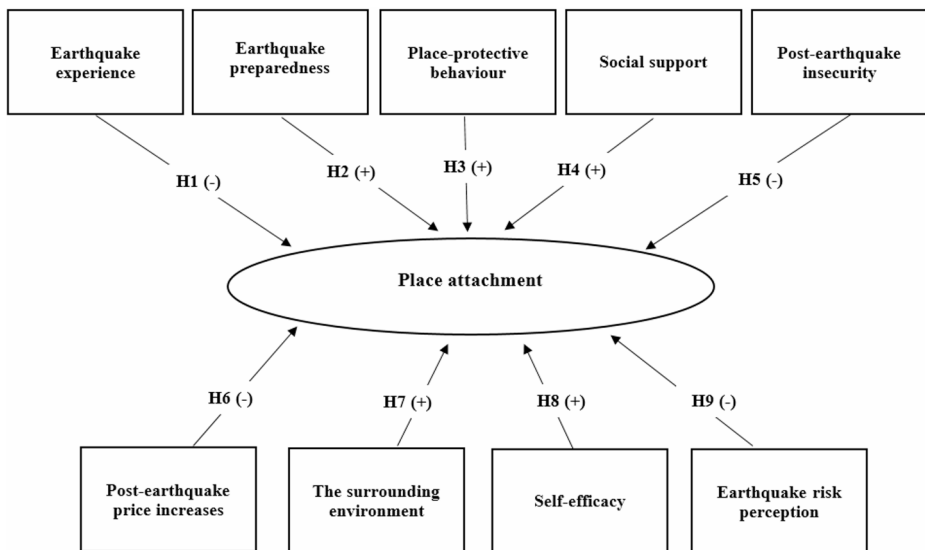


Fig. 1 Research model

In addition, socio-demographic characteristics were included as a control variable based on these studies. Furthermore, since socio-demographic variables are an important indicator of people's resilience to disasters (Cai et al. 2018), the results will also show the impact of these variables on place attachment.

2.1 Earthquake experience

Individuals who experience earthquakes encounter symptoms of post-traumatic stress disorder and depression (Başoğlu et al., 2004), which negatively impact their mental health (Kiy-mis and Fakioglu, 2024). Losses such as the loss of relatives or friends, or the loss of their home or workplace, can exacerbate trauma symptoms (North and Pfefferbaum 2013). After an earthquake, losses, injuries, and housing problems can negatively affect individuals' psychological well-being (Tomak et al. 2024; Beaglehole et al. 2023). Furthermore, moving from one's current location to another city or temporarily relocating can weaken social ties and adversely affect place attachment (Yorulmaz and Karadeniz 2021). Post-earthquake rubble and physical destruction can cause individuals to re-experience the trauma (Harada et al. 2015; Mavroulis et al. 2023). Experiencing losses under the rubble or being constantly exposed to images of rubble can increase fear and anxiety in individuals, complicating the psychological recovery process (Silver et al. 2013; Özgölet and Utkucu 2021). Furthermore, individuals who have experienced an earthquake perceive a higher probability of a similar disaster in the future (Cui and Han 2019). The effects of the earthquakes may reduce the place attachment of earthquake victims in Antakya. Therefore, H1 was proposed to test this condition.

H1 *Earthquake experience will be significantly and negatively correlated with place attachment.*

H1a *Injury will be significantly and negatively correlated with place attachment.*

H1b *Loss of a relative will be significantly and negatively correlated with place attachment.*

H1c *Loss of a friend will be significantly and negatively correlated with place attachment.*

H1d *Home damage will be significantly and negatively correlated with place attachment.*

H1e *Workplace damage will be significantly and negatively correlated with place attachment.*

H1f *Psychological impact will be significantly and negatively correlated with place attachment.*

H1g *Evacuation will be significantly and negatively correlated with place attachment.*

H1h *Discomfort from the rubble will be significantly and negatively correlated with place attachment.*

2.2 Earthquake preparedness

Earthquake preparedness is a process that begins with individuals perceiving the risks in their communities and involves developing protective behaviors against these risks (Bandura 1997; Lindell and Whitney 2000). Preparedness increases individuals' capacity to make effective decisions during and after a disaster and enables them to act more organized and consciously in crises (Lindell and Perry 2012). Individuals' place attachment has a decisive influence on disaster preparedness and response strategies (Mishra et al. 2010). Psychological preparedness contributes to more effective and controlled responses during a disaster (Lamjiry and Gifford, 2022). At the same time, individuals' preparedness for earthquakes shapes the bonds they form with the places they live in; people tend to make greater preparations to protect places they value (Paton 2003; Scannell and Gifford 2013). Individuals who feel place attachment tend to be more aware and prepared for disasters due to the motivation to protect their living spaces. In this context, behaviors such as preparing a disaster kit and action plan, and receiving disaster training enable individuals to become psychologically prepared for disasters (Atalay 2024). Earthquake victims who are prepared for an earthquake may feel confident in their preparations and believe they will be less affected by potential earthquakes, and may want to continue living in Antakya. H2 was proposed to determine the effect of earthquake preparedness on place attachment.

H2 *Earthquake preparedness will be significantly and positively correlated with place attachment.*

2.3 Place-protective behavior

Strong national identity and civic responsibility enhance a society's capacity to face challenges (Roza et al. 2023). Place attachment is a powerful motivator for sustainability, as individuals tend to protect environments to which they are emotionally attached (Manzo and Perkins 2006). Additionally, the cultural and historical significance of the region in which they live enhances place attachment (Manzo and Perkins 2006). Place-protective behaviors among residents in disaster areas can increase their place attachment, thereby enhancing their volunteerism and local engagement (Kokorsch and Gísladóttir 2023). (Wang et al. 2023) stated that individuals who can empathize with the environment exhibit stronger pro-environmental behaviors. Soopramanien et al. (2023) reported a positive relationship between place commitment and environmental responsibility. Earthquake victims may want Hatay's social, economic, and cultural activities to continue, citing the importance of national unity and sustainability. Therefore, they may be inclined to stay in Antakya and await post-earthquake regional development. To test this assumption, H3 was proposed.

