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RESEARCH ARTICLE

The development and initial validation of the Earthquake Fear Scale: Its links to personality traits, psychological distress, harmony in life, and mental wellbeing

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Abstract

Unexpected and unpredictable earthquakes may have a negative impact on people's mental health. The earthquake fear experienced by individuals causes psychological problems. This article is made up of three different studies that look at earthquake fear. The seven item Earthquake Fear Scale (EFS) was confirmed in Study I ($N = 407$) utilising confirmatory factor analysis. In addition, Item Response Analysis was done, and it was found that all of the items showed a good degree of discrimination. The reliability of the EFS has been proven with different reliability coefficients. In Study II ($N = 505$), both correlation and network analysis were carried out, and earthquake fear was found to be significantly associated with depression, anxiety, stress, and mental wellbeing. Moreover, neuroticism and conscientiousness, two of the big five personality traits, are significantly associated with earthquake fear. In Study III ($N = 382$), it was revealed that psychological distress and harmony in life play a serial and fully mediating role in the link between earthquake fear and mental wellbeing. The psychological influence of earthquake fear is emphasised in this pioneering and comprehensive study on earthquake fear.

KEYWORDS
earthquake fear, harmony in life, mental wellbeing, personality traits, psychological distress

1 | INTRODUCTION

Two major earthquake disasters in Türkiye on 6 February 2023, affected approximately 13 and a half million people. These earthquakes, which were called the "disaster of the century" directly affected 11 provinces of Türkiye and resulted in the deaths of over 45.000 people and the injuries of over 100.000 people. In addition, according to the state's official records, approximately 250 thousand buildings have been declared to be demolished or severely damaged and will be demolished immediately (AFAD, 2023). The February 6 Kahramanmaraş earthquake is new, but according to the data between 1927 and 2020 in Türkiye, it has been reported that there were 25 major earthquakes between 6 and 9 intensities, and these earthquakes caused a total of 143.730 deaths (Şenol, 2020). All these explanations demonstrate that people are seriously harmed in many ways, and prospective earthquakes pose a danger to the future.

This earthquake disaster affected not only the people living in the earthquake area but also all around Türkiye and even the world. Studies emphasise that the victims who experienced the earthquake from many different parts of the world had similar experiences. For example, Kung and Chen (2012) in Taiwan, Xu et al. (2019) and Tian et al. (2014) in China, Ali et al. (2012) in Pakistan, Başoğlu

et al. (2004) in Türkiye and Kannis Dymand et al. (2015) in New Zealand conducted research with earthquake victims. In these studies, it is seen that the findings related to earthquake victims are similar. Many people who were left homeless or lost all their belongings due to the earthquakes suffered financial damage and their need for shelter arose. Also, injured people encountered physiological problems. Also, injured people encountered physiological problems. Besides these, the great fear experienced by individuals in this process has caused them to be traumatised and experience many negative psychological problems. These psychological problems constitute a major barrier to people's capacity to sustain a healthy life. Therefore, there is a need for an in-depth examination of the psychological effects of earthquakes.

1.1 | Psychological effects of earthquake

An earthquake is a natural event that affects human life negatively, shakes deeply, and leaves serious psychological effects (Nakajima, 2012). There are many studies in the literature on the psychological effects of earthquakes. For instance, in a recent study by Prizmić-Larsen et al. (2023), it was reported that individuals affected by earthquakes exhibit long-term depressive tendencies and experience negative psychological problems such as anxiety problems. In addition, it is stated that the quality of life of these individuals is negatively affected in a multidimensional way due to depression, anxiety, stress, and somatisation (Lathabhavan & Lathabhavan, 2022; Rowney et al., 2014; Wang et al., 2000). Similarly, it is stated in the literature that individuals experience feelings such as guilt, anger, anxiety, and confusion more frequently with earthquakes (Ehring et al., 2011). Sümer et al. (2005) also emphasise that an earthquake disaster that occurs at a time that individuals do not expect or foresee may reduce their quality of life and wellbeing. The findings of all of these studies are further supported by a recent study by Frijters et al. (2021). In the afore-mentioned study, it was revealed that individuals who experienced an earthquake or a different disaster had more negative emotions and had less wellbeing than other people.

