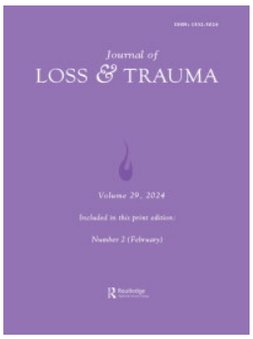

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Correlates of Posttraumatic Stress Disorder in the Aftermath of the February 2023 Earthquake in Turkey

Emre Han Alpay[a], Enya Redican[b], Philip Hyland[c], Thanos Karatzias[d], and Mark Shevlin[b]

[a]Department of Psychology, Mersin University, Mersin, Türkiye; [b]School of Psychology, Ulster University, Coleraine, UK; [c]Department of Psychology, Maynooth University, Maynooth, Ireland; [d]School of Health and Social Care, Edinburgh Napier University, Edinburgh, UK

ABSTRACT

On February 6, 2023, an earthquake registering 7.8 on the Richter scale struck southeast Turkey, and this was followed by a second earthquake of magnitude 7.5. The earthquake resulted in widespread loss, devastation, and destruction, and is anticipated to bear a significant psychological toll on survivors. This study aimed to investigate the prevalence and correlates of ICD-11 posttraumatic stress disorder (PTSD) in those living in earthquake-affected areas of Turkey. The sample was a convenience sample of 527 adults living in earthquake-affected areas of Turkey. Prevalence rates and gender differences in exposure to earthquake-related traumatic events were investigated. Moreover, prevalence rates of ICD-11 PTSD were computed, and demographic and trauma-related correlates of ICD-11 PTSD were assessed using logistic regression analyses. Most of the sample (99.2%; $n = 523$) experienced at least one earthquake-related traumatic event, with the majority experiencing multiple events. Findings demonstrated high endorsement of the ICD-11 PTSD symptom clusters, with 54.1% meeting criteria for diagnosis of probable ICD-11 PTSD. Correlates associated with increased risk of PTSD include female gender, physical injury in the earthquake, physical injury of family or loved ones in the earthquake and being in the higher earthquake-related traumatic events exposure quartiles. These findings indicate high levels of trauma exposure and PTSD among survivors of the recent earthquakes which occurred in Turkey. The identification of correlates associated with increased risk of PTSD is useful for identifying Turkish earthquake survivors who are most likely to need psychological support.

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PTSD; natural disaster; earthquake; Turkey; trauma

A devastating 7.8 magnitude earthquake struck southeast Turkey and the northwest of Syria on February 6, 2023. A number of aftershocks, including one with a magnitude similar to the first earthquake, also occurred.

CONTACT Mark Shevlin m.shevlin@ulster.ac.uk School of Psychology, Ulster University, Cromore Road, Coleraine, Co. Londonderry, Coleraine, BT52 1SA, UK.

According to estimates, the earthquakes have resulted in more than 50,000 fatalities, tens of thousands of injuries, and the internal displacement of more than 216,000 people (United Nations Population Fund [UNFPA, 2023]). It has also rendered nearly 1.5 million people temporarily homeless due to severe infrastructural damage (United Nations [UN], 2023). Accordingly, the earthquakes are projected to have significant long-term effects (Düzova et al., 2023), including having a detrimental impact on the mental health of the Turkish people (Garfin & Silver, 2023).

It is widely established that natural disasters commonly result in psychological distress in addition to the onset or exacerbation of psychiatric disorders among exposed populations including PTSD, depression, anxiety, substance abuse, grief reactions, and sleep disturbances (Agyapong et al., 2022; Beaglehole et al., 2018; Golitaleb et al., 2022; Morganstein & Ursano, 2020; Neria et al., 2008; Saeed & Gargano, 2022; Zhang et al., 2022). Given that disasters possess all the defining characteristics of large-scale traumatic events (Goldmann & Galea, 2014), it is unsurprising that one of the most prevalent psychological disorders observed among individuals exposed to natural disasters is posttraumatic stress disorder (PTSD) (Beaglehole et al., 2018; Goldmann & Galea, 2014; Hosseinnejad et al., 2022; Neria et al., 2008; North, 2016; Rafiey et al., 2019). A meta-analytic study reported prevalence rates ranging from 1.20% to 82.64% for PTSD among earthquake survivors, with the combined incidence of PTSD within nine months of an earthquake being 28.76% and after nine months being 19.48% (Dai et al., 2016). Explanations for the significant heterogeneity in rates of PTSD across studies have included variations in earthquake intensities, the degree to which victims were exposed to the earthquake, time of assessment, demographic and cultural backgrounds of samples, type of property loss, and whether a bereavement occurred (Dai et al., 2016; Tang et al., 2017). Another meta-analytic study by Hosseinnejad et al. (2022) that examined the prevalence of PTSD following earthquakes in Iran and Pakistan found that the rates of PTSD for Iranian and Pakistani survivors were 60.2% and 49.2%, respectively. A shorter time lapse, sex, and method of assessment were found to explain variation in prevalence estimates. Hence, given the widespread variation in post-earthquake PTSD prevalence rates, extrapolating findings from other disaster-exposed populations is unlikely to provide an accurate depiction of the extent of PTSD among the Turkish population.