H3 *Place-protective behavior will be significantly and positively correlated with place attachment.*

2.4 Social support

Social support increases community members' ability to act together and solve problems collectively (Ntontis et al., 2021). It is an important protective factor among individuals

coping with traumatic events such as disasters (Aksoy and Kabasakal 2023). Post-disaster social support also accelerates recovery processes (Fulton et al. 2020; Reifels et al. 2013) and helps individuals feel less alone by increasing social solidarity (Fulton et al. 2020; Dückers et al., 2017). Formal and informal social support provided after a disaster strengthens individuals' attachment to their place of residence (Chamlee-Wright and Storr 2009) and their sense of belonging (Nakagawa and Shaw 2004). Assistance provided by official institutions increases community trust and encourages individuals to remain in place (Aldrich 2012). Social support positively impacts public trust in local government, risk perception, and preparedness behaviors (Han et al. 2021). Family separation and the disruption of community ties during forced displacement after a disaster weaken social support systems, negatively impacting place attachment (Asfaw et al. 2019). Conversely, the inadequacy of local social service organizations to meet ongoing needs negatively affects long-term psychosocial recovery (Fulton et al. 2020; Dückers et al., 2017). Social support provided by individuals and organizations following earthquakes can increase the coping capacity of the earthquake victims. Social support can help them become more attached to Antakya. Therefore, H4 was proposed.

H4 *Social support will be significantly and positively correlated with place attachment.*

H4a *Formal social support will be significantly and positively correlated with place attachment.*

H4b *Informal social support will be significantly and positively correlated with place attachment.*

2.5 Post-earthquake insecurity

Increased social disorganization following disasters is associated with higher crime rates and a decline in individuals' safety perceptions (Peek and Sutton 2003). Property crimes (Roy 2010; Zahnow et al. 2017) and residential burglaries increase after disasters (Frailing 2021). Following the Chilean earthquake, serious looting occurred in the most affected areas, and the government imposed curfews in these areas (Hombrados 2020). The disruption of social order following the earthquake in Haiti increased the rate of sexual assault, and the inadequacy of humanitarian assistance and security systems increased physical assaults (Kolbe 2010). Child abuse cases increased after Hurricane Hugo and the Loma Prieta Earthquake (Curtis 2000). Increasing security problems in residential areas are a significant factor threatening place attachment (Chamlee-Wright and Storr 2009). Individuals with higher earthquake exposure are less likely to commit crimes than those with lower exposure (Calo-Blanco et al. 2017). When social security cannot be ensured, individuals' ties to their places are affected, leading to post-disaster migration (Norris et al. 2008). Crimes that earthquake victims experience or witness may weaken their place attachment. H5 was proposed to test the effect of crimes on place attachment.

H5 *Post-earthquake insecurity will be significantly and negatively correlated with place attachment.*

2.6 Post-earthquake price increases

Supply chain disruptions and resource shortages resulting from large-scale disasters lead to higher prices, especially for basic services (Kajitani et al. 2013). Some sellers attempt to profit from unethical price increases after disasters (Helveston 2024). Due to depletion of existing inventory or difficulties in transporting products to the disaster area, sellers charge excessive and unnecessary prices (Noy 2018). This market instability leads to exorbitant price increases, particularly for basic services such as food, water, and shelter (Tierney 2006). The increased demand for housing during this period leads to rising rents and real estate prices, thus creating a housing crisis (Green et al. 2011). Resource scarcity and rising building material costs following the Wenchuan earthquake slowed post-disaster reconstruction (Chang et al. 2012). Disruption of market balance and increasing prices due to disasters make life difficult for disaster victims (Olshansky et al. 2005). This may force displacement, especially for disaster victims with low income (Andersson et al. 2007; Costa et al. 2022). Based on this literature, H6 was proposed to test whether price increases after earthquakes affect place attachment.

H6 *Post-earthquake price increases will be significantly and negatively correlated with place attachment.*

2.7 The surrounding environment

Factors such as advanced ecological, social, economic, institution, infrastructure, and community capabilities in a city increase a city's resilience to disasters (Cutter et al. 2008). Individuals' physical satisfaction with their environment is a crucial factor that enhances place attachment (Bonaiuto et al. 1999). Damage and loss of life resulting from earthquakes make it difficult for people to access basic needs and services (Green and Miles 2011). This negatively impacts the social and economic satisfaction of disaster victims with their living environment (Liang 2015; Gim and Shin 2022). A study conducted in regions intensely affected by natural hazards showed that high levels of housing and environmental satisfaction reduce individuals' desire to move (Swapan and Sadeque 2021). In regions with high earthquake risk, improved facilities and opportunities increase people's satisfaction and encourage them to stay in the city (Özdemir and Mızrak 2023). Even though Antakya has been severely damaged by earthquakes, social and cultural factors in the city can increase the place attachment of earthquake victims.

H7 *The surrounding environment with the city will be significantly and positively correlated with place attachment.*

2.8 Self-efficacy

Self-efficacy enhances individuals' confidence in protecting themselves from potential disasters, thereby encouraging them to engage in preparedness activities (Wang et al. 2021a). High self-efficacy increases people's coping capacity, making them more resilient to disasters (Peng et al. 2020). It motivates people to take protective measures against future disasters (Samaddar et al. 2014). Greater self-efficacy can improve individuals' post-disaster

psychological well-being more quickly (Guerra et al. 2014). Furthermore, self-efficacy positively affects individuals' place attachment (Manzo and Prekins 2006) and has a mediating effect on the relationship between place attachment and disaster preparedness (Wang et al. 2021a). Earthquake victims may feel confident in their knowledge and skills, believing they can protect themselves and remain unharmed during an earthquake. This can strengthen their commitment to Antakya. H8 was proposed to reveal the relationship between self-efficacy and place attachment.

H8 *Self-efficacy will be significantly and positively correlated with place attachment.*

2.9 Earthquake risk perception

Environmental risk perception influences people's coping behaviors and thoughts, and when perceived risk is high, place attachment reduces coping intentions (Dominicis et al. 2015). Higher risk perceptions encourage people to take protective measures such as preparedness and mitigation (Wachinger, 2013). As individuals' beliefs about the likelihood of an earthquake recurring increase, their risk-related fears increase (Lechowska 2018). People may seek to avoid hazardous areas due to their need for emotional and physical safety (Bonaiuto et al. 2016). Earthquake victims may constantly worry about the possibility of another devastating earthquake in Antakya, fearing their loved ones and their financial well-being could suffer. This can increase their anxiety, worry, and fear of earthquakes, thus weakening their commitment to Antakya. H9 was proposed to investigate the relationship between risk perception and place attachment.

H9 *Earthquake risk perception will be significantly and negatively correlated with place attachment.*

H9a *Probability will be significantly and negatively correlated with place attachment.*

H9b *Fear will be significantly and negatively correlated with place attachment.*

3 Method

3.1 Research design

This study employed the correlational study design from quantitative research methods. This study design determines the level and direction of the relationship between variables (Büyüköztürk et al. 2024). This study applied this method because it reveals the level of place attachment of earthquake victims and the relationships between the factors that affect it.