After the earthquake, there may be some changes in thoughts and negative feelings among individuals. For instance, Şeker's (2016) study mentions that individuals may lose their belief in a just world following an earthquake. In addition, in this study, it is stated that individuals' level of enjoyment or satisfaction with life may decrease with the loss of belief in a just world. Similarly, in the study of Oishi et al. (2017), it was reported that individuals who experienced earthquakes had lower satisfaction. The ability of earthquake victims to adjust to daily life may also be adversely affected, in addition to satisfaction. Lastly, the personality traits of individuals are important following the earthquake. In the study by Osborne and Sibley (2013), the personality traits of individuals are emphasised as being impacted by the earthquake. These traits may determine how earthquake victims will react in the process or how they will develop coping strategies. For instance, introverts may experience reactions such as sadness, anxiety, and stress more intensely, while extroverts may respond positively more quickly (Canli et al., 2002). Therefore, supporting the positive personality traits of individuals after the earthquake may be psychologically valuable. All the research findings mentioned above prove that individuals affected by the earthquake may encounter serious psychological problems.

1.2 | The current study

In the literature, an earthquake is explained as an event that traumatises life for all individuals and causes serious damage to mental health (Goenjian et al., 2000; Kyutoku et al., 2012). Fear is the most fundamental feeling that people experience following an earthquake. Fear, which is a universal emotion, may be explained as a reaction to a phenomenon or event that individuals perceive as a threat. The literature states that following an earthquake, people's sense of control diminishes and fear is triggered (Khachadourian et al., 2016; Salcıoğlu et al., 2018). The fear felt in the medium term following the earthquake has a negative impact on the individual's mental health (Başoğlu et al., 2004; Grimm et al., 2012). In the literature, it is noted that the severity and effect of the traumatic experience are related to the level of fear (e.g., O'Toole, 2017; Xiao et al., 2015). Based on all of these studies, it is thought that investigating how much people who have been directly or indirectly influenced by earthquakes have experienced fear and how this situation impacts their wellbeing is crucial.

In post-earthquake studies, coping strategies or trauma concepts are generally emphasised, and measuring tools related to these concepts are adapted or developed (e.g., Ali et al., 2012; Leiva Bianchi & Araneda, 2013; Tanhan & Kayri, 2013; Yöndem & Eren, 2008). To the best of our knowledge, it has been determined that there is only one measuring tool to measure psychological reactions such as fear experienced in earthquakes (Prizmić-Larsen et al., 2023). Therefore, in this study, it is aimed to develop a measurement tool to measure the earthquake fear of Turkish people and test it in a hypothetical model. It is believed that the Earthquake Fear Scale (EFS) will lead to further scientific studies and psychological interventions.

This research was conducted with three separate studies and three separate samples. In this way, it is aimed to enable the research conducted in different studies to provide generalisable and applicable results for different participants in different cultures (Satıcı et al., 2023). Thus, it was aimed at obtaining valid and reliable results. Study I is the adaptation of the EFS; Study II is the examination of the relationship between earthquake fear and various variables; and Study III is the exploration of earthquake fear in terms of well-being with the serial mediation model.

2 | STUDY I

At this stage of the research, confirmatory factor analysis (CFA) of the EFS will be carried out. Moreover, the scale will be examined using Item Response Theory (IRT), and reliability analyses of the scale

will be made with distinct methods. It's a statistical modelling framework used in psychometrics and educational measurement to learn more about how test-takers respond to different types of questions (Baker, 2001). In this context, in the first stage of the study, an answer to the following research question is sought.

RQ1. Is the EFS psychometrically valid and reliable?

2.1 | Method

2.1.1 | Participants and procedure

Online surveys were used to acquire 407 (female = 296, 72.7% and male = 111, 27.3%) participants from 49 of Türkiye's 81 cities for Study I. The participants in the research were determined by convenience sampling method. All participants gave informed consent before participating in the study. In addition, all of the participants in this study were volunteers, and they were not paid any fees. The average age of the participants is 27.62 (SD = 10.93, age range = 18–77). When the educational status of the participants was examined, it was determined that the majority of them were at the university level (n = 282, 69.3%). In terms of working status, 12.5% of the participants stated that they were public employees, 18.9% were private sector employees, 12.3% were unemployed, and 56.3% were students. The majority of participants are in medium-class levels in terms of socio-economic status (n = 280, 68.8%). Lastly, 276 people (67.8%) stated that they were affected by the earthquake, and 131 people (32.2%) were not (see Table 1).