Given the high rates of PTSD in the aftermath of an earthquake, it is important to determine the factors that may contribute to greater risk. One such factor which has shown to play an important role in elevating the risk of developing PTSD is exposure to earthquake-related traumatic events (e.g., Baral & Bhagawati, Tang et al., 2017; Tanrıkulu et al., 2023;

Liang et al., 2019; Pino et al., 2021). For instance, research has shown significant correlates of PTSD for earthquake victims to include being trapped, experiencing fear, injury, or bereavement (Baral & Bhagawati, 2019; Dai et al., 2016; Tang et al., 2017), as well as experiencing property damage or witnessing death (Dai et al., 2016; Pino et al., 2021). Additionally, research has shown a dose-response association between exposure to earthquake-related traumatic events and symptoms of PTSD (Naeem et al., 2011). Overall, the extant evidence base indicates that exposure to earthquake-related traumatic events is a robust predictor of PTSD in earthquake survivors and that specific types of experiences are more likely to infer greater risk of PTSD.

Research pertaining to the epidemiology of PTSD among earthquake-exposed populations have relied on DSM-based definitions of the condition. However, in the most recent version of the *International Classification of Diseases* (ICD-11; World Health Organization [WHO], 2018), a revised formulation of PTSD was included. The ICD-11 describes PTSD as being comprised of three symptom clusters including (1) reexperiencing of the trauma in the here and now (Re), (2) avoidance of traumatic reminders (Av), and (3) sense of current threat (Th). Additionally, symptoms must be present several weeks after the traumatic event and cause significant impairment across multiple functional domains (WHO, 2018). ICD-11 PTSD symptoms have been explored in a range of populations such as those who have experienced war (Karatzias et al., 2023), clinical samples (Karatzias et al., 2019), and refugees (Vallières et al., 2018), but not yet in a natural disaster exposed population. This is particularly important given that studies have shown how significantly fewer individuals meet requirements for diagnosis of ICD-11 PTSD as compared to DSM-5 PTSD (e.g., Boelen, 2023; Heeke et al., 2020; Hyland et al., 2018; Shevlin et al., 2018).

Consequently, the current study sought to explore rates and correlates of ICD-11 PTSD symptoms in individuals who were exposed to the recent earthquakes in Turkey. It is critical to identify the prevalence and correlates of ICD-11 PTSD symptoms in order to develop interventions and mental health preparedness procedures that may alleviate the symptoms of PTSD (Lee et al., 2020). Based on existing literature (e.g., Dai et al., 2016; Hosseinnejad et al., 2016; Pino et al., 2021; Tanrıkulu et al., 2023), it was anticipated that rates and overall levels of PTSD symptoms would be high. Given that this was the first study to assess for ICD-11 PTSD, and prior research has shown substantial differences in prevalence rates according to the ICD and DSM-5 definitions of PTSD (e.g., Shevlin et al., 2018), it is important to determine the prevalence of ICD-11 PTSD in a post natural disaster context. It was expected that earthquake-related traumatic events relating to experiences of entrapment, fear, injury, bereavement, property

damage, and witnessing death would be linked to higher PTSD symptom levels (Baral & Bhagawati, 2019; Dai et al., 2016; Tang et al., 2017). Additionally, it was anticipated that rates of PTSD symptoms would be highest among those who had experienced higher levels of earthquake-related traumatic events.

Methods

Participants and procedure

The sample was a convenience sample of adults living in earthquake-affected areas of Turkey. Specifically, following the earthquake, more than 500,000 Turkish citizens moved to the city of Mersin where the government provided housing in student dormitories, empty flats, guesthouses, and hotels. Data was collected during the voluntary aid process and most data was collected from Kilikya-Nehir Social Solidarity and Culture Association; a non-governmental organization (NGO) based in Mersin. Most of the data was collected from the accommodation center of this NGO which hosted more than 400 earthquake victims. Inclusion criteria for participation in the study included that participants were literate, did not have any psychotic illness, and had been affected by the earthquake. On March 21, 2023 (about 45 days after the earthquakes), data collectiON started and concluded on April 22, 2023. Because most of the earthquake victims had no smartphone or computer, data was collected using pen and paper. The final sample comprised of 527 participants, of which the average age was 31.69 years ($SD = 13.80$, Median = 26.00, Range = 18–75 years). Females comprised more than two-thirds of the sample (65.3%; $n = 344$), while more than half of the sample were not in a romantic relationship (63.0%; $n = 338$). Almost half of the sample reported university as their highest educational attainment (46.7%; $n = 246$). Ethical approval for the current study was provided by the ethics committee of *blinded for review*.

