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Examination of trauma levels and earthquake stress coping strategies of university students who exercise and do not exercise after an earthquake

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Abstract

Background Earthquakes are calamities of devastating nature that induce longterm post traumatic stress on affected victims. As such, they are recognized worldwide as being huge sources of stress. In this research study, the first objective is to assess the level of trauma and earthquake stress of university students who exercise and those who do not.

Methods This study utilized the descriptive survey research method. The sample comprised 378 male and 300 female students who experienced the socially detrimental 7.7 Mw and 7.6 Mw earthquakes in Turkey on February 6, 2023. The data were both face-to-face and via computer-administered questionnaire with the tools of “Post-Earthquake Trauma Level Scale” and “Earthquake Stress Coping Strategies Scale.” After checking for normality, the parametric tests were used, the t-test to compare two groups of data, and ANOVA for three or more groups of data. Furthermore, Pearson correlation analyses were performed to compare the interactions between students who exercise and those who do not.

Results The study found that gender affected trauma levels, with female students ($X = 73.483$) exhibiting significantly higher trauma levels than male students ($X = 68.799$) ($p < 0.001$). Students who engaged in regular physical activity ($X = 67.71$) were found to have lower trauma levels compared to those who did not exercise ($X = 71.97$). Participants who feared being caught by the earthquake at home or school ($X = 73.32$), experienced the loss of someone close ($X = 88.10$) or believed that adequate precautions against the earthquake had not been taken ($X = 71.73$) had higher trauma scores. According to the results of the ANOVA test, students from the Departments of Sports Sciences ($X = 69.78$) and Religious Studies ($X = 69.63$) were observed to have lower trauma levels. Pearson correlation analysis showed a positive and moderate relationship between trauma levels and earthquake stress coping strategies among students who engaged in regular physical activity ($r = .176$, $p < 0.01$).

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Conclusions The research identified that factors such as gender, regular exercise, the experience of losing a loved one, and the perception that insufficient precautions were taken all significantly influence trauma levels. Moreover, the findings highlighted that regular physical exercise serves as an effective strategy for managing and coping with trauma.

Keywords Earthquake, Trauma, Posttraumatic stress, Anxiety, Sports

Introduction

Earthquakes, resulting from fractures in the Earth's crust that release stored energy as seismic waves, are among the most devastating natural disasters [1]. Turkey, situated on the seismically active Anatolian Plate within the Alpine–Himalayan seismic belt, has experienced over 20 earthquakes exceeding 7 Mw since 1900 [89]. Natural disasters can abruptly disrupt societies as universal stressors, affecting their psychological and social structures across cultures [3].

On February 6, 2023, two consecutive earthquakes measuring 7.7 Mw and 7.6 Mw struck Kahramanmaraş, followed by a 6.4 Mw quake in Hatay on February 20 [4, 5]. Known as the "Disaster of the Century," these events caused catastrophic damage across 11 provinces and 62 districts, including Kahramanmaraş, Hatay, Adıyaman, Gaziantep, Malatya, Şanlıurfa, Kilis, Osmaniye, Adana, Diyarbakır, and Elâzığ. In response, Turkey appealed internationally for assistance [3, 7].

The disaster resulted in 50,783 fatalities—including 7,302 foreign nationals—and left 107,000 individuals injured [102]. Thousands remained missing, homeless, or unemployed. Among the victims were 1,589 students and 148 academic staff members. In addition, 631,430 students were indirectly affected by displacement or regional disruption [9, 10], prompting a transition to remote education in affected universities as of February 20, 2023 [107].

Survivors endured substantial trauma stemming from personal injuries, the loss of loved ones, and the destruction of homes. Students, academic personnel, and administrative staff experienced acute psychological stress in the aftermath [6]. The literature documents long-term psychiatric consequences among survivors, including post-traumatic stress disorder (PTSD), often exacerbated by social dislocation and inadequate support systems [8, 11, 90, 103, 106]. PTSD commonly arises from exposure to life-threatening events, manifesting through intrusive symptoms and heightened arousal responses [8, 11].

Chronic post-earthquake stress is frequently driven by financial, social, and familial instability [12]. Factors such as age, gender, education level, economic loss, perceived social support, and direct exposure to the disaster influence the severity of PTSD symptoms [106].

These psychological impacts often extend to changes in beliefs, behaviour, and social interactions [13, 14]. While many individuals show resilience, effective recovery often hinges on cognitive coping strategies and access to personal and community resources [14]. Without adequate psychological support, ongoing anxiety and attentional deficits may hinder academic performance and functional recovery [15]. Addressing trauma-related disorders is essential to reduce the long-term emotional and social costs, yet research on extended psychological outcomes remains limited [90]. Even 18 months later, the quake's psychological aftermath shapes societal dynamics and is expected to persist.

In this context, exercise is a valuable component of post-disaster recovery, offering physiological and psychological benefits [16, 17, 24]. Physically, it enhances cerebral blood flow, modulates neurotransmitter activity, reduces muscular tension, and promotes structural brain adaptations, such as increased endocannabinoid receptor density. Psychologically, regular low-intensity exercise fosters self-efficacy, social connection, and self-esteem, helping to reduce stress [25]. Empirical studies affirm these benefits: Diaz and Motta (2008) reported reduced PTSD symptoms in adolescents following an aerobic intervention, while Rosenbaum et al. (2015) demonstrated that a walking and resistance training program significantly improved PTSD symptoms compared to standard treatment [26, 27].

Following the 2011 Japan earthquake, group exercise and health education programs were shown to improve survivors' mental health and quality of life [28]. Exercise enhances the body's resilience by regulating stress hormones and has antidepressant and anxiolytic effects [29, 30]. Physical activity, especially outdoors, reduces stress and supports mental well-being. Regular exercise also alleviates depressive symptoms, boosts self-confidence, regulates sleep, and helps prevent conditions such as obesity and depression [31, 32]. Alongside exercise, balanced nutrition and adequate sleep are vital for a healthy lifestyle [33, 34, 35, 113]. Even 30 min of aerobic exercise can lower cortisol responses to stress and reduce risks of cardiovascular diseases, stroke, and cancer [36, 37].

Turkey's seismic context and study rationale

Turkey's tectonic positioning—at the intersection of the African, Arabian, Eurasian, and Aegean plates—makes it highly susceptible to seismic activity, including subduction, continental collision, and deformation processes [79, 110, 115, 116]. This geographical vulnerability underscores the relevance of investigating trauma and rehabilitation in the Turkish context.

Research focus and contribution

While the existing literature highlights psychological outcomes such as trauma, anxiety, and depression in earthquake survivors [38, 39], limited studies have explored the specific role of exercise in alleviating these effects. This study addresses that gap by comparing trauma levels between university students who engage in physical activity and those who do not. Prior research has typically focused on the general population or professional groups, such as teachers [40–42]; this study instead concentrates on university students, examining the academic, social, and emotional disruptions they face.

By evaluating trauma symptoms and coping mechanisms across physically active and inactive students, this study provides empirical evidence of the psychosocial benefits of exercise. The findings contribute to validating physical activity as a therapeutic intervention and aim to inform institutional policies and support programs. Focusing on the most severely affected regions—Kahramanmaraş, Hatay, Diyarbakır, Adıyaman, Gaziantep, Malatya, Şanlıurfa, Kilis, Osmaniye, Adana, and Elazığ—the research also examines individual differences in trauma response based on gender, academic discipline, and levels of physical activity, aiming to generate actionable insights to guide post-disaster rehabilitation efforts.

Materials and methods

This section explains the details regarding the research model, the study group, and the process of developing the measurement tool.

Research design

This research was conducted via a descriptive approach within the survey model, which is a quantitative research method. Survey models are research approaches that aim to describe a situation (event, person, or object) as it exists, within its conditions, whether in the past or present [18].