2.1.2 | Measures

Earthquake Fear Scale

The items in the Fear of COVID-19 Scale (Ahorsu et al., 2022) were revised and the EFS consisting of seven items was created. In this scale, firstly, the word "earthquake" was used instead of the word "COVID-19" and changes were made. One of the sample items in the scale is "*Thinking about the earthquake makes me uncomfortable*". The scale is scored as a 5-point (1 = *strongly disagree*; 5 = *strongly agree*) score between 7 and 35. Possible high scores indicate that individuals have more earthquake fear. In this study, the Cronbach alpha coefficient was calculated as 0.89.

TABLE 1 Participants' characteristics.

	Study I		Study II		Study III	
Variable	***N***	**%**	***N***	**%**	***N***	**%**
Gender						
Female	296	72.7	406	80.4	282	73.8
Male	111	27.3	99	19.6	100	26.2
Educational status						
Primary school	6	1.4	-	-	2	0.5
High school	22	5.4	36	7.1	24	6.3
University	282	69.3	425	84.2	261	68.3
Master/Ph.D.	97	23.9	44	8.7	95	24.9
Working Status						
Public employee	51	12.5	53	10.5	50	13.1
Private sector employee	77	18.9	51	10.1	69	18.1
Unemployed	50	12.3	58	11.5	45	11.7
Student	229	56.3	343	67.9	218	57.1
Socio-economic status						
Low	111	27.3	152	30.1	100	26.2
Medium	280	68.8	337	66.7	262	68.6
High	16	3.9	16	3.2	20	5.2
State of being affected by earthquake						
Affected	276	67.8	383	75.8	258	67.5
Not affected	131	32.2	122	24.2	124	32.5
Age (mean–SD)	27.62	10.93	24.37	6.76	27.21	10.35

2.1.3 | Data analysis

The construct validity of the scale was examined at this stage of the research by CFA using maximum likelihood estimation. It was decided whether the fit between the data and the model was sufficient by examining fit indices such as the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Incremental Fit Index (IFI), Normed Fit Index (NFI), Goodness of Fit Index (GFI), and Standardized Root Mean Square Residual (SRMR). Standardized Root Mean Square Residual values below 0.08 and GFI, TLI, CFI, NFI, and IFI values above 0.90 are acceptable (Hoyle & Panter, 1995). The analysis of moment structures Graphics statistical programme was used for this analysis (IBM, 2023). The EFS item-total correlation scores and various reliability coefficients, including Cronbach's alpha (α), McDonald's omega (ω), and Guttmann's lambda (λ^6), were then calculated. Lastly, the model was validated through IRT in the Stata statistical programme. According to Baker (2001, p. 34), IRT is a technique that visualises each item with its characteristic curve and makes it possible to interpret these images according to certain value ranges. These value ranges are: 0 (none), 0.01–0.34 (very low), 0.35–0.64 (low), 0.65–0.1.34 (moderate), 1.35–1.69 (high), 1.70 and above (very high), and +infinity (perfect).

2.1.4 | Ethics

The study protocol has been approved by the Human Research Ethics Committee of Yıldız Technical University (Reference Number = 20230301953). This research was carried out in accordance with the ethical standards set forth in the Declaration of Helsinki in 1964 and in its subsequent updates. Professional ethical guidelines were adhered to at every stage of the research.

2.2 | Results

The CFA demonstrated good model fit for the seven-item EFS; $\chi_{(14,\ N\ =\ 407)} = 129.27$, $p < 0.001$; CFI = 0.922, NFI = 0.914, IFI = 0.922, GFI = 0.900, SRMR = 0.053. The seven-item one-dimensional factor of the scale clarified 54.75% of the variance. The factor loadings varied between 0.649 and 0.796. Consequently, the seven-item structure of the EFS was confirmed. Factor loadings, descriptive statistics, and item-total correlation are presented in Table 2.

Item Response Theory assumptions were checked before the analysis. One-dimensionality indicates that one of the IRT's assumptions, unidimensionality, has been satisfied. It indicates that only a single factor accounts for the item correlations (Reise & Haviland, 2005). Item invariance is another assumption of IRT (Nguyen et al., 2014). It can be defined as a phenomenon where the estimated substance parameters remain consistent across various populations. The good fit of the CFA values shows that this assumption is also met. The IRT analysis was done once the scale's structure was confirmed. According to Table 3, the values of the discrimination coefficient (a) ranged from 1.88 to 3.13. According to Baker's (2001) standards, all items were classified as quite high. These findings demonstrate that the EFS has the greatest discriminative power. Therefore, The EFS is a dependable measurement tool that allows for differentiation between individuals with high and low scores.