Measures

Demographic variables

Demographic variables include gender (Female = 0, Male = 1) and age (measured in years).

Earthquake-related traumatic events

The Traumatic Exposure Severity Scale (TESS; Elal & Slade, 2005) is a self-report measure of exposure to traumatic events among disaster survivors. The original Traumatic Exposure Severity Scale is comprised of 24-items, however, for the purposes of the present study only ten of those items were included. Ten items which comprehensively captured the various types of

Table 1. Endorsement rates for earthquake-related experiences.

		Total Sample ($N = 527$) (%)	Males ($n = 183$) (%)	Females ($n = 344$) (%)
1.	In the days following the earthquake did you have to spend the night somewhere other than in your home?	492 (93.4%)	171 (32.4%)	321 (60.9%)
2.	Did you need food and water aid after the earthquake?	444 (84.3%)	163 (30.9%)	**281 (53.3%)***
3.	Was your home damaged in the earthquake?	434 (82.4%)	158 (30.0%)	276 (52.4%)
4.	Did you have to relocate because your house became structurally unsafe to live in?	346 (65.8%)	124 (23.6%)	222 (42.2%)
5.	Were you physically injured in the earthquake?	141 (26.8%)	55 (10.4%)	86 (16.3%)
6.	Were any members of your family or your loved ones physically injured in the earthquake?	287 (54.5%)	102 (19.4%)	185 (35.1%)
7.	Did you lose any members of your family in the earthquake?	216 (41.0%)	75 (14.2%)	141 (26.8%)
8.	Did you lose any relatives (e.g., aunts, uncles, cousins, grandparents) in the earthquake?	233 (44.2%)	89 (16.9%)	144 (27.3%)
9.	Were you involved in the rescue work?	105 (19.9%)	**69 (13.1%)****	36 (6.8%)
10.	Did you see any dead bodies or body parts during the rescue and clearing up work period?	164 (31.1%)	**81 (15.4%)****	83 (15.4%)

Note: ** $p < .01$, * $p < .05$

experiences which can occur following exposure to an earthquake were included to avoid burdening participants. Hence, the current study used an abbreviated version of the Traumatic Exposure Severity Scale (TESS-A; Elal & Slade, 2005). A list of those items is presented in Table 1. For the current study, individual items were investigated as opposed to total scores.

ICD-11 PTSD

The International Trauma Questionnaire (ITQ; Cloitre et al., 2018) is a self-report measure of ICD-11 PTSD symptoms. The ITQ first screens for an individual's "index" traumatic event and participants are instructed to answer all questions in reference to this event. In the present study, participants were instructed to answer all questions in reference to the earthquake they had experienced. The ITQ consists of 12 items, of which six evaluate the three PTSD symptom clusters (Reexperiencing, Avoidance, Threat) and six evaluate the extra disturbances in self-organization (DSO) symptom clusters that are a component of the Complex PTSD (CPTSD) diagnosis. For the present study, only the PTSD module of the ITQ items were used because of the assessment of symptoms in relation to the recent earthquake experience. Three additional items are included which assess for functional impairment across numerous domains including social, occupation, and other important areas of life. Participants indicate how bothered they have been by the symptoms over the past month. All ITQ items are rated on a 5-point Likert scale ranging from 0 ("Not at all") to 4 ("Extremely"). The ITQ can be used to capture symptom severity and to determine if diagnostic requirements are met. The severity score method involves summing responses to all PTSD items, generating possible scores ranging from 0 to

24. Diagnostic requirements for PTSD include the presence of one of two items from each of the PTSD symptom clusters and at least one functional impairment item must be positively endorsed (endorsement is based on a Likert score of $\geq$ 2 (i.e., "Moderately")). The internal reliability of the PTSD ($\alpha = .83$) scores in this sample was excellent.