Research aim

This study aims to examine the posttraumatic stress levels of university students who engage in sports and those

who do not, as well as their coping strategies for earthquake-related stress across various variables. In line with this aim, the following research questions are addressed:

- *Do students' posttraumatic stress levels differ by gender?*
- *Do students' posttraumatic stress levels differ by their field of study?*
- *Do students' posttraumatic stress levels differ on the basis of their level of physical activity?*
- *Do students' earthquake stress coping strategies differ by gender?*
- *Do students' earthquake stress coping strategies differ by their field of study?*
- *Do students' earthquake stress coping strategies differ on the basis of their engagement in physical activity?*

Participants

The population of this study consists of students who are enrolled in or were physically present during the earthquakes in the provinces of Kahramanmaraş, Hatay, Adıyaman, Gaziantep, Malatya, Şanlıurfa, Kilis, Osmaniye, Adana, Diyarbakır, and Elazığ on February 6 and 20, 2023. The sample includes students who were physically present in these provinces during the earthquakes and those whose families reside in these regions but who were in other provinces at the time of the earthquakes. Thus, students who experienced the earthquake directly or indirectly were included in the sample. Purposive sampling was used to determine the sample, and simple random sampling was then applied to select participants from the eligible candidates, ensuring equal selection probability. A sample is a subset selected from a population according to specific rules, which is assumed to represent the population sufficiently [18]. The impartiality and representativeness of the population are crucial in this context [19].

Data collection

The "Post-Earthquake Trauma Level Scale (PETLS)", developed by Tanhan & Kayri in 2013, and the "Earthquake Stress Coping Scale (ESCS)", developed by Yöndem & Eren in 2008, were used in this study [2, 19]. A review of the relevant literature was conducted to identify specific characteristics of the volunteers who participated in the research. A "Personal Information Form," prepared by the researchers, was used to collect data on variables related to these concepts. As part of this study, the scales designed to assess trauma levels and stress-coping strategies of university students affected by

the earthquake were administered face-to-face to participants accessible at school, while online forms facilitated participation of those who could not be reached in person.

Personal information form

Participants who voluntarily took part in the study were administered a form collecting detailed information on their gender, academic department (e.g., Sports Sciences, Religious Sciences, Health Sciences, Natural and Mathematical Sciences, Educational Sciences, Social Sciences), fear of experiencing an earthquake at school or home, regular physical activity habits, perceptions regarding the adequacy of earthquake preparedness measures, experiences of loss of life among family or acquaintances, age, economic status, and duration of regular physical activity.

Post-earthquake trauma level scale (PETLS)

In this study, the validity and reliability of the PETLS were established by Tanhan and Kayri (2023). The scale is rated on a five-point Likert scale ranging from "Strongly Disagree (1), Somewhat Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5)" and consists of 20 items. The scale includes five subdimensions: "Behavioral Problems, Emotional Limitation, Affective, Cognitive Structure, and Sleep Problems" [19]. In the validity and reliability study of the PETLS conducted by Tanhan and Kayri (2013), Cronbach's Alpha coefficient was calculated as $\alpha=0.87$. This study calculated the Cronbach's Alpha coefficient for PETLS as $\alpha=0.820$. In the literature, Cronbach's Alpha values of 0.80 and above indicate that the measurement tool is highly reliable [46, 47, 93]. In this context, the $\alpha=0.820$ Cronbach's Alpha value obtained in our study supports the notion that PETLS is a psychometrically strong and reliable tool, despite varying definitions in the literature, and falls within acceptable threshold values.

The scale's scores range from a minimum of 20 to a maximum of 100. Based on the reliability and validity analysis conducted by the author, a score of 52.385 ± 5.051 has been identified as the critical threshold indicating traumatization among individuals. Scores falling below this threshold correspond to low levels of traumatization, whereas those exceeding it denote high levels. Furthermore, an increase in scores reflects a greater degree of impact experienced by individuals due to the earthquake.

Studies of the earthquake stress coping scale (ESCS)

In this study, the validity and reliability of the "ESCS" were established by Yöndem and Eren (2008). The scale is rated on a four-point Likert scale ranging from "Never (1)" to "Always (4)" and consists of 16 items. The scale includes three subdimensions: positive reappraisal,

seeking social support, and religious coping [2]. In the validity and reliability study of the ESCS conducted by Yöndem and Eren (2008), the Cronbach's Alpha coefficients were found to be $\alpha=0.85$ for religious coping, $\alpha=0.69$ for positive reappraisal, and $\alpha=0.74$ for seeking social support. This study calculated the Cronbach's Alpha value for ESCS as $\alpha=0.664$. While different definitions exist, this value demonstrates the scale's internal consistency. It is an important criterion for evaluating the scale's reliability, falling within acceptable threshold values [46, 47, 93]. Higher scores obtained for each subdimension indicate that the individual employs the corresponding coping strategy more frequently, while lower scores suggest less frequent use; this finding has also been reported by the author(s) who conducted the scale's reliability study.

Statistical analyses

A normality analysis was conducted on the collected data, and it was determined that the data met the assumption of normality, allowing for the application of parametric tests. The research findings were analysed via IBM SPSS 27 software. Descriptive statistical methods (count, percentage, mean, standard deviation) were employed to evaluate the data. A t test was used to compare continuous quantitative data between two independent groups, and the effect size was examined via the eta-square (η^2) test. In the literature, eta-squared values of 0.01 are considered small, 0.06 medium, and 0.14 large [20, 21, 22, 23, 109, 111]; a one-way ANOVA test was conducted for comparisons involving more than two independent groups. For participants who engaged in physical activity and those who did not, Pearson correlation tests were used, with the correlation coefficients varying across disciplines, regardless of sign [20, 21, 22, 23, 54, 111]. The correlation coefficients, irrespective of sign, were interpreted as follows: 0.10–0.29 small, 0.30–0.49 medium, and 0.50–1.00 large [20, 25, 84, 93, 111, 112]. The findings were analysed with a 95% confidence interval and a 5% significance level. The results were considered significant at $p < 0.05$. Higher total and subscale scores from the measurement tools administered to participants indicated a more significant use of earthquake coping strategies. In comparison, lower mean scores indicated less use of such strategies. Similarly, higher scores on the Post-Earthquake Trauma Assessment Scale and its subscales indicate higher levels of trauma among individuals.

According to the data presented in Table 1, the participants' mean scores were as follows: ESC reached a mean of 51.17, "Religious Coping"—17.06, "Positive Reappraisal"—19.61, "Seeking Social Support" subscale—14.50, PETLS—70.94, "Behavioral Problems"—13.93, "Emotional Constraint"—17.60, "Affective"—13.73, "Since the Skewness

Table 1 Skewness and kurtosis values of the scale scores administered to participants

		N	Mean	Sum	Min	Max	Skewness	Std. Error	Kurtosis	Std. Error
ESCS	Total	678	51.17	34,696	28	64	-.322	.094	.124	.187
	Religious Coping	678	17.06	11,569	5	20	-.917	.094	.400	.187
	Positive Reappraisal	678	19.61	13,297	9	24	-.629	.094	.181	.187
	Seeking Social Support	678	14.50	48,100	6	20	-.140	.094	-.671	.187
PETLS	Total	678	70.94	9830	37	100	-.077	.094	-.190	.187
	Behavioral Problems	678	13.93	9445	4	20	-.368	.094	.525	.187
	Emotional Constraint	678	17.60	11,931	6	25	-.136	.094	-.493	.187
	Affective	678	13.73	9310	4	20	-.051	.094	-.700	.187
	Cognitive Structure	678	14.16	9602	4	20	-.197	.094	.260	.187
	Sleep Disorders	678	11.52	7812	3	17	-.570	.094	-.337	.187

ESCS postearthquake trajectory level scale, PETLS postearthquake trajectory level scale

and Kurtosis values of the data fell within a range of -1.5 and $+1.5$, the data under analysis followed a normal distribution [56]. Others that we did not include in the analysis for the current study violated the normality assumption in this case by being outliers. On these grounds, the normality of the data was deemed met, and parametric tests were used for the analyses.