Lastly, Cronbach's alpha, McDonald's omega, and Guttmann's lambda were used to analyse the reliability coefficients of the seven-item EFS (for each study asunder). The reliabilities of the seven item

TABLE 3 Item Response Theory (IRT) results for the Earthquake Fear Scale (EFS).

Item	*a* Coefficient	SE	Confidence interval	*z*	$p > \|z\|$
Item 1	3.07	0.31	2.45–3.69	9.73	0.001
Item 2	2.95	0.30	2.36–3.54	9.81	0.001
Item 3	1.95	0.18	1.60–2.31	10.85	0.001
Item 4	2.23	0.20	1.83–2.63	10.88	0.001
Item 5	1.88	0.19	1.51–2.26	9.82	0.001
Item 6	3.13	0.29	2.55–3.70	10.74	0.001
Item 7	2.61	0.23	2.15–3.07	11.11	0.001

TABLE 2 Factor loadings, descriptive statistics, and item-total correlations.

Item	Factor loadings	Mean	SD	Item-total correlations
1. I am very fearful about earthquake.	0.796	4.04	0.88	0.732
2. Thinking about the earthquake disturbs me.	0.776	4.14	0.91	0.714
3. My hands shake when I think about the earthquake.	0.649	2.39	1.14	0.618
4. I am very afraid of losing my life in an earthquake.	0.734	3.81	1.14	0.682
5. I get anxious and worried when I watch news and stories about earthquakes in the media.	0.662	4.19	0.95	0.604
6. Worry about being caught in an earthquake keeps me awake.	0.794	3.11	1.28	0.760
7. My heartbeat speeds up when I think about being caught in an earthquake.	0.755	3.33	1.25	0.723

Note: $N = 407$.

EFS demonstrated that the Cronbach's alpha (α ranged = 0.880–0.889), McDonald's omega (ω ranged = 0.884–0.893), and Guttmann's lambda (λ^6 ranged = 0.882–0.893) were highly acceptable (see Table 4).

3 | STUDY II

After examining the validity and reliability of the EFS, the relationships between earthquake fear and depression, anxiety, stress, mental wellbeing, and the big five personality traits were investigated in Study II. The Big Five-Factor Model is a personality theory proposed by McCrea and Costa (1997) that suggests that there are five basic characteristics that distinguish individuals from each other. These personality factors are known as OCEAN (openness to experience), conscientiousness, extraversion, agreeableness, and neuroticism. This theory is a frequently used approach to understanding the different behavioural responses of individuals to events (Carter et al., 2013; Yanto et al., 2021). Thus, both the criterion correlation validity of the EFS was tested using previously validated and reliable scales, and the relationships between personality traits and other variables were examined. In this context, at this stage of the research, answers to the following research questions will be sought.

> RQ2. Is there a relationship between earthquake fear and depression, anxiety, stress, mental wellbeing and big five personality traits?

3.1 | Method

3.1.1 | Participants and procedure

In Study II, a total of 505 (female = 406, 80.4% and male = 99, 19.6%) participants from 48 of Türkiye's 81 provinces answered the online form. The participants in the research were determined by convenience sampling method. All participants gave informed consent before participating in the study. In addition, all of the participants in this study were volunteers and they were not paid any fees. When the answers were examined, it was determined that the mean age was 24.37 (SD = 6.76, age range = 18–79). In terms of educational status, the majority stated that they were at the level of a university (n = 425, 84.2%). In terms of working status, 10.5% of the participants are public employees, 10.1% are private sector employees, 11.5% are unemployed, and 67.9% are students. The socio-economic status of the majority of the participants is in the medium class (n = 337, 66.7%). At this stage of the research, 383 people (75.8%) stated that they were affected by the earthquake, and 122 people (24.2%) were not affected by the earthquake (see Table 1).

3.1.2 | Measures

Depression Anxiety Stress Scales-21

The DASS-21 was developed Henry and Crawford (2005; Turkish version: Yılmaz et al., 2017). This scale was used to measure the psychological distress. The 21 items (e.g., "*I realized that I never experienced positive emotions*") are rated on a four-point scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). There are seven items in each of the three sub-dimensions: depression, anxiety and stress. High scores, the total of three sub-dimension, indicate that the level of psychological distress is high. It was stated that the Cronbach alpha coefficient of the sub-dimensions of the scale ranged between 0.76 and 0.82. In this study, the Cronbach's alpha coefficient was calculated as 0.89 for the depression sub-dimension, 0.87 for the anxiety sub-dimension and 0.88 for the stress sub-dimension.