Data analysis

First, descriptive statistics were calculated to determine endorsement rates for each earthquake-related traumatic event, and gender differences were tested using the Pearson chi-square (χ^2) test. The strength of the association was quantified using Cramer's V ($\leq$ 0.2 = weak, 0.2–0.6 = moderate, $>$ 0.6 strong). Second, rates of endorsement for the PTSD items and symptom clusters, as well as the prevalence rates of ICD-11 PTSD and differences in prevalence rates according to gender and age were examined. Moreover, descriptive statistics were calculated for the PTSD items as well as overall PTSD score. Third, both a bivariate and multivariate binary logistic regression analysis were conducted to determine the unadjusted and adjusted associations between 12 correlates (i.e., gender, age, and the ten earthquake-related traumatic events) and meeting diagnostic requirements for ICD-11 PTSD. To examine the cumulative effect of exposure to multiple earthquake-related traumatic events controlling for gender and age, the Traumatic Exposure Severity Scale-A scores were summed and transformed into a quartile variable with the lowest quartile used as the reference category. Transforming the summed score into a quartile variable allowed for an examination of how different quantities of traumatic exposure inferred greater risk of PTSD. Fourth, a bivariate and multivariate regression analysis was conducted to examine the association between correlates and total PTSD scores. These analyses provided both unstandardized regression coefficients (B) and standardized regression coefficients (β). All analyses were conducted using SPSS Version 28.

Results

Most of the sample (99.2%; $n = 523$) experienced at least one earthquake-related traumatic event. Of those trauma-exposed participants, 4.6% ($n = 24$) reported experiencing one earthquake-related traumatic event, 6.3% ($n = 33$) reported exposure to two, 8.4% ($n = 44$) reported exposure to three, and 80.7% ($n = 422$) reported exposure to four or more. The average number of earthquake-related traumatic events was 5.43 ($SD = 2.30$, Range = 0–10). The most commonly endorsed earthquake-related traumatic events were "*In the days following the earthquake did you have to spend the*

Table 2. Descriptive statistics for ITQ PTSD items.

PTSD items	Endorsement	Mean	*SD*	Mdn	Range
Reexperiencing					
Having upsetting dreams that replay part of the experience or are clearly related to the experience?	59.2 % ($n = 312$)	1.87	1.25	2.00	0–4
Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now?	77.0% ($n = 406$)	2.46	1.18	2.00	0–4
Re cluster	82.5% ($n = 435$)	4.33	2.11	4.00	0–8
Avoidance					
Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)?	65.6% ($n = 350$)	2.07	1.34	2.00	0–4
Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)?	58.9% ($n = 310$)	1.82	1.38	2.00	0–4
Av cluster	74.0% ($n = 390$)	3.90	2.46	4.00	0–8
Threat					
Being "super-alert", watchful, or on guard?	76.4% ($n = 403$)	2.45	1.29	3.00	0–4
Feeling jumpy or easily startled?	75.0% ($n = 395$)	2.46	1.36	3.00	0–4
Th cluster	83.5% ($n = 440$)	4.91	2.44	5.00	0–8
Total PTSD	54.1% ($n = 285$)	13.13	5.76	14.00	0–24

night somewhere other than in your home" (93.4%; $n = 492$), "*Did you need food and water aid after the earthquake"* (84.3%; $n = 444$), and "*Was your home damaged in the earthquake"* (82.4%; $n = 434$).

Females were significantly more likely to endorse the items "*Did you need food and water aid after the earthquake"* (Male = 30.9%, Female = 60.9%; χ^2 (1) = 4.91, p = .03, V = .097) while males were significantly more likely to endorse the items "*Were you involved in the rescue work?"* (Male = 13.1%, Female = 6.8%; χ^2 (1) = 55.55, $p < .001$, V = .33) and "*Did you see any dead bodies or body parts during the rescue and clearing up work period?"* (Male = 15.7%, Female = 15.4%; χ^2 (1) = 26.51, $p <$ .001, V = .22).

Item-level descriptives for the PTSD items are included in Table 2. The mean PTSD score for the sample was 13.13 ($SD = 5.76$), with females having significantly higher scores ($M = 14.01$, $SD = 5.50$) than males ($M = 11.47$, $SD = 5.88$), t (525) = −4.94, $p < .001$, Cohen's $d = 0.45$. The ITQ items with the highest rates of endorsement were "*Being "super-alert," watchful, or on guard"* (76.4%, $n = 403$), "*Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now"* (77.0%, $n = 406$), and "*Feeling jumpy or easily startled"* (75.0%, $n = 395$). The ITQ symptom cluster with the highest endorsement rate was sense of current threat (83.5%, $n = 440$), followed by reexperiencing (82.5%, $n = 435$), and avoidance (74.0%, $n = 390$). Overall, 54.1% (95% CI = 49.8%, 58.4%) met diagnostic requirements for ICD-11 PTSD. There was a significant gender difference in rates of PTSD (Males = 14.4%, Females = 39.7%; χ^2 (1) = 17.78, $p < .001$, V = .184). There was no age difference in likelihood of meeting criteria for PTSD

Table 3. Logistic regression analysis of age, gender, and earthquake-related experiences predicting PTSD.