3.2 Study area

This study was conducted in the Antakya district of Hatay province (Fig. 2), which was affected by two devastating earthquakes centered in Kahramanmaraş on February 6, 2023.

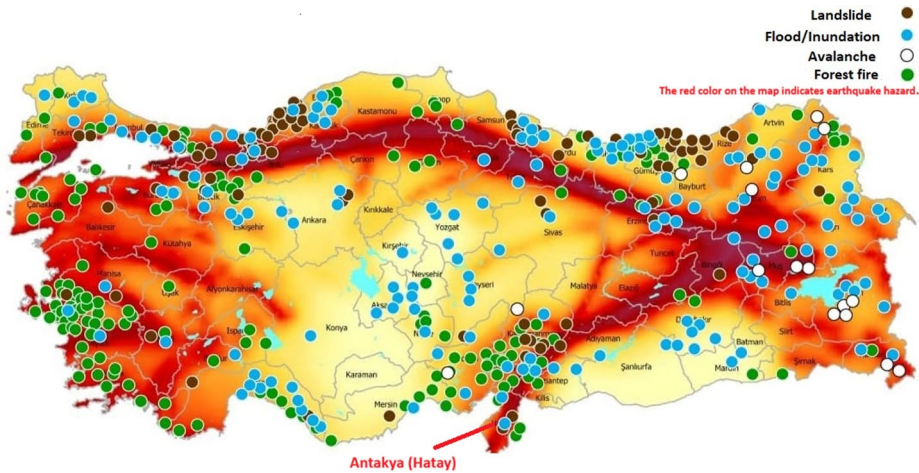


Fig. 2 Türkiye disaster risk map (Ministry of Interior of the Republic of Türkiye 2022)

These earthquakes, which simultaneously affected many settlements in Türkiye and Syria, caused 56,683 deaths and affected 18 million people (CRED 2024). On February 20, 2023, a 6.4 magnitude earthquake occurred in Hatay (Kürçer et al. 2023). Although the epicenter of the earthquakes on February 6, 2023, was the Kahramanmaraş district, the greatest destruction occurred in Hatay province (Mistiköğlu 2024; Yuzbaşı 2024). While the number of severely damaged and collapsed buildings in 11 provinces was 36,932, a total of 13,883 severely damaged or collapsed buildings were in Hatay province (TMMOB 2023). Many buildings in Hatay that were slightly damaged in the February 6, 2023 earthquake were seriously damaged in the February 20, 2023 earthquake (Yuzbaşı 2024). Additionally, historical and cultural structures in the region were also severely damaged (Mistiköğlu 2024; Bozkurt 2023). Inappropriate building design, improper interventions in structural and non-structural parts, lack of maintenance, and use of poor-quality materials caused serious damage to many buildings in Hatay (Altunsu et al. 2024; Vapur et al. 2023). The heaviest damage in Hatay province occurred in Antakya on February 6, 2023 (Yuzbaşı 2024). Antakya's location in the Amik Lake basin increased the destructive effects of the earthquake on buildings (Sakarya et al. 2024). Soil liquefaction, collapses, and ground degradation were observed in Antakya (Bol et al. 2024). Earthquakes destroyed many buildings in Antakya that were marketed as new, luxurious, modern, safe, and earthquake-resistant, causing people to doubt the stability of their own homes (Üçkulak and Soyuluk 2023). The population of Antakya, which was 399,045 in 2022, decreased by 25% in 2024, falling to 299,586 (Turkish Statistical Institute 2025). Settlements in Antakya, which suffered great damage from earthquakes (NASA 2023), were largely evacuated (Fig. 3). Life and commercial activities continue among collapsed and damaged buildings (Fig. 4).

3.3 Participants

To collect data, 453 earthquake victims in Antakya were contacted online between March 10, 2024, and April 15, 2024. The sample includes earthquake victims aged 18 and over who were in Antakya during the February 6, 2023 Kahramanmaraş earthquakes and were residing