Short Warwick-Edinburgh Mental Well-being Scale

The Short Warwick-Edinburgh Mental Well-being Scale (SWEMWS) was developed by Tennant et al. (2007; Turkish version: Demirtaş & Baytemir, 2019). The seven items (e.g., "*I feel comfortable*") are rated on a five-point scale from 1 (*none of the time*) to 5 (*all of the time*) with scores ranging from 7 to 35. Possible high scores indicate a high level of mental wellbeing. The Cronbach's alpha coefficient of the scale was reported as 0.86. In this study, the Cronbach's alpha value was 0.82.

Big Five Inventory

The Big Five Inventory (BFI) was developed by Rammstedt and John (2007; Turkish version: Türküm et al., 2016). This scale was used to measure the big five personality traits. The 10 items (e.g., "*I see myself as a meticulous person*") are rated on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). There are two items in each subscale of this scale. These sub-dimensions are openness, conscientiousness, extraversion, agreeableness, neuroticism. The Cronbach's alpha coefficients of the sub-dimensions of the BFI were reported as 0.73, 0.68, 0.71, 0.73 and 0.71, respectively.

TABLE 4 Reliability results of the Earthquake Fear Scale (EFS).

	Study I (N = 407)	Study II (N = 505)	Study III (N = 382)
Cronbach's alpha	0.889	0.888	0.880
McDonald's omega	0.892	0.893	0.884
Guttmann's lambda	0.893	0.884	0.882

3.1.3 | Data analysis

At this stage of the study, the descriptive findings of the variables were examined through the statistical package for the social sciences 22 statistical programme. A correlation analysis was conducted for the relationship between earthquake fear and depression, anxiety, stress, mental wellbeing, and the Big Five personality traits. Demographic variables such as gender, age, and perceived socio-economic status were also included in this correlation analysis. Lastly, the relationships between all the variables discussed at this stage were described by network analysis using the Jeffreys's Amazing Statistics Program.

3.2 | Results

In Study II, Correlations with descriptive statistics such as range, mean, and SD, are presented in Table 5. There was a significant positive correlation between earthquake fear and depression ($r = 0.407$, $p < 0.001$), anxiety ($r = 0.621$, $p < 0.001$), and stress ($r = 0.435$, $p < 0.001$). Earthquake fear is negatively associated with mental wellbeing ($r = -0.266$, $p < 0.001$). In addition, as the sub-dimensions of - neuroticism and conscientiousness - the big five personality traits, positive relationship was found between neuroticism and earthquake fear ($r = 0.341$, $p < 0.001$) and a negative relationship between conscientiousness and earthquake fear ($r = -0.117$, $p < 0.009$). Moreover, a significant negative relationship was found between earthquake fear and gender ($r = -0.370$, $p < 0.001$). On the other hand, it has been determined that there is no significant relationship between earthquake fear and openness ($r = -0.040$, $p > 0.05$), extraversion ($r = -0.061$, $p > 0.05$), and agreeableness ($r = -0.047$, $p > 0.05$). Demographic variables such as age ($r = 0.011$, $p > 0.05$) and socio-economic status ($r = -0.072$, $p > 0.05$) are not significantly associated with earthquake fear.

Figure 1 displays the network analysis findings for the earthquake fear together with the other variables. This image revealed that earthquake fear was strongly related to anxiety and gender, more than other variables.

TABLE 5 Relationship of the earthquake fear with the variables.

				Correlation with earthquake fear	
Variable	**Range**	***M***	***SD***	***r***	***p***
Age	18–79	24.37	6.76	0.011	0.801
Gender (dichotomous)[a]	1–2	1.26	0.44	−0.370	<0.001
Socio-economic status	1–5	2.68	0.63	−0.072	0.107
Depression	0–21	8.82	5.67	0.407	<0.001
Anxiety	0–21	6.43	5.03	0.621	<0.001
Stress	0–21	8.51	5.38	0.435	<0.001
Mental wellbeing	7–35	22.62	4.55	−0.266	<0.001
Big five personality traits					
Openness	2–10	7.24	1.87	−0.040	0.373
Conscientiousness	2–10	7.24	1.78	−0.117	<0.009
Extraversion	2–10	6.61	2.14	−0.061	0.175
Agreeableness	2–10	7.94	1.62	−0.047	0.289
Neuroticism	2–10	6.16	1.85	0.341	<0.001

[a]1 = female for gender.