	Bivariate			Multivariate		
	OR	*CI*	*p*	*OR*	*CI*	*p*
Age	1.01	(0.99, 1.02)	.417	1.00	(0.99, 1.02)	.709
Gender (Female)	**2.18**	**(0.51, 3.14)**	**<.001**	**2.65**	**(1.75, 4.02)**	**< .001**
In the days following the earthquake did you have to spend the night somewhere other than in your home?	1.62	(0.81, 3.24)	.171	1.48	(0.71, 3.13)	.298
Did you need food and water aid after the earthquake?	1.32	(0.83, 2.12)	.242	1.08	(0.62, 1.89)	.783
Was your home damaged in the earthquake?	1.39	(0.89, 2.18)	.150	1.17	(0.65, 2.11)	.593
Did you have to relocate because your house became structurally unsafe to live in?	1.21	(0.84, 1.73)	.308	0.73	(0.44, 1.17)	.178
Were you physically injured in the earthquake?	**2.54**	**(1.68, 3.83)**	**<.001**	**2.26**	**(1.41, 3.60)**	**< .001**
Were any members of your family or your loved ones physically injured in the earthquake?	**2.23**	**(1.57, 3.17)**	**<.001**	**1.72**	**(1.13, 2.62)**	**.010**
Did you lose any members of your family in the earthquake?	**1.62**	**(1.14, 2.31)**	**.007**	1.20	(0.76, 1.90)	.430
Did you lose any relatives (e.g., aunts, uncles, cousins, grandparents) in the earthquake?	1.41	(1.00, 1.99)	.053	0.95	(0.60, 1.50)	.824
Were you involved in the rescue work?	0.92	(0.60, 1.41)	.696	0.95	(0.60, 1.50)	.648
Did you see any dead bodies or body parts during the rescue and clearing up work period?	1.35	(0.93, 1.96)	.117	1.50	(0.91, 2.46)	.110

Abbreviations: OR: Odds Ratio; CI: 95% Confidence Intervals; p: significance level.

(Criteria met: $M = 32.12$ [$SD = 14.14$] vs. Criteria not met: $M = 31.18$ [$SD = 13.39$]: t (525) = −.77, p = .439, d = .07).

The unadjusted and adjusted associations between the correlates and meeting criteria for ICD-11 PTSD are presented in Table 3. In the unadjusted models, meeting criteria for ICD-11 PTSD was associated with being physically injured in the earthquake (OR = 2.54), family or loved ones being physically injured in the earthquake (OR = 2.23), losing family in the earthquake (OR = 1.62) and female gender (OR = 2.65). The adjusted logistic regression model was statistically significant (χ^2 (12) = 59.28, $p < .001$). In the adjusted model, female gender (AOR = 2.65), being physically injured in the earthquake (AOR = 2.26) and having any family members or loved ones being physically injured in the earthquake (AOR = 1.72) remained significantly associated with meeting criteria for PTSD.

Table 4 reports the association between the earthquake-related traumatic events quartile and meeting criteria for ICD-11 PTSD, controlling for gender and age. The adjusted logistic regression model was statistically significant (χ^2 (5) = 52.07, $p < .001$). Those in the highest quartile were significantly more likely to meet criteria for PTSD (AOR = 3.54).

Finally, the unadjusted and adjusted associations between the correlates and total PTSD scores are presented in Table 5. In the unadjusted models,

Table 4. Logistic regression analysis of cumulative earthquake-related experiences predicting PTSD.

	PTSD	Multivariate		
	n (%)	*OR*	*CI*	*p*
Age		1.00	(0.99, 1.02)	.736
Gender (Female)	39.7% (*n* = 209)	**2.76**	(1.86, 4.09)	<.001
Earthquake-related traumatic events quartile 1	9.9% (*n* = 53)	–	–	–
Earthquake-related traumatic events quartile 2	12.9% (*n* = 68)	0.78	(0.47, 1.29)	.329
Earthquake-related traumatic events quartile 3	16.1% (*n* = 85)	1.38	(0.81, 2.33)	.234
Earthquake-related traumatic events quartile 4	15.2% (*n* = 80)	**3.54**	(1.92, 6.51)	<.001

Abbreviations: OR: Odds Ratio; CI: 95% Confidence Intervals; p: significance level.