Results

The data obtained from students are addressed in this section through descriptive analyses

According to Table 2, 55.8% of the participants were male, and 44.2% were female, with the largest group of students from the Faculty of Sports Sciences (26.4%). Most participants (78.5%) believed adequate measures were not taken regarding earthquake preparedness. Additionally, 56.9% reported experiencing fear of an earthquake at school or

home. Only 25.7% of the participants engaged in regular physical activity. These findings provide valuable insights into perceptions of safety and psychosocial impacts following the earthquake, serving as a foundation for developing targeted support and intervention programs.

In Table 3, a statistically significant difference was found between male and female participants in the study group regarding the overall ESCS total score, as were the subscale means for "Religious Coping," "Positive Reappraisal," and "Seeking Social Support" ($p < 0.01$). The mean ESCS total score for male participants was 49.59 ± 5.406 , whereas for female participants, it was 53.17 ± 6.975 . The effect size for this statistically significant difference was determined to be Eta-squared (η^2) = 0.078, indicating a medium effect, with 7.76% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.279$ and $d = 0.583$.

Table 2 The demographic statistics and frequency distribution of the participants were analyzed

Variable	Group	f	%
Gender	Male	378	55.8
	Female	300	44.2
Department	Department of Sports Sciences	179	26.4
	Department of Religious Sciences	131	19.3
	Department of Health Sciences	118	17.4
	Department of Natural and Mathematical Sciences	78	11.5
	Department of Educational Sciences	104	15.3
	Department of Social Sciences	68	10.0
Do you have a fear of experiencing an earthquake at school or at home?	Yes	386	56.9
	No	292	43.1
Do you do regular sports?	Yes	174	25.7
	No	504	74.3
Do you believe that adequate measures have been taken against the earthquake?	Yes	146	21.5
	No	532	78.5
Is there any loss of life in your family or acquaintances?	Yes	47	6.9
	No	631	93.1

Table 3 Independent samples test results for total and subscale mean scores of PETLS and ESCS by gender in the study group

Scale & Subdimension		Variable	n	Mean	SD	t-test		
						t	df	P
ESCS	ESCS -Total	Male	378	49.59	5.406	-7.541	676	.000*
		Female	300	53.17	6.975			
	Religious Coping	Male	378	16.71	2.870	-3.728	653.208	.000*
		Female	300	17.51	2.743			
	Positive Reappraisal	Male	378	19.16	2.776	-4.674	630.371	.000*
		Female	300	20.18	2.882			
	Seeking Social Support	Male	378	13.72	2.855	-7.574	676	.000*
		Female	300	15.48	3.164			
PETLS-	PETLS- Total	Male	378	68.799	10.568	-5.474	676	.001*
		Female	300	73.483	11.665			
	Behavioral Problems	Male	378	13.720	2.939	-1.923	634	.05*
		Female	300	14.163	3.020			
	Emotional Constraint	Male	378	16.992	3.889	-4.279	676	.001*
		Female	300	18.357	4.403			
	Affective	Male	378	13.209	3.661	-4.050	627,342	.001*
		Female	300	14.387	3.837			
	Cognitive Structure	Male	378	13.696	2.834	-4.707	648	.001*
		Female	300	14.713	2.765			
	Sleep Disorders	Male	378	11.183	3.090	-3.048	676	.02*
		Female	300	11.863	2.612			

* $p < .05$, ESCS Earthquake Stress Coping Scale, PETLS postearthquake trauma level scale

The mean score for male participants on the "Religious Coping (ESCS)" subscale was 16.71 ± 2.870 , whereas for female participants, it was 17.51 ± 2.743 . The effect size for this statistically significant difference was determined to be Eta-squared (η^2) = 0.020, indicating a small effect, with 2.01% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.142$ and $d = 0.288$.

The mean score for male participants on the "Positive Reappraisal (ESCS)" subscale was 19.16 ± 2.776 , whereas the mean score for female participants was 20.18 ± 2.882 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.031, indicating a small effect, with 3.13% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.177$ and $d = 0.361$.

The mean score for male participants on the "Seeking Social Support (ESCS)" subscale was 13.72 ± 2.855 , whereas the mean score for female participants was 15.48 ± 3.164 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.078, indicating a medium effect, with 7.82% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.280$ and $d = 0.361$.

In Table 3, statistically significant differences were found between male and female participants in the study group

regarding the total "PETLS" scale score, as well as the subscale mean scores for "Behavioral Problems," "Emotional Constraint," "Affective," "Cognitive Structure," and "Sleep Disorders." The mean total "PETLS" score for male participants was 68.799 ± 10.568 , whereas for female participants, it was 73.483 ± 11.665 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.042, indicating a medium effect, with 4.245% of the total variance explained by the independent variable (gender). The other effect sizes were calculated as $r = 0.206$ and $d = 0.423$.

The mean score for male participants on the "Behavioral Problems (PETLS)" subscale was 13.720 ± 2.939 , whereas for female participants, it was 14.163 ± 3.020 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.005, indicating a small effect, with 0.5% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.162$ and $d = 0.149$.

The mean score for male participants on the "Emotional Constraint (PETLS)" subscale was 16.992 ± 3.889 , whereas the mean score for female participants was 18.357 ± 4.403 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.026, indicating a small effect, with 2.637% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.177$ and $d = 0.331$.

The mean score for male participants on the "Affective (PETLS)" subscale was 13.209 ± 3.661 , whereas the mean score for female participants was 14.387 ± 3.837 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.024, indicating a small effect, with 2.369% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.154$ and $d = 0.313$.

The mean score for male participants on the "cognitive structure (PETLS)" subscale was 13.696 ± 2.834 , whereas the mean score for female participants was 14.713 ± 2.765 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.032, indicating a small effect, with 3.173% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.178$ and $d = 0.364$.

The mean score for male participants on the "Sleep Disorders (PETLS)" subscale was 11.183 ± 3.090 , whereas the mean score for female participants was 11.863 ± 2.612 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.014, indicating a small effect, with 1.356% of the total variance explained by the independent variable (gender). The effect sizes were calculated as $r = 0.116$ and $d = 0.236$.

As shown in Table 4, no statistically significant difference was found in the overall "ESCS" scale mean scores based on the participants' responses to the question "Do you do regular sports?" ($p > 0.325$).

However, a statistically significant difference was found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Do you believe that adequate measures have been taken against the earthquake?" ($p < 0.002$). The mean score for participants who believed that adequate measures had not been taken was 51.57 ± 6.687 , whereas the mean score for those who believed that adequate measures had been fully taken was 49.74 ± 4.973 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.014, indicating a medium effect, with 1.381% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.118$ and $d = 0.287$.

A statistically significant difference was found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Is there any loss of life in your family or acquaintances?" ($p < 0.001$). The mean score for participants who had experienced loss of life in their family or acquaintances was 54.1 ± 7.56 , whereas the mean score for those who had not experienced such loss was 51.00 ± 6.26 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.015, indicating a medium effect, with 1.544% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.124$ and $d = 0.492$.

A statistically significant difference was also found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Do you have a fear of experiencing an earthquake at

Table 4 Independent samples test results for total and subscale mean scores of PETLS and ESCS according to demographic variables in the study group

Scale	Variable	Category	n	X	SD	t test		
						t	df	P
ESCS	Do you do regular sports?	Yes	174	51.59	4.831	.985	676	.325
		No	504	51.03	6.855			
	Do you believe that adequate measures have been taken against the earthquake?	Yes	146	49.74	4.973	-3.077	676	.002*
		No	532	51.57	6.687			
	Is there any loss of life in your family or acquaintances?	Yes	47	54.10	7.560	3.256	676	.001*
		No	631	51.00	6.260			
	Do you have a fear of experiencing an earthquake at school or at home?	Yes	386	52.73	6.078	7.525	617.948	.001*
		No	292	49.12	6.241			
PETLS	Do You Do Regular Sports?	Yes	174	67.71	10.208	-4.341	676	.001*
		No	504	71.97	11.462			
	Do You Believe that Adequate Measures have been Taken Against the Earthquake?	Yes	146	67.77	11.165	-3.790	231.291	.001*
		No	532	71.73	11.198			
	Is There Any Loss of Life in Your Family or Acquaintances?	Yes	47	88.10	14.200	8.771	49.413	.001*
		No	631	69.60	9.938			
	Do you have a fear of experiencing an earthquake at school or at home?	Yes	386	73.32	11.803	6.681	676	.001*
		No	292	67.64	9.717			

* $p < .05$, ESCS Earthquake Stress Coping Scale, PETLS postearthquake trauma level scale

school or home?" ($p < 0.001$). The mean score for participants who reported having a fear of experiencing an earthquake at school or home was 52.73 ± 6.078 , whereas those without such fear had a mean score of 49.12 ± 6.241 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.077, indicating a significant effect, with 7.525% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.290$ and $d = 0.584$.