4 | STUDY III

In the third and final stage of the research, the serial mediating role of psychological distress and harmony in life in the link between earthquake fear and mental wellbeing will be tested. In this context, in the last stage of the research, an answer to the following research question will be sought.

> RQ3. Do psychological distress and harmony in life play serial mediating roles in the relationship between earthquake fear and mental wellbeing?

4.1 | Method

4.1.1 | Participants and procedure

For Study III, a total of 382 (female = 282, 73.8% and male = 100, 26.2%) participants from 47 of Türkiye's 81 provinces filled out the online form. The participants in the research were determined by convenience sampling method. All participants gave informed consent before participating in the study. In addition, all of the participants in this study were volunteers, and they were not paid any fees. The average age of the participants is 27.21 (SD = 10.35, age range = 18–77). As in the first two stages of the research, the majority group in terms of educational status is university level ($n = 261$, 68.3%). When the working status is examined, 13.1% of the participants are public employees, 18.1% are private sector employees, 11.7% are unemployed, and 57.1% are students. Participants stated that they are mostly in the medium class in terms of socio-economic status ($n = 262$, 68.6%). Lastly, 258 (67.5%) of the participants whose data were collected at this stage stated that they were affected by the earthquake, and 124 (32.5%) were not affected by the earthquake (see Table 1).

4.1.2 | Measures

At this stage, the following scale was added and introduced in addition to the EFS, the Depression Anxiety Stress Scale-21 and the SWEMWS.