Note: Earthquake-related traumatic events quartile 1 = those scoring 25% on total number of traumas; Earthquake-related traumatic events quartile 2 = those scoring between 25.1% and 50% on total number of traumas; Earthquake-related traumatic events quartile 3 = those scoring 51% to 75% on total number of traumas; Earthquake-related traumatic events quartile 4 = those scoring 100% on total number of traumas.

significant positive correlates of PTSD symptom levels included damage to home in the earthquakes, being physically injured in the earthquakes, family or loved ones being physically injured in the earthquakes, losing family in the earthquakes, losing relatives in the earthquakes, seeing dead bodies or body parts during the rescue, and clearing up work period and female gender. In the adjusted models, significant positive correlates included being physically injured in the earthquakes and family or loved ones being physically injured in the earthquakes and female gender. Table 6 reports the association between the earthquake-related traumatic events quartile and total PTSD symptom levels, controlling for gender and age. The overall adjusted model was statistically significant, $R^2 = .14$, $F(12, 513) = 6.79$, $p < .001$.Those in the third quartile and those in the highest quartile had significantly higher levels of PTSD symptoms.

Discussion

The primary goal of this study was to examine the occurrence and correlates of ICD-11 PTSD in a convenience sample of people living in the earthquake-exposed regions of Turkey shortly after the disaster. Almost everyone surveyed reported exposure to at least one earthquake-related traumatic events, with the majority reporting exposure to four or more events. The most commonly endorsed earthquake-related traumatic events related to both loss of resources and damage to one's home. Significant gender differences were observed across the different types of earthquake-related traumatic events with females being more likely to report requiring food and water aid after the earthquake and males being more likely to report involvement in rescue work and exposure to dead bodies during the clearing up process. These findings align with research demonstrating how the experience of catastrophic events is markedly different for males and females such that males typically play a significant role in the rescue phase

Table 5. Regression analysis on PTSD symptom levels.

	Bivariate					Multivariate				
	B	*SE*	*β*	*t*	*p*	*B*	*SE*	*β*	*t*	*p*
Age	.009	(.018)	.022	.494	.622	.001	(.019)	.002	.051	.959
Gender (Female)	**2.545**	**(.516)**	**.211**	**4.936**	**<.001**	**3.08**	**(.533)**	**.255**	**5.777**	**<.001**
In the days following the earthquake did you have to spend the night somewhere other than in your home?	1.334	(1.007)	.058	1.325	.186	.764	(.972)	.033	.786	.432
Did you need food and water aid after the earthquake?	.885	(.688)	.056	1.286	.199	.000	(.736)	.000	.000	1.000
Was your home damaged in the earthquake?	**1.321**	**(.656)**	**.088**	**2.014**	**.045**	.710	(.776)	.047	.915	.361
Did you have to relocate because your house became structurally unsafe to live in?	.847	(.528)	.070	1.603	.109	−.678	(.640)	−.056	−1.058	.290
Were you physically injured in the earthquake?	**2.135**	**(.559)**	**.164**	**3.817**	**<.001**	**1.200**	**(.589)**	**.092**	**2.039**	**.042**
Were any members of your family or your loved ones physically injured in the earthquake?	**2.872**	**(.488)**	**.249**	**5.882**	**<.001**	**2.026**	**(.558)**	**.175**	**3.632**	**<.001**
Did you lose any members of your family in the earthquake?	**1.653**	**(.505)**	**.141**	**3.271**	**.001**	.176	.591	.015	.297	.766
Did you lose any relatives (e.g., aunts, uncles, cousins, grandparents) in the earthquake?	**1.696**	**(.500)**	**.146**	**3.392**	**< .001**	.665	.593	.057	1.121	.263
Were you involved in the rescue work?	.431	(.628)	.030	.686	.493	.329	.729	.023	.451	.652
Did you see any dead bodies or body parts during the rescue and clearing up work period?	**1.386**	**(.539)**	**.112**	**2.571**	**.010**	1.156	.623	.093	1.856	.064
R-squared						.137				

Abbreviations: B: unstandardized beta value; p: significance level; *SE*: standard error of B; *t*: *t*-statistic; *β*: standardized beta value.

while females often assume a caring role (Moreno et al., 2022). Overall, these findings offer a novel understanding of the severity of posttraumatic stress symptoms in the immediate wake of the earthquakes, as well as an overview of the characteristics of the survivors and the earthquakes that increase susceptibility to maladaptive posttraumatic stress reactions.