In Table 4, a statistically significant difference was found in the overall "PETLS" scale mean scores based on participants' responses to the question "Do you do regular sports?" ($p < 0.001$). The mean score for participants who engaged in regular sports was 67.71 ± 10.208 , whereas for those who did not, the mean score was 71.97 ± 11.462 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.027, indicating a medium effect, with 2.712% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.165$ and $d = 0.382$.

No statistically significant difference was found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Do you believe that adequate measures have been taken against the earthquake?" ($p < 0.001$). The mean score for participants who believed that adequate measures had not been taken was 71.73 ± 11.198 , whereas those who believed that adequate measures had been fully taken had a mean score of 67.77 ± 11.165 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.021, indicating a medium effect, with 2.081% of

the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.242$ and $d = 0.354$.

A statistically significant difference was found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Is there any loss of life in your family or acquaintances?" ($p < 0.001$). The mean score for participants who experienced a loss of life in their family or acquaintances was 88.10 ± 14.20 , whereas the mean score for those who did not experience such a loss was 69.60 ± 9.938 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.102, indicating a medium effect, with 10.217% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.780$ and $d = 1.326$.

A statistically significant difference was also found in the overall "ESCS" scale mean scores based on participants' responses to the following question: "Do you have a fear of experiencing an earthquake at school or home?" ($p < 0.001$). The mean score for participants who reported having a fear of experiencing an earthquake at school or home was 73.32 ± 11.803 , whereas those without such fear had a mean score of 67.74 ± 9.717 . The effect size for this significant difference was determined to be Eta-squared (η^2) = 0.062, indicating a significant effect, with 6.194% of the total variance explained by the independent variable. The other effect sizes were calculated as $r = 0.249$ and $d = 0.518$.

In Table 5, In the study group, the mean ESCS score for students in the Sports Sciences department was 50.65 ± 6.219 , whereas the mean scores for participants

Table 5 ANOVA test results for the total ESCS and PETLS scores and subscale mean scores based on the academic department variable of participants in the study group

Scale	Category	N	X	Ss	Source of Variance	KT	sd	KO	F	P	Significant
ESCS	Sports Sciences ^(a)	179	50.65	6.219	Between G	70.981	5	14.196	.345	.885	-
	Religious Sciences ^(b)	131	51.45	6.608	Within G	27,646.482	672	41.141			
	Health Sciences ^(c)	118	51.29	6.709	Total	27,717.463	677				
	Natural and Mathematical Science ^(d)	78	51.42	6.115							
	Educational Sciences ^(e)	104	51.21	6.441							
	Social Sciences ^(f)	68	51.47	6.309							
	Total	678	51.17	6.399							
PETLS	Sports Sciences ^(a)	179	69.78	11,141	Between G	982.827	5	194,809	1,515	.174	-
	Religious Sciences ^(b)	131	69.63	11,304	Within G	85,481.009	672	128,607			
	Health Sciences ^(c)	118	72.83	11,609	Total	86,463.386	677				
	Natural and Mathematical Science ^(d)	78	71.89	10,932							
	Educational Sciences ^(e)	104	71.44	11,480							
	Social Sciences ^(f)	68	70.66	11,081							
	Total	678	70.87	11,301							

ESCS studies of earthquake stress coping scale, PETLS postearthquake trauma level scale

Table 6 Pearson correlation analysis test results between the overall averages of the ESCS and PETLS scales and subscale mean scores of participants who engage in sports

		X	SS	ESCS -Total	Religious Coping	Positive Reappraisal	Seeking Social Support
PETLS- Total	r	67.71	10.209	.176*	-.038	-.044	.394**
Behavioral Problems	r	13.43	2.912	.016	-.039	.029	.040
Emotional Constraint	r	16.96	4.029	.144	-.022	-.014	.293**
Affective	r	12.56	3.623	.023	-.103	-.055	.190*
Cognitive Structure	r	13.56	2.846	.082	.000	-.086	.225**
Sleep Disorders	r	11.20	3.149	.271**	.058	-.011	.444**

** . $P < 0.01$, * . $P < 0.05$, ESCS Earthquake Stress Coping Scale, PETLS Post-Earthquake Trauma Level Scale

Table 7 Pearson correlation analysis test results between the overall averages of the ESCS and PETLS scales and subscale mean scores of participants who do not engage in sports

		X	SS	ESCS -Total	Religious Coping	Positive Reappraisal	Seeking Social Support
PETLS- Total	r	71.964	11.463	.0604	-.011	-.008	.145**
Behavioral Problems	r	14.085	2.989	.001	.001	-.003	.0045
Emotional Constraint	r	17.815	4.208	-.041	-.103*	-.057	.0595
Affective	r	14.133	3.757	.066	.051	-.009	.102*
Cognitive Structure	r	14.349	2.822	.118**	.050	.058	.150**
Sleep Disorders	r	11.581	2.814	.098*	-.011	.008	.209**

** . $P < 0.01$, * . $P < 0.05$, ESCS Earthquake Stress Coping Scale, PETLS Post-Earthquake Trauma Level Scale

in the Theology, Health Sciences, Natural Sciences, Education Sciences, and Social Sciences departments were 51.45 ± 6.608 , 51.29 ± 6.709 , 51.42 ± 6.115 , 51.21 ± 6.441 , and 51.47 ± 6.309 , respectively. The mean PETLS score for students in the Sports Sciences department was 69.78 ± 11.14 , whereas the mean scores for participants in the Theology, Health Sciences, Natural Sciences, Education Sciences, and Social Sciences departments were 69.63 ± 11.30 , 72.83 ± 11.60 , 71.89 ± 10.93 , 71.44 ± 11.48 , and 70.66 ± 11.08 , respectively. There was no statistically significant difference in PETLS scores between the groups based on their academic departments ($F = 0.174$; $p > 0.05$).

The following two paragraphs pertain to the description titled “Table 6: Pearson correlation analysis test results between the overall averages of the ESCS and PETLS scales and subscale mean scores of participants who engage in sports.” Therefore, Table 6 should be placed here accordingly. A positive and statistically significant low-level correlation was found between PETLS-Total and ESCS-Total scores among participants who engaged in regular sports ($r = 0.176$, $p < 0.01$). Additionally, a positive and statistically significant moderate correlation was found between PETLS-Total and “seeking

social support” ($r = 0.394$, $p < 0.01$). A positive and statistically significant moderate correlation was also identified between emotional constraint_(PETLS) and seeking social support_(ESCS) ($r = 0.293$, $p < 0.01$).

A positive and statistically significant low-level correlation was found between “affective_(PETLS)” and “seeking social support_(ESCS)” ($r = 0.190$, $p < 0.01$). Similarly, a positive and statistically significant low-level correlation was found between “cognitive structure_(PETLS)” and “seeking social support_(ESCS)” ($r = 0.225$, $p < 0.01$). A positive and statistically significant moderate correlation was identified between “sleep disorders_(PETLS)” and “seeking social support_(ESCS)” ($r = 0.444$, $p < 0.01$). Finally, a positive and statistically significant moderate correlation was found between “sleep disorders_(PETLS)” score and the ESCS-Total score ($r = 0.271$, $p < 0.01$).