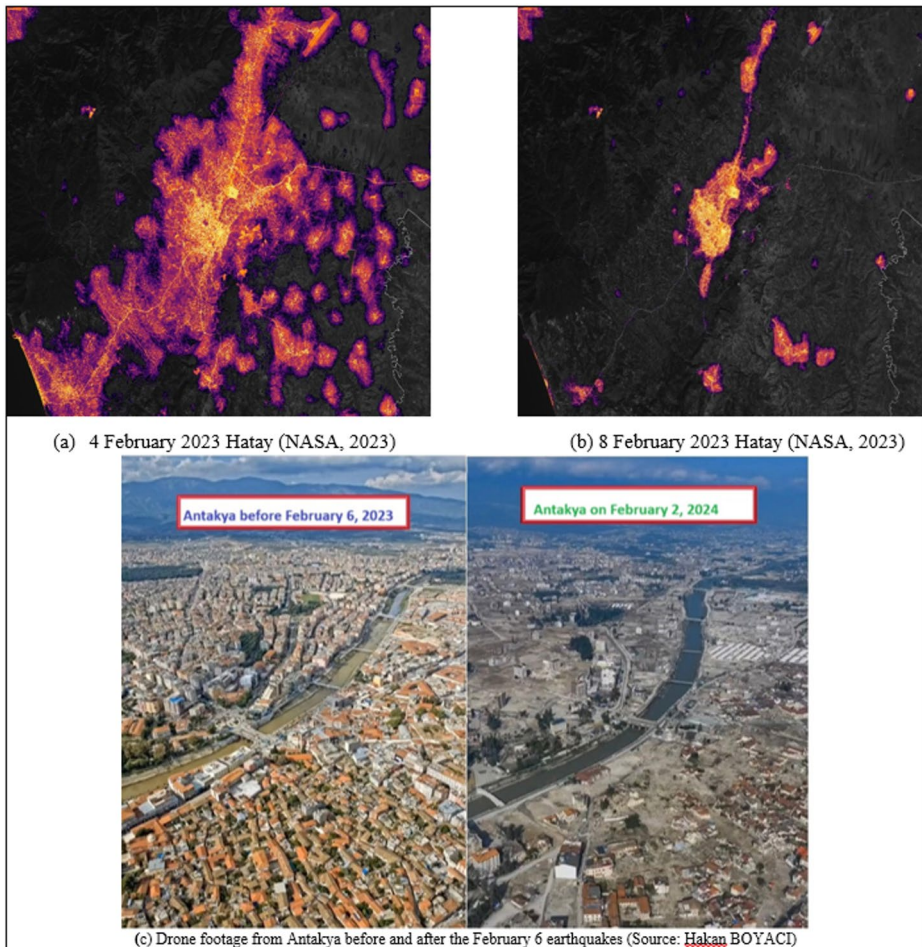


Fig. 3 Images from Antakya before and after the earthquakes

in Antakya at the time of data collection. Researchers in this study contacted acquaintances in Antakya and asked them to complete the survey and transfer it to their acquaintances in Antakya. Additionally, the survey form was shared on social media accounts that produce content related to Antakya, and followers were asked to distribute the survey form to other earthquake victims in Antakya. For ten days starting from April 15, 2025, researchers were unable to reach any new participants. Data collection was terminated because a sample of 453 individuals is sufficient in a population of approximately 300,000 (Krejcie and Morgan 1970).

3.4 Survey instrument

The survey form in this study consisted of three parts. The first part determined the earthquake victims' gender, age, marital status, income, number of children, education level, chronic illness, occupation, length of stay in Antakya, living area, and earthquake prepared-

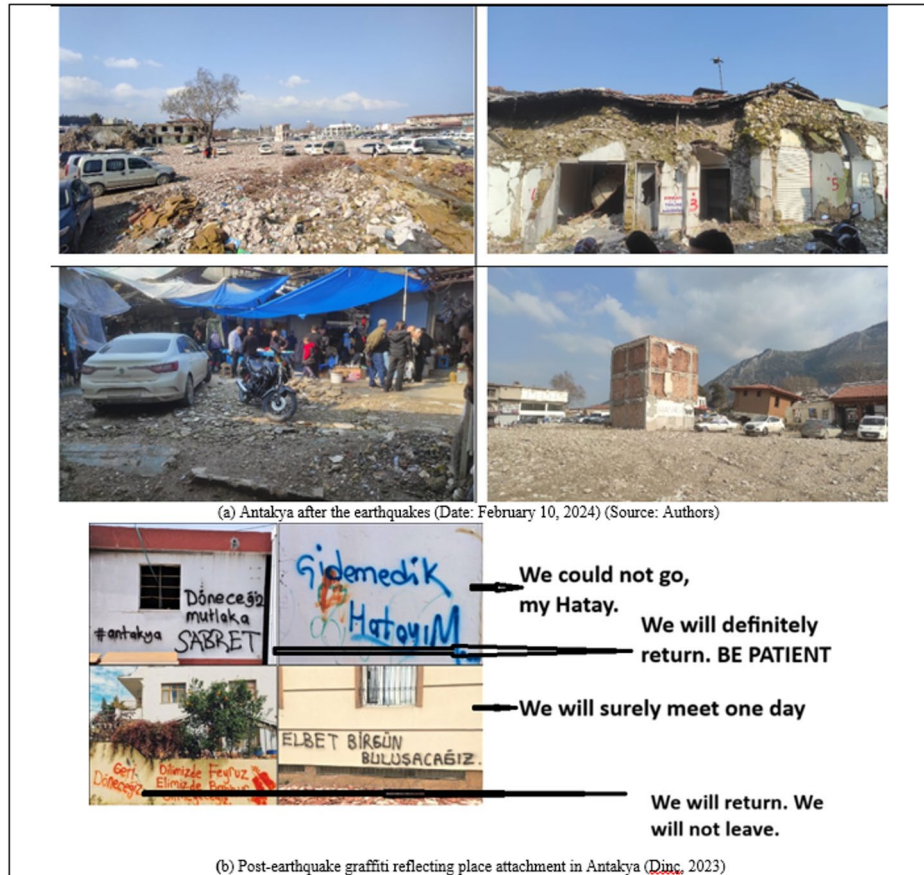


Fig. 4 Images from Antakya after the earthquakes

ness. The second part inquired about experiences with the earthquakes (Injury, loss of a relative, loss of a friend, home damage, workplace damage, psychological impact, evacuation, and discomfort from the rubble). The third part measured place-protective behavior, social support, post-earthquake insecurity, post-earthquake price increases, the surrounding environment, self-efficacy, earthquake risk perception, and place attachment using a 5-point Likert scale. As the score obtained from these questions increases, the value of the variables also increases.

The structure of the questions in the survey form was created based on the literature. The variables and their sources were as follows: earthquake experience (Tobin et al. 2011; Scolobig et al. 2012), earthquake preparedness (Kohn et al., 2012; Mooney 2011), place-protective behavior (Niemets et al. 2021; Angelidou and Psaltoglou 2017; Arcadis 2016), social support (Chao 2017; Xu et al. 2017; Yu et al. 2022), post-earthquake price increase (Lemieux 2014; Nogami 2015), post-earthquake price increases (Mueller et al. 2009), the surrounding environment (Senlier et al., 2009; Hsieh 2025), self-efficacy (Samaddar et al. 2014; Babcicky and Seebauer 2020; Yu et al. 2022), earthquake risk perception (Bubeck et al. 2012; Xu et al. 2020; Peng et al. 2019), place attachment (Dinc 2023; Zhang et al. 2014;

Kick et al. 2011; Hernandez et al. 2007; Shamai and Ilatov 2005; Domingues et al. 2021; Peng et al. 2020).

The questions were formulated with the considering that the people of Antakya experienced a devastating earthquake a year ago. For example, Yu et al. (2022) determined social support by assessing the extent to which family members, relatives, friends, and neighbors can help mitigate the potential disruptions that a sudden natural disaster might cause. Therefore, in this study, since data were collected after devastating earthquakes, social support was evaluated according to the adequacy of the assistance people received. Lemieux (2014) and Nogami (2015) stated that there may be an increase in crime rates after disasters. This study asked earthquake victims how much the crime rate increased after the earthquakes. Peng et al. (2019) measured risk perception in terms of probability, fear, unknown, and controllability, while Xu et al. (2020) measured it in terms of probability and severity. Since this study was conducted one year after the devastating earthquakes, risk perception was measured using probability and fear dimensions. This is because it was calculated that earthquake victims felt fear at the thought of another earthquake occurring. Researchers assessed place attachment using factors such as sense of place (Domingues et al. 2021), level of attachment (Shamai and Ilatov 2005), and positive attitudes, thoughts, and nostalgia (Dinç, 2023). In this study, to measure place attachment, participants were asked whether earthquakes reduced their desire to live in Antakya.