Consistent with the extant evidence base (e.g., Dai et al., 2016; Hosseinnejad et al., 2022; Tang et al., 2017), rates and overall levels of PTSD symptoms were extremely elevated in the current sample. The PTSD symptom cluster that was most pertinent to participants related to hyperarousal. This is unsurprising given that increased occurrence and frequency of earthquakes are expected in the affected regions for many years to come (Dal Zilio & Ampuero, 2023). The endorsement rates of all PTSD symptom clusters in the present study were substantially higher than those observed in studies conducted on other earthquake-exposed populations. For instance, Lai et al. (2004) found that in their sample of survivors of the 1999 Taiwanese earthquake (7.3 on Richter scale) that rates of endorsement of intrusion symptoms was 61.5%, avoidance/numbing symptoms was 12.3%, and hyperarousal symptoms was 48.4%. Another study conducted by Livanou et al. (2002) on survivors of the previous Turkish earthquake

Table 6. Regression Analysis of Cumulative Earthquake-Related Experiences on PTSD symptom levels.

	PTSD $\bar{x}$ (*SD*)	Multivariate				
		B	*SE*	*β*	*t*	*p*
Age		−.004	(.018)	−.054	−.984	.325
Gender (Female)	14.01 (5.50)	**3.007**	(.503)	.249	5.981	< .001
Earthquake-related traumatic events quartile 1	12.27 (5.88)	–	–	–	–	–
Earthquake-related traumatic events quartile 2	11.44 (5.76)	−.675	(.686)	−.054	−.984	.325
Earthquake-related traumatic events quartile 3	14.05 (5.54)	**2.065**	(.703)	.163	2.938	.003
Earthquake-related traumatic events quartile 4	15.13 (5.76)	**3.550**	(.762)	.251	4.657	<.001

Abbreviations: B: unstandardized beta value; *p*: significance level; *SE*: standard error of *B*; *t*: *t*-statistic; *β*: standardized beta value.

Note: Earthquake-related traumatic events quartile 1 = those scoring 25% on total number of traumas; Earthquake-related traumatic events quartile 2 = those scoring between 25.1% and 50% on total number of traumas; Earthquake-related traumatic events quartile 3 = those scoring 51% to 75% on total number of traumas; Earthquake-related traumatic events quartile 4 = those scoring 100% on total number of traumas.

(7.4 on Richter scale) also reported lower endorsement rates of the symptom clusters. The higher endorsement of these symptom clusters in the present study is likely attributable to the greater magnitude of the recent Turkish earthquakes, with research demonstrating magnitude of exposure to a natural disaster to represent a key risk factor of PTSD (Neria et al., 2008). Hence, this study provides initial evidence for a high burden of PTSD symptoms among survivors of the recent Turkish earthquakes, indicating that strategies for the assessment and treatment of PTSD should be implemented.

Overall, findings demonstrated that just over half of the sample met criteria for diagnosis of probable ICD-11 PTSD. The prevalence of PTSD in the present study is notably higher than the pooled estimates reported in a meta-analytic study where 28.76% of earthquake survivors met criteria for diagnosis of probable PTSD (based on DSM definitions) (Dai et al., 2016), yet comparable to rates observed following the Iranian and Pakistan. The prevalence of PTSD observed in the present study is also notably higher than those reported for the previous Turkish earthquake where prevalence rates have been found to range from 19.2% to 23% (Onder et al., 2006; Başoğlu et al., 2002). Again, it is possible that the greater magnitude of the most recent earthquake accounts for the higher prevalence of PTSD, supporting predictions that the Turkish earthquakes are likely to resulted in increased levels of trauma and PTSD as compared to the previous earthquake (Iqbal & Sheikh, 2023). Alternatively, assessment of PTSD in the current study was conducted soon after the exposure to the earthquakes whereas studies of prior Turkish earthquakes were conducted fourteen months (Başoğlu et al., 2002) and thirty-six months (Onder et al., 2006) following the earthquake. Research has shown how PTSD symptoms decrease during the first two years post-earthquake (Hosseinnejad et al., 2022; Karamustafalıoğlu et al., 2023), and hence, further research is

required to capture changes in the prevalence of PTSD among Turkish earthquake survivors over time.

Consistent with prior research conducted on earthquake-exposed populations (Tang et al., 2017) in addition to the broader PTSD literature (e.g., McGinty et al., 2021), rates of PTSD were highest among female survivors of the earthquakes. Numerous explanations have been proposed for the greater incidence of PTSD among females including that females are often exposed to traumas that are more likely to evoke a posttraumatic stress response (Tolin & Foa, 2006), as well as genetic predisposition and hormonal influences and fluctuations (Christiansen & Berke, 2020). However, when discussing these gender effects, it is important to mention that over two-thirds of the sample were female. Although (as highlighted) females have been frequently identified as being at greatest risk of PTSD, the poor representativity of males within the current study may preclude an accurate representation of the extent of PTSD among males in post-earthquake Turkey. Moreover, it may be a contributing factor to the high rates of PTSD in the current sample.