The following two paragraphs correspond to the description titled “Table 7: Pearson correlation analysis test results between the overall averages of the ESCS and PETLS scales and subscale mean scores of participants who do not engage in sports.” Therefore, Table 7 should be placed here accordingly. Among participants who do

not engage in regular sports, a positive and statistically significant low-level correlation was found between PETLS-Total and positive reappraisal ($r=0.145$, $p<0.01$).

A negative and statistically significant low-level correlation was identified between the "Emotional Constraint (PETLS)" subscale and the "Religious Coping (ESCS)" subscale ($r=0.103$, $p<0.01$).

A positive and statistically significant small correlation was found between the "affective (ESCS)" subscale and the "positive reappraisal (ESCS)" subscale ($r=0.102$, $p<0.01$).

Positive and statistically significant small correlations were also found between the "cognitive structure (PETLS)" subscale and ESCS-Total, as well as the "positive reappraisal (ESCS)" subscale ($r=0.118$, $p<0.01$; $r=0.150$, $p<0.01$, respectively).

A positive and statistically significant small correlation was identified between the "sleep disorders (PETLS)" subscale and the "positive reappraisal (ESCS)" subscale ($r=0.209$, $p<0.01$).

Discussion

This In this study, the levels of trauma experienced by university students who engage in sports and those who do not, as well as their coping strategies after an earthquake, were examined in terms of demographic variables such as gender, department, and class. According to the research findings, statistically significant differences were identified between the genders of participating students in terms of the overall score and sub-dimensions of the ESCS scale (Table 3). It was found that female students scored higher on the Earthquake Stress Coping Scale (ESCS) than male students after the earthquake. This indicates that women employ coping strategies for stress more frequently than men. The literature includes findings suggesting that women are more inclined to seek emotional support and adopt coping strategies for dealing with stress [57].

In the "Religious Coping" subscale, it was found that women ($X=17.51$) had higher mean scores than men ($X=16.71$). This indicates that women are more likely to turn to religious elements following an earthquake than men. Notably, in societies with Islamic faith, such as Turkey, it has been observed that women utilize religious practices (e.g., prayer) as a coping strategy. Waithaka and Gough (2017), in their study titled "The Influence of Religion on Stress and Coping of College Students," found that female college students employ religious coping strategies more intensively than their male counterparts (pp. 33–34) [58]. Similarly, Dennis et al. (2004) reported that women exhibit higher levels of spiritual commitment than men [59]. These findings align with the broader literature indicating that women are more likely to utilize

religious coping strategies following traumatic events. It is well established that religious coping constitutes a prevalent and effective method for managing stress in traumatic events such as earthquakes, with faith playing a crucial role in mitigating stress and promoting psychological well-being [60, 61]. Chan and Rhodes (2013) demonstrated that among low-income women, positive religious coping is significantly associated with posttraumatic growth (PTG), whereas negative religious coping correlates with psychological distress (GPD). Moreover, they highlighted that women's level of religious commitment enhances positive religious coping. Ayten and Sağır (2014) reported that both positive and negative religious coping strategies are linked to depressive tendencies. The meta-analysis conducted by Ano and Vasconcelles (2005) further substantiates these associations, revealing that positive religious coping is related to psychological well-being, while negative religious coping is connected with adverse psychological outcomes [62]. Byrd and McKinney (2012) emphasized that strong spiritual identity and practical coping skills positively influence mental health [63]. Pargament et al. (1998) characterized positive religious coping as encompassing spiritual satisfaction, support, and forgiveness, whereas negative religious coping was described in terms of punitive religious perceptions and spiritual dissatisfaction; however, they did not explore gender differences [64]. These findings suggest that women tend to turn toward spiritual resources to enhance their psychological resilience and that the stress-buffering effects of faith are more pronounced among women. Accordingly, the higher religious coping scores observed among female participants in our study are consistent with the literature linking religious coping to psychological well-being and underscore the pivotal role of religious belief in women's psychosocial recovery following disasters.

A study conducted by Şahin and Bilik (2024) revealed that the experiences of impoverished individuals regarding disaster preparedness and post-earthquake experiences were hindered by economic difficulties, which were associated with fatalistic beliefs [65]. This finding parallels the results of our study. Similarly, research by Gören (2023) on the February 6, 2023 Kahramanmaraş earthquakes demonstrated that individuals not directly affected by the disaster experienced secondary traumatic stress and predominantly resorted to positive religious coping methods [66]. The study highlights the widespread psychological impacts of disasters, emphasizing the importance of religious and social coping strategies. This finding is consistent with the results of our research.

Significant differences were identified between genders in the "Positive Reappraisal" subscale ($p<0.01$). It was determined that women ($X=20.18$) employed

positive reappraisal strategies more frequently than men ($X=16.71$), focusing on the positive aspects of stressful events by reframing them. Nolen-Hoeksema (2012) reported that this tendency suggests women exert greater cognitive effort to enhance their psychological resilience, particularly in response to post-earthquake trauma [67].

In the "Seeking Social Support" subscale, women ($X=15.48$) scored significantly higher than men ($X=13.72$) ($p<0.01$), indicating that women employ social support-seeking strategies more frequently. Taylor et al. (2000) proposed that, unlike the classic "fight-or-flight" response, females exhibit a distinct biobehavioral pattern termed "tend-and-befriend," characterized by nurturing behaviours aimed at protecting the self and offspring, alongside the formation and maintenance of social networks to mitigate stress. They further highlighted that this pattern is underpinned by neuroendocrine mechanisms involving oxytocin, female reproductive hormones, and endogenous opioid peptides. These findings suggest that women's social roles and cultural norms encourage the pursuit of social support [68]. Furthermore, a study by Karbeyaz (2023) revealed that teachers working in earthquake-affected regions experienced high levels of earthquake-related anxiety, with female teachers reporting higher anxiety levels than their male counterparts. This underscores that women tend to utilize a broader range of coping strategies in response to traumatic events, which may positively influence their psychological well-being.

According to the research findings, statistically significant differences were identified between male and female participants in terms of the overall score and subdimensions of the Post-Earthquake Trauma Level Scale (PETLS), which measures post-earthquake trauma levels ($p<0.01$). It was found that female participants ($X=73.48$) had higher total PETLS scores compared to male participants ($X=68.80$) (Table 3). A study by Yakıt Ak and Uyurdağ (2024) examined the increased responsibilities and resulting vulnerabilities of women affected by the earthquake in Diyarbakır [69]. The findings emphasized that women experienced heightened domestic roles and economic concerns, highlighting the importance of developing supportive mechanisms. Olf (2017) and Norris et al. (2002) have documented that women exhibit higher levels of psychological distress and trauma symptoms following disasters [70, 71]. The tendency of women to report higher trauma levels after traumatic events and disasters is often explained by a combination of biological, psychological, and social factors [72].

When the PETLS subscales were examined, women ($X=14.163$) scored higher than men ($X=13.720$) on the "Behavioral Problems" subscale. This finding indicates that traumatic events lead to small but significant

gender-related differences in behavioural responses. Similarly, Norris et al. (2002) reported that women tend to experience more behavioral and emotional problems following traumatic events [71].

For the "Emotional Constraint" subscale, women ($X=18.357$) also scored higher than men did ($X=16.992$). The higher scores of women with emotional constraints suggest that their emotional responses to traumatic events may be more intense. Olf (2017) noted that women are more emotionally sensitive after disasters, so they are more likely to use emotional constraints as a coping strategy [70].