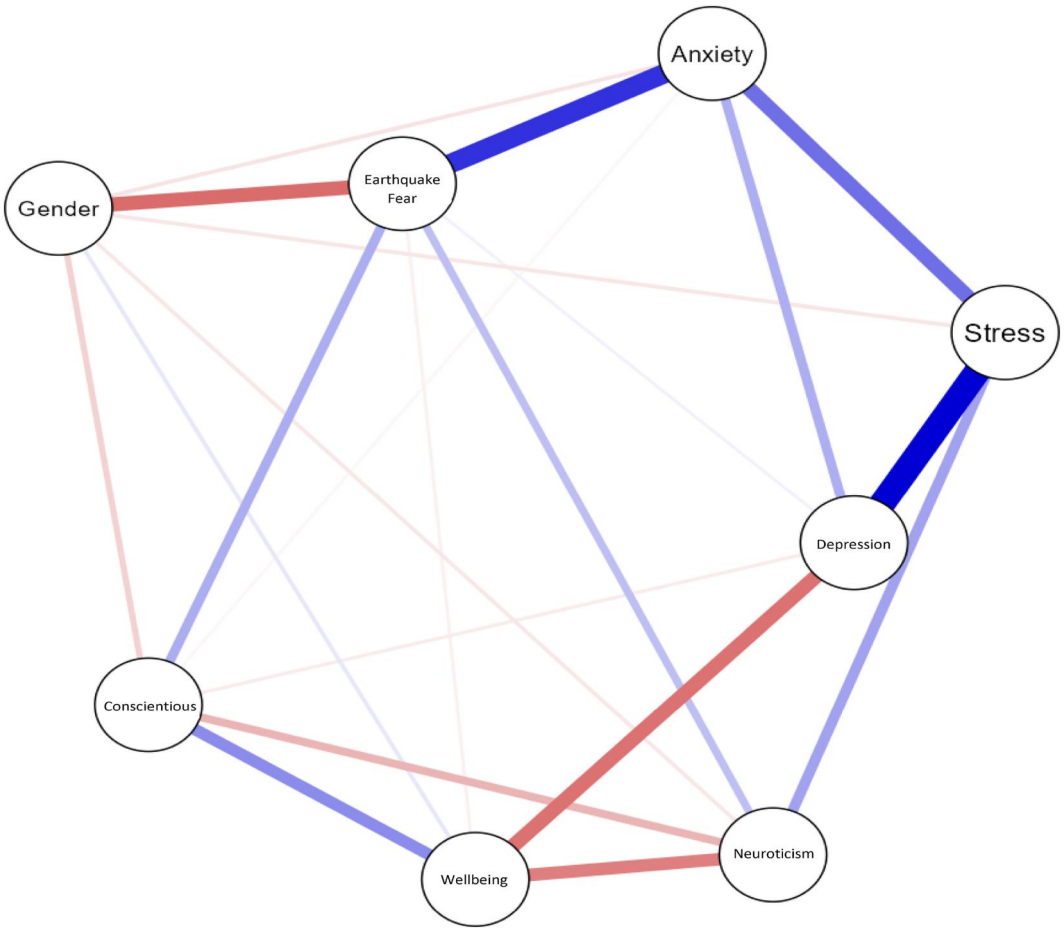

FIGURE 1 Network analysis for earthquake fear. Blue lines represent positive correlations and red lines represent negative correlations.

Harmony in Life Scale

The Harmony in Life Scale (HLS) was developed by Kjell et al. (2016; Turkish version: Satıcı & Göçet Tekin, 2017). The five items (e.g., "*I accept different circumstances in my life*") are rated on a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*) with scores ranging from 5 to 35. High scores mean that participants have a high level of harmony in life. The Cronbach's alpha coefficient of the scale was reported as 0.78. In this research, the Cronbach alpha coefficient was found as 0.82.

4.1.3 | Data analysis

In the data analysis, the relationships between earthquake fear, mental wellbeing, psychological distress, and harmony in life were examined using Pearson correlation analysis. Then, serial mediation analysis was performed using Hayes's (2018) PROCESS macro plug-in v4.1 (Model 6). In this analysis, which is based on regression, the serial mediating role of psychological distress and harmony in life in the relationship between earthquake fear and mental wellbeing was tested. In the serial multiple mediation analysis, which includes two mediating variables, the independent variable affects the dependent variable in four different ways, one directly and the other three indirectly. Lastly, the significance level of this mediating role was determined by the bootstrapping method, which is accepted as a contemporary approach by Hayes and Preacher (2014). The reason for choosing this analysis method is that it shows the direct and indirect effects between the variables in a healthier way. Hayes's conditional process analysis with the PROCESS macro plug-in is an analysis method that shows the mediation effect between variables in a contemporary way.

4.2 | Results

Earthquake fear was significantly and positively associated with psychological distress ($r = 0.650$, $p < 0.001$) and negatively correlated with harmony in life ($r = -0.406$, $p < 0.001$). In addition, the earthquake fear was negatively correlated with mental wellbeing ($r = -0.484$, $p < 0.001$). The results (see Figure 2) showed that earthquake fear significantly predicted psychological distress ($B = 1.49$, $p < 0.01$) and harmony in life ($B = -0.114$, $p < 0.05$). Moreover, the total effect of earthquake fear on mental wellbeing was significant ($B = -0.361$, $p < 0.01$). On the other hand, the (direct) effect of earthquake fear on mental wellbeing did not continue to emerge after controlling the impacts of psychological distress and