The final aim of the present study was to explore correlates of ICD-11 PTSD among the earthquake-exposed sample. First, associations with demographic (i.e., gender, age) and earthquake-related traumatic events were examined. Findings from the bivariate and multivariate analyses indicated that female gender was a significant correlate of PTSD, with possible explanations for this previously highlighted. Consistent with our initial hypothesis and previous research (Baral & Bhagawati, 2019; Dai et al., 2016; Tang et al., 2017), physical injury of the self as well as family or loved ones were identified as significant correlates of PTSD in both the bivariate and multivariate analyses. Notably, although the loss of family members and relatives in the earthquakes were significant correlates of PTSD in the bivariate analyses, these associations reached a level of statistical non-significance in the multivariate analyses. It is likely that the shared variance between these earthquake-related traumatic events and PTSD is fully accounted for by the other traumatic events included in the analysis. There are numerous ways to examine the impact of earthquake-related trauma exposure on risk of PTSD; with many studies investigating exposure in an aggregated form (e.g., Jin et al., 2014; Wang et al., 2020) and the current study investigated individual trauma types. There are advantages associated with both approaches such that the investigation of individual earthquake-related events in the present study enabled the identification of those experiences most highly associated with risk of PTSD (Kessler et al., 2017), whereas examining cumulative exposure to multiple types of earthquake-related experiences can also be a highly robust correlate of subsequent PTSD (e.g., Karam et al., 2014). To ensure that both

approaches were addressed, the association between demographics (i.e., gender, age) and earthquake-related traumatic events quartiles were also examined in the current study. Findings from the bivariate and multivariate analyses demonstrated how those in earthquake-related traumatic events quartile four were almost four times more likely to meet criteria for diagnosis of probable PTSD. This is an expected finding given the widely established dose-response association between trauma exposure and risk of PTSD (e.g., Cloitre et al., 2019; Kvedaraite et al., 2022). The analyses were all replicated for total PTSD symptom levels, with findings being mostly consistent with those for diagnostic status. Hence, this demonstrates that even if an individual fails to meet the diagnostic criteria for PTSD, the correlates of interest are still associated with higher levels of symptom severity.

Notably, the current study was unable to account for prior traumatic experiences when examining the association between earthquake-related traumatic events and risk of PTSD. Research has demonstrated prior trauma exposure and pre-trauma psychopathology to represent significant risk factors for subsequent trauma-related psychopathology (Sayed et al., 2015). This has also been evidenced in studies looking at risk factors of PTSD among earthquake survivors, where it has been shown that prior trauma exposure played a significant role in the development and onset of PTSD (e.g., Ehring et al., 2011; Tang et al., 2017). Hence, it is not possible to discount the possibility that the increased risk of PTSD among particular participants may be driven by preexisting traumas and psychopathologies. Moreover, Complex PTSD (CPTSD) typically develops in response to exposure to multiple, repeated, and prolonged interpersonal traumas from which escape is often difficult (Hyland et al., 2017). Hence, future research may wish to examine the association between poly-traumatisation (co-occurring traumatic events that are both earthquake and non-earthquake related) and risk of CPTSD.

Despite being the first study to examine the prevalence and correlates of PTSD among survivors of the recent Turkish earthquakes, findings from this study should be considered in light of several limitations. First, participants were recruited using convenience sampling methods and hence, the generalizability to the wider earthquake affected Turkish population is uncertain. Second, and as previously mentioned, the gender composition of the present sample comprised of females for the majority, and thus research is now needed using more representative samples. Third, and also as previously mentioned, only earthquake-related traumatic events were included in this study while PTSD was examined only with respect to the earthquake. Fourth, given the recency of the earthquake, it was deemed that the examination of Complex PTSD (CPTSD) may be inappropriate. Research is necessary to determine the prevalence of CPTSD among

survivors in the future. Finally, because the data collection took place shortly after the earthquakes, the questionnaires were designed to be quick and simple to complete. As a result, many potentially significant factors, including relationships, education, and mental history, were not examined.

Overall, the current study indicates high levels of PTSD among survivors of the recent Turkish earthquake. The identification of correlates associated with increased risk of PTSD symptom levels and diagnostic status such as female gender, physical injury in the earthquake, physical injury of family or loved ones in the earthquake and cumulative trauma exposure is useful for identifying Turkish earthquake survivors who are most likely to need psychological support following the earthquake.

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ORCID

Emre Han Alpay http://orcid.org/0000-0002-3479-2013
Enya Redican http://orcid.org/0000-0002-8863-2234
Philip Hyland http://orcid.org/0000-0002-9574-7128
Mark Shevlin http://orcid.org/0000-0001-6262-5223

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