The "Cognitive Structure" subscale determined that women scored higher than men (women: 14.713, men: 13.696). Another study by Budak and Kandil (2023) examined university students' earthquake knowledge and awareness levels [73]. The research revealed that students who received disaster management training demonstrated higher levels of sustainable earthquake awareness. In contrast, male students exhibited greater awareness of the relationship between earthquakes and structural integrity than female students. Additionally, it was found that variables such as age and academic department created significant differences in earthquake awareness. It can be inferred that individuals with higher levels of awareness may experience lower levels of anxiety. Norris, Friedman, and Watson (2005) emphasize the critical importance of early intervention following disasters, particularly prioritizing the mental health needs of women, children, and survivors in developing countries. They highlight the necessity of interagency coordination due to the complex nature of disasters and advocate for the development of ecological, community-level interventions. Furthermore, they stress the allocation of limited clinical resources to those most in need as a vital strategy to mitigate the cognitive and psychological impacts of trauma [71].

In the "sleep disorders" subdimension, women scored higher than men did (women: 11.863, men: 11.183). The greater likelihood of women experiencing sleep problems aligns with findings suggesting that insomnia and sleep disorders may exhibit gender-based differences following traumatic events [70]. Demirtaş, Doğru, and Kılıç (2024) revealed that the economic, social, and psychological lives of school administrators and teachers were negatively affected by the trauma experienced by 38 participants impacted by the February 6, 2023 Kahramanmaraş earthquakes. The study found that earthquake experiences led to fear, panic, sleep disturbances, and death anxiety [74]. These results indicate that women are more sensitive to trauma after earthquakes than men are, with notable gender differences in emotional, cognitive, and behavioural coping strategies. Furthermore, these findings highlight

that women may require more support during postdisaster trauma recovery processes and that gender plays a significant role in posttraumatic well-being. In other research data, participants' general scores for postearthquake stress coping strategies (ESCS) were examined on the basis of factors such as precautions taken regarding the earthquake, whether there was any loss of life and the fear of experiencing an earthquake (Table 4). No significant difference was found in the ESCS scores based on whether the participants engaged in regular sports. Although the literature frequently emphasizes the positive effects of regular exercise on mental health [75, 76], this study revealed no significant impact of regular exercise on post-earthquake stress coping. In contrast, Chan et al. (2023) reported that moderate-intensity anaerobic exercise has a pronounced mood-enhancing effect, with sessions lasting 10 to 30 min sufficient for mood regulation. Furthermore, they highlighted that exercise positively influences emotional responses through neuroplasticity. Similarly, Wang et al. (2023) demonstrated that physical activity yields beneficial effects on mental health following traumatic events, significantly reducing symptoms of anxiety, depression, and post-traumatic stress disorder (PTSD). However, some studies have indicated that regular exercise does not significantly affect post-earthquake stress coping, suggesting that exercise may not play a sufficiently prominent role in individuals' coping mechanisms for traumatic experiences [75, 76].

In the analysis of other research data, participants' average Earthquake Stress Coping Scale (ESCS) scores were examined regarding factors such as earthquake-related precautions, experiences of loss, and fear of encountering an earthquake (Table 4). No significant differences were found in ESCS scores based on whether participants exercised regularly. Although the literature frequently emphasizes the positive effects of regular physical activity on overall mental health [75, 76], this study found that the habit of exercising did not significantly impact the level of post-earthquake stress coping.

On the other hand, significant differences in ESCS scores were observed based on participants' beliefs regarding the adequacy of earthquake-related precautions. Participants who believed that sufficient measures had been taken reported lower stress levels. In contrast, higher stress levels were observed among those who perceived earthquake preparedness inadequate. These findings indicate that individuals' perceptions of safety may enhance their resilience to traumatic events, a conclusion supported by previous research.

A qualitative study conducted by Çoban, Sözbilir, and Göktaş (2017) examined the preparedness perceptions of

individuals who had experienced earthquakes, focusing on pre-, during, and post-earthquake measures [77]. The study revealed that despite their experiences, participants lacked sufficient knowledge and preparedness, failing to take necessary precautions due to educational deficiencies. It was determined that when perceptions of safety were high, post-traumatic stress levels were lower.

Following Hurricane Katrina, the long-term trauma and recovery processes of children were investigated. Researchers highlighted the diverse recovery paths taken by children in the aftermath of trauma, emphasizing the role of social, familial, and structural support in this process [78]. Thus, individuals' perceptions of safety and preparedness can directly affect their psychological well-being in the aftermath of major disasters such as earthquakes.

The loss of family members or acquaintances significantly affected participants' trauma levels. It was found that participants who experienced the loss of a family member or someone from their close social circle exhibited higher levels of stress. The literature widely acknowledges that individuals who lose loved ones during traumatic events are more vulnerable to post-traumatic stress disorders [114]. Gümüş and Çakır (2023) investigated the motivation for physical activity and levels of healthy eating among young individuals who experienced the earthquake in Elazığ [80]. Exercise can have antidepressant and anxiolytic effects, which may enhance students' capacity to cope with stress following traumatic events [81]. Regular physical activity, a part of daily life, will foster psychological resilience in students after an earthquake and support their overall health. Regular physical activity a part of daily life will not only foster psychological resilience in students after an earthquake but also support their overall health. Their study revealed that while individual factors increased motivation, environmental factors had a lesser impact, and motivation for physical activity positively influenced healthy eating attitudes. This study supports these findings, demonstrating that the loss of close relations heightens individuals' post-traumatic stress levels.

The fear of experiencing an earthquake also significantly impacted trauma levels. Participants who feared encountering an earthquake at school or home exhibited higher trauma scores compared to those without such fears. Öztürk (2013) highlights the importance of earthquake education, noting that prospective primary school teachers demonstrated insufficient preparedness following earthquakes [82]. This finding underscores that the fear of experiencing similar traumatic events in the future, combined with a lack of preparedness, is a key factor contributing to heightened levels of traumatic stress. Similarly, the literature indicates that survivors of

traumatic events often experience increased levels of fear and anxiety regarding potential future disasters, which in turn elevates their stress levels [55, 83]. These findings align with the results of our study.

Our study examined differences in PETLS scores based on factors such as regular physical exercise, earthquake-related precautions, the presence of fatalities in the immediate surroundings, and the fear of being caught in an earthquake (Table 4). Regular physical activity was found to have a significant effect on trauma levels, with participants who engaged in regular exercise reporting lower trauma levels. These findings support the positive impact of physical activity in coping with traumatic stress. Research indicates that regular physical activity plays a crucial role in managing stress and facilitating recovery after trauma. The higher trauma levels observed in participants who did not engage in physical activity suggest that exercise may improve their ability to cope with stress and reduce the negative effects of trauma [85, 86]. Regular exercise significantly contributes to reducing stress, boosting self-confidence, and alleviating symptoms of depression. It is well-known that outdoor physical activities are more effective in relieving stress due to the calming effects of contact with nature [87]. In this context, encouraging students to engage in outdoor sports is critical in promoting physical health and enhancing their mental well-being and psychological resilience.

Participants who lacked confidence in the adequacy of earthquake precautions were found to have higher trauma scores. This finding highlights the impact of perceived safety on individuals' post-traumatic well-being. A lack of trust in safety measures may lead individuals to feel more vulnerable to traumatic events. Fothergill and Peek (2015) demonstrated that a sense of security in the face of traumatic events enhances individuals' psychological resilience and reduces stress levels [78]. Güngör (2023) examined the psychosocial effects of the February 6, 2023, Kahramanmaraş earthquakes on survivors, revealing that while the disaster fostered social solidarity, it also shaped criticisms of governmental neglect and concerns about the future [40]. This outcome aligns with the findings of our study. Therefore, belief in the effectiveness of post-earthquake safety measures significantly influences post-traumatic stress levels.

The higher trauma scores of participants who experienced the loss of loved ones in their close circle are a commonly supported finding in the literature. Individuals who lose loved ones after traumatic events tend to have higher stress levels and experience more profound trauma during the grieving process [88]. This study presents similar findings, suggesting that individuals who

experience loss may need more significant support during the posttraumatic recovery process.