A pilot test was conducted to check the content and face validity of the survey form. First, a total of four experts with doctoral degrees in disaster management—one disaster manager and three academics—reviewed the survey content. The experts' suggestions regarding the survey form were as follows: They all stated that it would not be appropriate to assess earthquake risk perception using the severity and controllability dimensions in a region recently affected by devastating earthquakes. Therefore, only the possibility and fear dimensions were included when determining earthquake risk perception. Second, eleven earthquake victims residing in Antakya completed and checked the survey after receiving information about the research. The earthquake preparedness variable is exemplified according to the suggestions of earthquake victims (Water, food, clothing, medicine, radio, etc.). The survey form was implemented after being modified in line with the suggestions of experts and earthquake victims.

3.5 Data analysis

Data were analyzed via SPSS using descriptive statistics and ordinal logistic regression. Categorical variables were presented as frequencies (F) and percentages (%), and continuous variables were presented as means (M) and standard deviations (SD). Place attachment was employed as the dependent variable, and the strength and direction of the variables affecting it were determined using ordinal logistic regression. Since the variance inflation factor values were below 4 (O'Brien 2007) and the tolerance values were above 0.2 (Hosmer et al. 2008), there was no multicollinearity problem in terms of ordered logistic regression. The results of the ordinal logistic regression analyses were interpreted through odds ratios (ORs) and Nagelkerke R^2 values. An odds ratio less than 1 indicates a negative relationship between the dependent variable and the independent variable, while a value greater than 1 indicates a positive relationship. Statistical levels of 0.001, 0.01, and 0.05 were used.

3.6 Ethical considerations

Earthquake victims participated in this study voluntarily and were informed that their data would be used for a scientific study. The Gümüşhane University Scientific Research and Publication Ethics Committee approved this study from a scientific and ethical perspective at its meeting dated January 24, 2024, and numbered 2024/1, with the number E-95674917–108.99–231,632.

4 Results

Table 1 shows the questions in the survey form, the variables, and their descriptive characteristics. Of the earthquake victims who participated in this study, 53.9% (244) were women and 58.9% (267) were between 18 and 28 years old. 65.3% of the participants (296) were single and 52.5% of the participants (238) were in the middle-income group. 68.7% (311) of the participants had no children, and the highest level of education among all the participants was undergraduate or above (33.8%). The percentage of participants without chronic diseases was 88.5% (401), and 52.1% (236) of the participants had been living in Antakya for 15–30 years. 32.7% (148) of the participants lived in their own homes, 7.9% (36) lived with relatives. 61.1% (277) of the participants had no earthquake preparedness. 28.3% (128) of the participants were injured, 74.0% (335) lost at least one relative, and 84.8% (384) lost at least one friend. 82.1% of participants reported damage to their home, and 52.5% reported damage to their workplace. 97.4% of the participants were psychologically affected, and 61.1% (277) of the participants moved to another city after the earthquakes. Rubble removal efforts disturbed 89.4% (405) of the participants.

Earthquake victims exhibited high levels of place-protective behavior ($M=3.657$, $SD=0.809$). The informal social support ($M=1.231$, $SD=1.164$) received by participants after the earthquakes was greater than the formal social support ($M=1.013$, $SD=0.995$). According to earthquake victims, crime rates ($M=2.209$, $SD=0.985$) and prices ($M=3.660$, $SD=0.630$) increased significantly in Antakya after the earthquakes. Earthquake victims' fear of earthquakes ($M=2.907$, $SD=1.256$) was higher than their perceived earthquake possibility ($M=2.242$, $SD=0.953$).

Table 2 presents the impact of demographic variables and earthquake experience on place attachment. Gender, age, marital status, number of children, education level, chronic disease, occupation, and place of residence were not significantly correlated with place attachment. Place attachment was higher among earthquake victims in the high-income group than among those in the low-income group. Place attachment was higher among earthquake victims who had lived in Antakya for 31 years or more compared to those who had lived in Antakya for 1–14 years.

Place attachment was lower among earthquake victims who were not injured or whose relatives had not died. Losing a friend, damage to the home or workplace, and psychological impact were not significantly correlated with place attachment. Moving to another city and being disturbed by the rubble were significantly correlated with place attachment. Place attachment was 1.784 times higher for those who did not move to another city than for those who did. Place attachment was 1.879 times higher for the participants who were not disturbed by the rubble removal efforts (Table 3).

Table 1 The survey form, variables, and descriptive characteristics of the variables

Variables (Questions in the survey)	Groups	F	%
Gender (What is your gender?)	Male	244	53.9
	Female	209	46.1
Age (What is your age range?)	18–28	267	58.9
	29–39	118	26.0
	40 and above	68	15.0
Marital status (What is your marital status?)	Single	296	65.3
	Married	157	34.7
Monthly income (What is your monthly income?)	Low	179	39.5
	Middle	238	52.5
	High	36	7.9
Number of children (How many children do you have?)	No child	311	68.7
	One child	48	10.6
	Two children	51	11.3
	More than two	43	9.5
Education level (What is your educational level?)	Literate	23	5.1
	Primary school	16	3.5
	Elementary	18	4.0
	High school	151	33.3
	Pre-undergraduate	75	16.6
	Undergraduate	153	33.8
	Master's or doctorate	17	3.8
Chronic disease (Do you have a chronic illness?)	No	401	88.5
	Yes	52	11.5
Occupation (What is your profession?)	Unemployed	66	14.6
	University student	147	32.5
	Self-employed	20	4.4
	Officer	78	17.2
	Tradesmen	17	3.8
	Worker	34	7.5
	Other	91	20.1
Residence duration in Antakya (years) (How many years have you lived in Antakya?)	1–14	102	22.5
	15–30	236	52.1
	31 and above	115	25.4
Place of residence (Where do you currently reside?)	I'm a renter	127	28.0
	I live in my own house	148	32.7
	I stay at a relative's house	36	7.9
	I do not live at home (tent, container, dormitory)	142	31.3
Earthquake preparedness (Did you make preparations for 3 days after an earthquake? (Water, food, clothing, medicine, radio, etc.))	No	277	61.1
	Yes	176	38.9
Injury (Were you injured due to the earthquakes?)	No	325	71.7
	Yes	128	28.3
Loss of a relative (Did you lose a relative due to the earthquakes?)	No	118	26.0
	Yes	335	74.0
Loss of a friend (Did you lose a friend due to the earthquakes?)	No	69	15.2
	Yes	384	84.8

Table 1 (continued)