The participants who were afraid of experiencing an earthquake had significantly higher trauma scores than did those without such fear. This finding suggests that postdisaster traumatic events can create lasting fear in individuals and that the anxiety of experiencing similar events in the future can increase stress levels. Similarly, Henderson et al. (2009) emphasized that having been exposed to traumatic events and being afraid of them can complicate the posttraumatic recovery process [43]. This underscores the critical role of individuals' ability to redevelop a sense of safety in their environment for their overall well-being after trauma.

The post-earthquake stress coping (ESCS) and trauma levels (PETLS) of participants were analyzed based on their academic departments; however, no significant differences were identified between groups (Table 5). It was found that ESCS and PETLS scores were similar across departments, including Sports Sciences, Theology, Health Sciences, Natural Sciences, Education Sciences, and Social Sciences.

In another study conducted by Baran and Işık (2024), the stress levels of nurses and the impact of post-earthquake trauma on this stress were examined [39]. The findings indicated a positive and moderate correlation between earthquake anxiety and stress levels among nurses, demonstrating that increased trauma levels significantly influenced stress. This result suggests that the academic field of study does not substantially affect post-earthquake stress and trauma levels. Although the literature contains studies indicating that different professional groups or fields of education may respond differently to traumatic events, no such effect of departmental differences was observed in this study [44]. Research shows that regular physical activity positively influences stress hormones, helping the body become more resilient in managing stress [91]. Additionally, exercise can have antidepressant and anxiolytic effects, which may enhance students' ability to cope with stress after traumatic events [81]. Incorporating regular physical activity into daily life will provide students psychological resilience following an earthquake while supporting their overall health.

In a separate study by Öztürk (2013), the earthquake experiences of prospective primary school teachers and the changes in their post-earthquake lives were examined [82]. The study highlighted that teacher candidates lacked sufficient preparation for post-earthquake scenarios, emphasizing the importance of earthquake education. Our study's findings further underscore the necessity of providing awareness training to students.

Additionally, a study conducted by Tin, Kaya, and Güzen (2021) investigated the individual preparedness levels of teachers working in Türkoğlu/Kahramanmaraş for a potential major earthquake [92]. The results demonstrated that disaster experience, education, and demographic factors increased preparedness levels. The study emphasized the need for earthquake preparedness plans for residential areas, highlighting that individual preparedness must be enhanced beyond the scope of our findings.

Although it is assumed that psychological well-being following traumatic events may vary according to individuals' professional groups or fields of education, no such difference was identified in this study. This result suggests, as Felton et al. (2013) emphasised that post-trauma recovery processes may be more influenced by personal and environmental factors rather than academic disciplines [45].

Karakış and Karaağiz (2024) examined the levels of earthquake anxiety, stress, and depression among a sample of adults aged 18 and over in Turkey following significant earthquakes [38]. Their findings revealed a negative correlation between psychological flexibility and these symptoms, indicating that higher levels of psychological flexibility can mitigate such effects. Although participants studying in health and social sciences exhibited slightly higher levels of stress coping and trauma, these differences were not statistically significant. This finding suggests that different professional fields may have a homogeneous effect on individuals' ability to cope with trauma and stress. The literature suggests that students in health and social sciences are often more likely to experience posttraumatic stress [94]. However, the lack of a statistically significant effect of the academic department on trauma and stress coping in this study implies that differences in academic fields are not a determining factor for posttraumatic well-being. Chronic stress has adverse effects on physical and mental health [95, 96]. Therefore, physical activities aimed at increasing students' earthquake awareness are essential for their post-traumatic well-being and preparing them for potential future disasters. Exercise is associated with numerous health benefits, including reduced risks of cardiovascular disease, obesity, stroke, and cancer, improved musculoskeletal health, lower mortality rates, and better stress regulation [97].

In this study, a significant relationship was identified between total PETLS and ESCS scores among participants who engage in regular physical exercise (Table 6). Yılmaz and Çetinkaya (2024) examined the future expectations and sports participation motivations of young adults following an earthquake, revealing that recreational sports enhance motivation and foster a more

positive outlook on the future during the recovery process [42]. Physical activity is crucial in reducing trauma and stress levels among students after natural disasters like earthquakes. Physical education programs implemented in disaster-affected areas contribute to healing psychological trauma and enhancing students' psychological flexibility [117]. Moreover, even 30 min of aerobic exercise has been shown to reduce cortisol responses to psychosocial stress [99]. BUSSRADAKİ- Table 6 should not be displayed here, as its designated placement has already been indicated earlier in the Findings section as Table 6. It can therefore be moved to that location.

Notably, a positive correlation was observed between "Seeking Social Support" and both trauma levels and stress coping strategies. This finding underscores the critical role of social support in managing post-earthquake trauma. Seeking social support is widely supported in the literature as a key mechanism for maintaining psychological well-being, particularly after traumatic events [100].

It has been demonstrated that sports activities effectively address psychological trauma among students in disaster-affected areas, contributing to the gradual alleviation of mental health issues through specially designed physical education programs [42]. Interventions promoting physical activity in disaster zones have led to significant improvements in subjective health status and social participation, highlighting the importance of exercise in recovery.

These findings align with the results of our study. The more pronounced relationship among individuals who regularly engage in sports suggests that physical activity may expand social networks and enhance the capacity to receive support from these networks. Alpulu and Yılgin (2024) found that individuals who engage in sports experience lower levels of trauma compared to those who do not, indicating that sports participation has positive effects on psychological recovery [98]. These findings further support the conclusions drawn from our study.

The positive relationship between "Emotional Constraint" and "Seeking Social Support" suggests that individuals may alleviate their emotional limitations by seeking social support. Previous studies have also shown that social support can mitigate emotional constraints, effectively reducing emotional stress [101]. Güngör (2023) examined the psychosocial effects of the February 6, 2023, Kahramanmaraş earthquakes on survivors, revealing that while the disaster fostered social solidarity, it also shaped criticisms of governmental negligence and concerns about the future [40].

Additionally, weak but significant correlations were found between social support and the "affective" and "cognitive structure" subscales. These findings suggest that seeking social support may

contribute to preserving cognitive structures and regulating emotional responses. Social support may assist in maintaining cognitive functioning and ensuring emotional stability in individuals [48].

The positive relationship between "sleep disorders" and "seeking social support" suggests that social support may alleviate sleep disturbances. Similarly, the literature indicates that social support plays a significant role in reducing sleep disorders caused by stress and anxiety [49]. In this study, social support emerged as a critical coping strategy, particularly for individuals experiencing sleep problems. Studies have indicated that individuals from different cultures and nations frequently use sports as a coping strategy to enhance resilience and social cohesion during recovery efforts [104].

The research conducted by Tomata et al. (2015) examined the health effects of interventions promoting physical activity among individuals affected by the 2011 Great East Japan Earthquake [105]. This longitudinal study demonstrated that encouraging physical activity in disaster-affected areas led to significant improvements in subjective health status and social participation. The study highlights the critical role of physical activity in the recovery process, emphasizing its effectiveness in preserving both psychological and physical health in the aftermath of a disaster.

Finally, the positive relationship identified between the total PETLS and ESCS scores indicates that as trauma levels increase, stress-coping strategies are employed more frequently. These findings suggest that individuals develop more strategies to cope with rising stress levels [50].

Among participants who did not engage in regular sports, significant relationships were observed between postearthquake trauma levels (PETLS) and stress coping strategies (ESCS) (Table 7). A weak but statistically significant correlation was identified between PETLS and "positive reappraisal." This finding suggests that individuals who have experienced trauma may be inclined to derive meaning from these events and reassess them from a more positive perspective. Positive reappraisal is a coping strategy that helps individuals handle stressful events with increased flexibility and adaptability. Studies have shown that using this approach to address traumatic stress can have positive effects on mental well-being [51, 108]. Physical activity is crucial in reducing trauma and stress levels among students after natural disasters like earthquakes. Physical education programs implemented in disaster-affected areas contribute to healing psychological trauma and enhancing students' psychological flexibility [117]. Moreover, even 30 min of aerobic exercise has been shown to reduce cortisol responses to psychosocial stress [99].

A negative correlation was found between "Emotional Constraint" and "Religious Coping," suggesting that individuals who less frequently employ religious coping strategies may be more prone to experiencing emotional constraints. Religious coping is regarded as an effective mechanism for stress management, particularly following trauma [64]. This finding indicates that religious coping may serve as a buffering mechanism to help individuals overcome emotional constraints.

The positive relationship between the "affective" and "positive reappraisal" subscales reveals that individuals use positive reappraisal strategies when their emotional responses are reassessed. Troy et al. (2010) demonstrated that individuals encountering stressful life events utilize cognitive reappraisal (CRA)—the ability to reinterpret emotional responses—in a way that facilitates more effective regulation of their emotional reactions by positively reframing stressful situations. This finding supports the notion that cognitive reappraisal serves as a significant moderator, attenuating the relationship between stress and depressive symptoms [52].

The positive relationship between "cognitive structure" and "positive reappraisal" suggests that preserving cognitive structure is related to the use of positive reappraisal strategies. After traumatic events, individuals may use positive reappraisal strategies more frequently to maintain their cognitive structure. Kunz (2019) highlighted that in the post-earthquake recovery project conducted in Bam, Iran, sports and play were employed as coping strategies for children, yielding positive results. Creating a supportive environment through local coaches improved behaviour, established trust, and facilitated psychosocial rehabilitation despite challenging living conditions [110]. These findings support the results of our study, demonstrating that sports are a significant tool in coping with post-disaster trauma. Our findings are consistent with Kunz's (2019) study demonstrating the effectiveness of sports and play in helping children cope with trauma following the Bam earthquake. Notably, the creation of a supportive environment by local coaches significantly facilitated the psychosocial recovery of the children. This underscores that it is not merely the physical activity itself, but also the social and emotional support embedded within sports that plays a crucial role in coping with trauma.

In conclusion, promoting outdoor physical activity effectively enhances earthquake awareness on both an individual and societal level. Such activities help students become better prepared for disasters while contributing to reduced post-traumatic stress levels. This finding aligns with the literature, which suggests that individuals use various coping strategies to regulate their cognitive processes after traumatic events [53]. Additionally, the positive relationship between "sleep disorders" and "positive reappraisal" suggests that sleep

disturbances may be alleviated through positive reappraisal strategies. While sleep disorders are common following stress and trauma, the literature highlights that these issues can be reduced by employing positive coping strategies [49]. This study also demonstrated that positive reappraisal strategies may help reduce sleep problems experienced after trauma.

Limitations of the study and recommendations for future research

This study has certain limitations that may affect the generalizability and accuracy of the findings. Although the research was conducted on a specific group of students and the sample size is considered statistically sufficient, broader and more diverse participant groups could enhance the comprehensiveness of the results. The use of self-report questionnaires introduces the risk of subjective responses. Incorporating qualitative methods in future research could provide a deeper understanding of participant experiences and enrich the overall findings.

Conclusion

This research provides essential findings for understanding the trauma levels and coping strategies of university students, both those who engage in sports and those who do not, in the aftermath of an earthquake. Postearthquake trauma and stress coping strategies vary significantly on the basis of individuals' experience, gender, and various demographic factors. The results of this study suggest that more comprehensive research is needed in the future to reduce trauma levels and improve coping strategies in postdisaster contexts. Specifically, assessing the long-term psychological effects of disasters and examining the effectiveness of strategies applied during rehabilitation, particularly for students, are critical. This information is essential for understanding how well interventions support the recovery of individuals and communities after traumatic events.

Female students are more sensitive to trauma, with engaging in sports identified as an effective coping strategy. A direct relationship was observed between postearthquake security measures and trauma levels. Women presented higher trauma levels than men did and were more likely to use strategies such as seeking social support, religious coping, and positive reappraisal. These findings indicate that women tend to rely more on social and emotional resources to increase their psychological resilience after trauma.

Moreover, regular physical activity was found to be effective in reducing participants' trauma levels, with physical exercise having a positive effect on their post-trauma well-being. Additionally, participants who

experienced the loss of a family member or acquaintance experienced significantly greater trauma. These findings underscore the importance of strengthening psychosocial support mechanisms for individuals following disasters.

It is recommended that special support programs be developed, particularly for female students and those who do not engage in regular physical activity. Universities can ease students' ability to navigate such challenging times by offering counselling and psychological support services in the aftermath of traumatic events. Furthermore, improving postdisaster safety measures and increasing efforts to make areas such as schools and homes more earthquake resistant may positively impact individuals' recovery processes and reduce the trauma levels experienced during disasters.

The participants who believed that adequate earthquake precautions had been taken reported lower trauma levels, highlighting that the perception of safety is a key factor in posttrauma psychological well-being. Future research should focus on different sociocultural groups to improve the generalizability of these findings. Additionally, long-term studies are recommended to examine how trauma-related stress and coping strategies change over time in greater detail.

The study also revealed that students who feared being caught in an earthquake while at school or at home had higher trauma levels than did those without such fears. Specifically, the fear of being at school or home during an earthquake significantly increased participants' psychological trauma levels. It is known that traumatic events such as earthquakes can lead to persistent stress and anxiety, and reducing this fear could improve individuals' posttraumatic well-being. Therefore, developing postdisaster psychosocial support programs may effectively strengthen coping strategies for such fears.

This study underscores the importance of seeking social support and employing cognitive strategies, such as positive reappraisal, in alleviating posttraumatic stress. A positive correlation was identified between trauma level and the use of social support-seeking strategies, indicating that individuals with strong social ties tend to develop more effective coping mechanisms following trauma.

During the earthquake, students from the Faculty of Sports Sciences and those studying physical education and coaching who were outside the affected regions and not directly impacted were encouraged to participate in sports activities in their respective areas. These students contributed to the recovery process by organizing daily sports activities to help children from families experiencing trauma and living in challenging conditions, such

as tents and container shelters, cope with their trauma. The ability to maintain cognitive resilience and positively reframe traumatic events can enable individuals with high levels of trauma to cope more effectively with stress. These findings emphasize the importance of interventions to develop coping strategies within educational programs and highlight the need for further research. Future research should focus on a larger sample size, compare posttraumatic stress coping strategies and grieving processes among students from different cultural and religious backgrounds, and incorporate long-term studies. Additionally, employing qualitative data collection methods would provide a deeper understanding of participants' experiences and support the quantitative findings.

Abbreviations

SD	Standard deviation
X	Mean
SPSS	Statistical Package for the Social Sciences
p	Probability value
t test	Independent samples t test
F value	F statistic
r	Pearson correlation coefficient
df	Degrees of freedom
ESCS	Studies of Earthquake Stress Coping Scale
PETLS	Post-Earthquake Trauma Level Scale
KO	Sum of squares
KT	Mean Square
η^2	Eta squared

Authors' contributions

Conception and design of the study: Z.Ç., M.K., T.Ö., Ü.E., and M.G.; Data acquisition, analysis, or interpretation of data: Z.Ç., M.G., A.N.D., M.A.C., S.G., and Ü.E. Drafting the manuscript: Z.Ç., T.Ö., A.N.D., M.G., M.A.C., and S.G. All authors critically reviewed the manuscript for important intellectual content. Senior authorship: Z.Ç. All authors approved the final version of the manuscript.

Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. The dataset will be accessible only for academic purposes, and any use of the data will recognize the original study and maintain the confidentiality of the participants.

Declarations

Ethics approval and consent to participate

The research was conducted with the knowledge and approval of the school administration. The study was carried out in accordance with the Declaration of Helsinki and applicable local guidelines and regulations. Ethical approval was obtained from the Faculty Ethics Committee of the Bayburt University Rectorate, Bayburt University, with the decision number E-51694156–050.99–122871 dated 07.03.2023, documented in the 2023/68 Bayburt University Rectorate Ethics Committee Decisions. The participants in this study voluntarily participated of their own accord. Informed consent was obtained from all participants. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 10 October 2024 Accepted: 3 July 2025

Published online: 05 August 2025

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