Variables (Questions in the survey)	Groups	F	%
Home damage (Did the earthquakes damage your house?)	No	81	17.9
	Yes	372	82.1
Workplace damage (Did the earthquakes damage your workplace?)	No	215	47.5
	Yes	238	52.5
Psychological impact (Did the earthquakes affect you psychologically?)	No	12	2.6
	Yes	441	97.4
Evacuation (Did you evacuate to another city after the earthquakes?)	No	176	38.9
	Yes	277	61.1
Discomfort from the rubble (Are you bothered by the rubble removal work?)	No	48	10.6
	Yes	405	89.4
		Mean	SD
Place-protective behavior: Do you think the integrity of Hatay is important for Türkiye?		3.657	0.809
Formal social support: How adequate was the assistance you received from institutions after the earthquakes on February 6, 2023?		1.013	0.995
Informal social support: How adequate was the assistance you received from your relatives after the earthquakes on February 6, 2023?		1.231	1.164
Post-earthquake insecurity: Was there an increase in crime rates after the earthquakes on February 6, 2023, in Antakya?		2.905	0.985
Post-earthquake price increases: Was there an excessive, unnecessary increase in prices (housing, rent, food, etc.) after the earthquakes on February 6, 2023, in Antakya?		3.660	0.630
The surrounding environment: How satisfied are you with the social/economic opportunities in Antakya?		1.426	1.288
Self-efficacy: Do you have sufficient information to protect yourself in the event of an earthquake?		2.362	0.980
Earthquake risk perception (Possibility): What is the likelihood of a catastrophic earthquake occurring in Antakya in the near future?		2.242	0.953
Earthquake risk perception (Fear): How frightened are you by the possibility of an earthquake in Antakya?		2.907	1.256
Place attachment: Do you think your desire to live in Hatay has decreased after the earthquakes on February 6, 2023?		2.446	1.433
Response options: Place-protective behavior (0=Never, 4=Always), Social support (0=I received no assistance, 4=It was more than enough), Post-earthquake insecurity/Post-earthquake price increases (0=It never happened, 4=It happened excessively), The surrounding environment (0=I am not satisfied at all, 4=I am extremely satisfied), Self-efficacy (0=I have no knowledge, 4=I have a lot of knowledge), Possibility (0=Very low, 4=Very high), Fear (0=It does not fright at all, 4=It frightens a lot), Place attachment (0=Always, 4=Never)			

Earthquake preparedness, social support, post-earthquake insecurity, post-earthquake price increases, self-efficacy, and earthquake risk perception were not significantly correlated with place attachment. Place-protective behavior and the surrounding environment were significantly and positively correlated with place attachment. The surrounding environment had a greater impact on place attachment than place-protective behavior.

Table 4 shows the combined effects of all independent variables on place attachment. Gender was significantly correlated with place attachment, with men's place attachment being 1.781 times higher than the place attachment of women. Those who lived longer in Antakya had higher place attachment. Earthquake victims who lost relatives and did not evacuate to other cities after the earthquakes had higher place attachment. Place-protective behavior, informal social support, and the surrounding environment were significantly and positively correlated with place attachment.

Table 2 Ordered logistic regression results of demographic variables and earthquake experience on place attachment

Variables	Groups	ORs
<i>Demographic variables</i>		
Gender	Male	1.448
	Female ^a	
Age	18–28	1.073
	29–39	0.782
	40 and above ^a	
Marital status	Single	1.640
	Married ^a	
Monthly income	Low	0.354*
	Middle	0.552
	High ^a	
Number of children	No child	0.617
	One child	0.416
	Two children	1.189
	More than two ^a	
Education level	Literate	0.614
	Primary School	1.249
	Elementary	1.236
	High School	0.506
	Pre-undergraduate	0.488
	Undergraduate	0.393
Chronic disease	Master's or doctorate ^a	
	No	1.737
Occupation	Yes ^a	
	Unemployed	
	University Student	1.420
	Self-employed	1.264
	Officer	1.621
	Tradesmen	1.342
	Worker	2.484
	Other ^a	1.452
Residence duration in Antakya (years)	1–14	
	15–30	0.320**
	31 and above ^a	0.604
Place of residence	I'm a renter	
	I live in my own house	1.040
	I stay at a relative's house	1.182
	I don't live at home (tent, container, dormitory) ^a	
Pseudo R-Square	Nagelkerke	
	0.163	
<i>Earthquake experience</i>		
Injury	No	0.639*
	Yes ^a	
Loss of a relative	No	0.579**
	Yes ^a	
Loss of a friend	No	0.610
	Yes ^a	

Table 2 (continued)

Variables	Groups	ORs
Home damage	No	0.715
	Yes ^a	
Workplace damage	No	1.223
	Yes ^a	
Psychological impact	No	0.940
	Yes ^a	
Evacuation	No	1.784**
	Yes ^a	
Discomfort from the rubble	No	1.879*
	Yes ^a	
Pseudo R-Square	Nagelkerke	
	0.083	

^a reference category

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 3 Ordinal logistic regression results of the relationship between earthquake preparedness, place-protective behavior, social support, post-earthquake insecurity, post-earthquake price increase, the surrounding environment, self-efficacy, and earthquake risk perception and place attachment

Independent variables	Group	ORs	ORs	ORs	ORs	ORs	ORs	ORs	ORs
Earthquake preparedness	No	0.848							
	Yes								
Place-protective behavior			1.376**						
Formal social support				0.970					
Informal social support				0.991					
Post-earthquake insecurity					1.109				
Post-earthquake price increases						1.009			
The surrounding environment							1.659***		
Self-efficacy								0.970	
Earthquake risk perception (Possibility)									0.875
Earthquake risk perception (Fear)									0.989
Pseudo R-Square									
Nagelkerke		0.02	0.02	0.01	0.03	0.01	0.11	0.00	0.01

^a reference category

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Nagelkerke values showed that the variation in place attachment was explained most by socio-demographic variables, the surrounding environment, and earthquake experience, respectively. According to the analysis results, some hypotheses were accepted while others were rejected. Hypotheses H1a–H1f, which test the relationship between earthquake experience and place attachment, were rejected. Among the H1 hypotheses, those claiming that evacuation (H1g) and discomfort from the rubble (H1f) would have a significant and negative effect on place attachment were accepted. Hypotheses testing the relationship between

Table 4 Ordinal logistic regression results of the effect of all independent variables on place attachment

Variables	Groups	ORs
Gender	Male	1.781**
	Female ^a	
Age	18–28	1.044
	29–39	0.707
	40 and above ^a	
Marital status	Single	1.629
	Married ^a	
Monthly income	Low	0.532
	Middle	0.584
	High ^a	
Number of children	No child	0.452
	One child	0.366
	Two children	1.158
	More than two ^a	
Education level	Literate	0.419
	Primary School	0.870
	Elementary	0.941
	High School	0.396
	Pre-undergraduate	0.384
	Undergraduate	0.335*
Chronic disease	Master's or doctorate	
	No	1.759
Occupation	Yes ^a	
	Unemployed	0.997
	University Student	0.855
	Self-employed	1.725
	Officer	1.003
	Tradesmen	2.672
	Worker	1.213
	Other ^a	
Residence duration in Antakya (years)	1–14	0.361**
	15–30	0.517*
	31 and above ^a	
Place of residence	I'm a renter	0.820
	I live in my own house	1.226
	I stay at a relative's house	1.394
	I don't live at home (tent, container, dormitory) ^a	
Injury	No	0.725
	Yes ^a	
Loss of a relative	No	0.622*
	Yes ^a	
Loss of a friend	No	0.981
	Yes ^a	
Home damage	No	0.618
	Yes ^a	
Workplace damage	No	1.096
	Yes ^a	

Table 4 (continued)

Variables	Groups	ORs
Psychologically impact	No	0.722
	Yes ^a	
Evacuation	No	1.510*
	Yes ^a	
Discomfort from the rubble	No	1.647
	Yes ^a	
Earthquake preparedness	No	0.687
	Yes ^a	
Place-protective behaviour		1.311*
Formal social support		0.829
Informal social support		1.224*
Post-earthquake insecurity		1.081
Post-earthquake price increases		0.984
The surrounding environment		1.808***
Self-efficacy		1.017
Earthquake risk perception (Possibility)		0.880
Earthquake risk perception (Fear)		0.900
Pseudo R-square	Nagelkerke	
	0.32	

^a reference category

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

earthquake preparedness (H2), social support (H4), post-earthquake insecurity (H5), post-earthquake price increases (H6), self-efficacy (H8), earthquake risk perception (H9), and place attachment were rejected. Hypotheses claiming that place-protective behavior (H3) and the surrounding environment (H7) would have a significant and positive effect on place attachment were accepted.

5 Limitations

This study has several limitations. First, it was conducted in a region affected by the Kahramanmaraş earthquakes, which devastated more than ten provinces in Türkiye and many of their districts and villages. To mitigate the effects of these earthquakes, accelerate recovery, and preserve the social structures of these provinces, place attachment can be investigated in other provinces. Second, the data in this study were cross-sectional. Because the recovery of cities after such large earthquakes is extensive and challenging, people's place attachment can be affected. Therefore, the place attachment of earthquake victims should be continuously investigated in detail. Third, the study examined the place attachment of earthquake victims residing in the earthquake zone. Identifying the place attachment of earthquake victims residing in other provinces after the earthquakes and the factors that influence it may enable people to return to their former cities. Finally, this study was conducted with the general population. Understanding the place attachment of vulnerable groups, such as women, the poor, the disabled, refugees, and earthquake victims who lost all family members, is essential for disaster management.

6 Discussion

This study explores which variables, how, and to what extent they affect place attachment among the earthquake victims in Antakya after the devastating earthquakes of 2023. Demographic variables were applied as control variables, and the impact of earthquake experience on place attachment was investigated through a multidimensional lens. The relationship between place attachment and variables such as earthquake preparedness, place-protective behavior, social support, post-earthquake insecurity and price increase, the surrounding environment, self-efficacy, and earthquake risk perception was examined.

The study provides data on the region's integrity, social networks, security, economic status, the surrounding environment, risk perception, and sense of place from the perspective of the earthquake victims. This study provides resources for government officials to protect regions after the earthquakes, ensure healthy recovery, and rebuild better. The results will enable the sustainability of earthquake-affected cities and the design of more effective response and recovery strategies after future disasters.

Inconsistent with H1, earthquake victims who were injured and lost relatives had higher place attachment. However, consistent with H1, earthquake victims who evacuated to another city after the earthquakes and were disturbed by rubble removal operations had lower place attachment. A study in Hatay indicated that those who lost relatives, suffered economic losses, and had their homes destroyed experienced higher trauma (Ergin et al. 2024). It is anticipated that the rubble quickly stored in inappropriate areas immediately after the earthquake in Hatay will cause environmental, economic, social, and cultural problems (Yılmaz et al. 2023). A study conducted three to four months after the earthquake, using field observations, indicated that dust from rubbles in Antakya posed a risk to hygiene and health (Suvari et al. 2024). Recovery efforts must be conducted quickly and in a planned manner to reduce the traumatic and economic impacts of earthquakes on earthquake victims. In Antakya, in particular, because earthquake rubble disturbs the public, safety and hygiene measures should be increased, and rubble should be stored in more appropriate locations. On the other hand, further studies conducted with earthquake victims who were injured, disabled, or lost their homes, workplaces, and families will better reveal their problems and provide a better understanding of the factors affecting their place attachment.

Earthquake preparedness, inconsistent with H2, did not significantly affect place attachment. Previous studies found a positive relationship between preparedness and place attachment (Xu et al. 2018; Wallis et al. 2022; Wang et al. 2021a). This study asked about earthquake preparedness in general, so the type and extent of earthquake preparedness may have an impact on place attachment. In this study, consistent with H3, earthquake victims' place protective behavior increased their place attachment. Studies indicated that people with high place attachment make greater efforts to improve their environment (Zhang et al. 2014; Halpenny 2010; Burley 2007). For Antakya and Hatay to become better than before the earthquake, people should be informed about the cultural, economic, and environmental characteristics of these regions. In particular, people who migrated to other places after the earthquakes should be encouraged to return to contribute to the development of these earthquake zones.

Inconsistent with H4, social support was not significantly correlated with place attachment; however, informal social support had a significant and positive effect on place attachment when all independent variables were included in the analysis simultaneously.

Therefore, studies conducted on vulnerable groups such as women, low-income groups, those with chronic illnesses, and those with many children after the earthquakes can provide a better understanding of the impact of informal social support. Because the type and amount of informal social support received can vary among different demographic groups. After the earthquake, strong ties to friends, community, family, and society increased people's place attachment (Qian et al. 2025; Xiang et al. 2024). According to stakeholders and earthquake victims, cultural identity and interpersonal connections are important for Antakya's recovery (Aydin 2025). Mızrak and Turan (2023) found that social support in a region with natural hazards increases people's intention to stay where they are. To increase cooperation, communication, and harmony among people in Antakya, social community leaders, influencers, and administrators can organize outreach activities. Furthermore, more information about the outreach efforts should be provided to increase people's trust in public institutions and their communities.

Post-earthquake insecurity, inconsistent with H5, did not significantly affect place attachment. In a study conducted in the region affected by the 1999 Marmara earthquake in Türkiye, both earthquake victims and those not affected by the earthquake sought to relocate because they feared they would face security problems after a potential earthquake (Özdemir and Mızrak 2023). After the February 6, 2023, Kahramanmaraş earthquake, there was an increase in crime rates in the earthquake zones, and many citizens were defrauded (Tezcan and Inan 2024; Küpeli et al., 2025). In this study, the majority of earthquake victims reported an increase in crime rates in Antakya after the earthquakes; however, this did not affect their place attachment. The high crime rate indicates that security measures should be taken to protect people and property in the earthquake zone and that security strategies should be increased in future disaster planning.

Inconsistent with H6, excessive and unnecessary post-earthquake price increases were not significantly correlated with place attachment. The earthquakes caused significant economic devastation in Türkiye (Kahraman 2023) and particularly negatively disturbed business in Antakya (Ozcan Tatar et al. 2024). According to earthquake victims participating in this study, there were significant price increases in Antakya, but this did not affect their place attachment. Because the adequacy of individuals' and households' economic resources is critical for post-earthquake recovery, authorities should take precautions against excessive price increases.

Consistent with H7, the surrounding environment variable is the strongest variable increasing place attachment among earthquake victims in this study. Özdemir and Mızrak (2023) found that satisfaction with the environment among earthquake victims and other citizens in the earthquake-affected region reduced their desire to move to safer areas. Satisfaction with post-earthquake improvements in the environment, buildings, and tourism positively affected places attachment (Qian et al. 2025). Those who migrated from Hatay and lived in other cities in Türkiye stated that they would return to Hatay if problems such as housing, health, unemployment, and transportation were resolved (Eraslan 2024). Even though Antakya suffered significant damage from the earthquakes, this did not affect place attachment among earthquake victims. When considering the impact of the city's social and economic development on place attachment, post-disaster recovery policies should also consider public opinions about city design.

Self-efficacy, inconsistent with H8, did not significantly affect place attachment. As earthquake-affected people's capacity to cope with the hazard increased, their place attach-

ment also increased (Zheng et al. 2019). Qing et al. (2022) found no significant relationship between place attachment and self-efficacy. Seebauer and Winkler (2020) found that people with high self-efficacy preferred to stay in areas with natural hazards. In this study, earthquake survivors' knowledge of how to protect themselves in an earthquake did not affect place attachment. Future studies could examine earthquake survivors' self-efficacy in more detail.

Inconsistent with H9, the possibility and fear of earthquakes were not significantly correlated with place attachment in this study. A negative and significant relationship emerged between perceived risk and place attachment in the earthquake-affected region (Zheng et al. 2019). Xiang (2024) found a significant and negative relationship between place attachment and risk perception after an earthquake. Previous studies found that different dimensions of risk perception affected people's place attachment in different ways (Xu et al. 2020; Holley et al. 2022). Because Antakya witnessed devastating earthquakes, earthquake victims may believe that future earthquakes will not cause further damage.

When all independent variables, along with control variables, were included in the analysis, the effect of some variables on place attachment changed. In this case, gender, education, and informal social support affected place attachment; however, income, injury, and discomfort from rubble did not. This highlights that socio-demographic variables are critical in coping with the effects of disasters and that place attachment needs to be investigated more comprehensively. This is because socio-demographic variables were the strongest explanatory factors for place attachment among the variables. In particular, among socio-demographic variables, gender, income, education, and length of residence in Antakya affected place attachment.

In this study, women and low-income earthquake victims had lower place attachment. Studies in Türkiye found that women were more vulnerable to earthquakes (Mızrak et al. 2021) and they faced physical, social, and psychological problems in the aftermath of Kahramanmaraş earthquakes (Ural et al. 2024; Demiröz Yıldırım, 2025). High economic income enables disaster victims to recover quickly from the effects of disasters (Wang et al. 2021b). Low-income people may live in more favorable conditions in areas at high risk of natural hazards (Rentschler 2022). This suggests that administrators and institutions should provide greater support to vulnerable groups during the recovery process. This can help overcome inequalities, build a more resilient community, and take precautions against future disasters. Earthquake victims who lived longer in Antakya had higher place attachment. Previous studies reported that residing for a long time in a high-risk disaster area increased the desire to stay there (Mızrak and Turan 2023; Ozdemir and Mızrak 2023). The experiences of people who have lived in Antakya for a long time and are more familiar with its nature and culture can provide insights to managers working on recovery. Understanding the impact of variables such as age, marital status, number of children, chronic illness, occupation, and place of residence on place attachment requires further research, primarily qualitative research.

7 Conclusions and recommendations

This study examined the factors influencing place attachment among earthquake victims in Antakya Province, which was affected by the February 6, 2023, Kahramanmaraş earthquake. Data was collected one year after the earthquakes using a survey method from earthquake victims living in the affected area. Consequently, women, those with lower monthly incomes, and those living in the earthquake zone for shorter periods had lower place attachment. Injury due to earthquakes, loss of relatives, not evacuating to another city, and not being disturbed by rubble removal all increased place attachment. Perceiving the earthquake zone as important for the country's sustainability and satisfaction with the city increased place attachment.

Scientists, NGOs, and disaster managers must understand the problems among vulnerable groups, such as women and low-income individuals, and maintain their sense of place by providing them with more financial and psychological support during the recovery period. The physical and psychological effects of the earthquake-ravaged environment on the earthquake victims should be investigated in detail, and their attitudes, satisfaction levels, and suggestions regarding the environment should be taken into account for recovery efforts. Because recovery in Antakya may take a long time, there may be earthquake victims leaving the area or returning to it. Therefore, scientists and managers should periodically assess the place attachment of people living in earthquake-affected regions and the factors that influence it to support recovery efforts and maintain social cohesion. Furthermore, the feelings and thoughts of earthquake victims who migrated from Antakya during the recovery period should also be investigated. The ties of people living in earthquake zones to the community and the region should be strengthened through training, seminars, and cultural events. Legal measures should be strengthened to prevent crime and price increases in earthquake zones.

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Declarations

Conflicts of interest No conflict of interest.

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