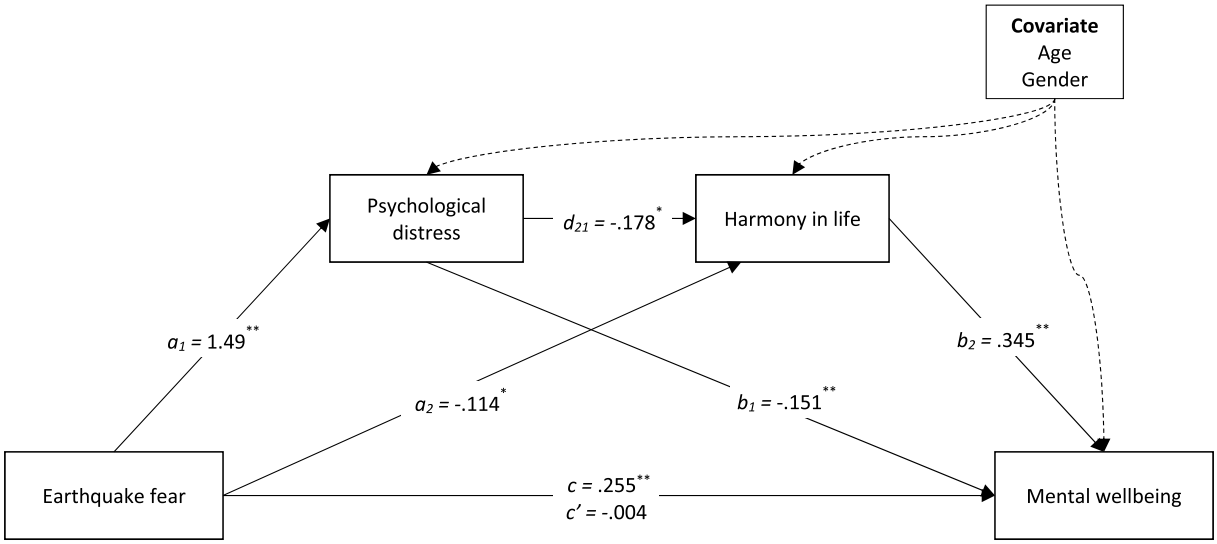

FIGURE 2 The result of serial multiple mediational model, $^{**}p < 0.01$; $^{*}p < 0.05$.

harmony in life ($B = -0.004$, $p > 0.05$). Both psychological distress ($B = -0.225$, $SE = 0.03$, 95%CI [−0.333, −0.199]) and harmony in life ($B = -0.046$, $SE = 0.02$, 95%CI [−0.091, −0.007]) were found to mediate the relationship between earthquake fear and mental wellbeing. It was also revealed that earthquake fear facilitated mental wellbeing through psychological distress and then harmony in life (i.e., serial mediating effect) ($B = -0.107$, $SE = 0.02$, 95%CI [−0.147, −0.073]). As a result, psychological distress and harmony in life serially and fully mediate between earthquake fear and mental wellbeing.

5 | DISCUSSION

After two major earthquake disasters, the mental health of Turkish society has become a worrying concern. Because an earthquake is an event that triggers fear and creates a perception of danger or threat in the minds of individuals, this fear, which arises due to the earthquake, may negatively impact the emotional reactions and mental health of individuals. Therefore, in this study, it was aimed to develop the EFS in order to measure the earthquake fear level of individuals and examine its relationship with a number of variables. In this direction, the COVID-19 Fear Scale, which was recently developed for COVID-19 and induced substantial fear in people, was revised and utilised in this study.

The first finding obtained in this study is that the EFS is psychometrically valid and reliable. This finding provides an answer to the first research question in the first phase of the study. The research findings reveal that the one-factor structure of the EFS fits well, and all different measures, including Cronbach's alpha (α), McDonald's omega (ω) and Guttmann's lambda (λ^6) are at a sufficient level in the reliability analysis. These findings, it may be said, are at acceptable reliability levels in the literature (Karagöz, 2017). In addition, in this study, the IRT was applied to investigate the relationships between the item responses of the participants. The IRT results demonstrated that 100% of the scale items were classified as quite high. According to Baker (2001), α value must be greater than 1.0 for the items to be distinctive. In this context, it was determined that the items in the EFS were greater than 1.88. This means that the items of the EFS have high discrimination power. The discrimination power indicates the likelihood of distinguishing between two samples drawn at random from the population of interest (Smalldon & Moffat, 1973).

In the second stage of the study, it was determined that there was a significant relationship between earthquake fear and depression, anxiety, stress, and mental wellbeing. In addition, a significant relationship was found to exist between neuroticism and conscientiousness, among the big five personality traits, and earthquake fear. This finding answers the second research question. The results of previous studies support this finding (e.g., Ehring et al., 2011; Prizmić-Larsen et al., 2023; Rowney et al., 2014). In the afore-mentioned studies, it has been reported that earthquake fear causes long-term depressive tendencies, excessive anxiety, and stress in individuals. Similarly, in another study, it was reported that individuals showed more depression symptoms following an earthquake (Piccardi et al., 2017). Kung and Chen (2012) stated that the fear perceptions of individuals who had been exposed to earthquake disasters differed significantly compared to those who were not. Similarly, Tian et al. (2014) reported that people who have experienced earthquakes before are more afraid of earthquakes. In this study, it was observed that individuals without earthquake experience had lower earthquake risk perceptions, whereas individuals with earthquake experience had higher perceptions of earthquake risk. Terpstra (2011) researched individuals exposed to flood disasters and found higher risk expectations of disaster victims, similar to previous studies. Likewise, in this study, it was reported that the level of fear among disaster victims that they will be caught in a new disaster is high. From this point of view, it can

be concluded that the level of fear of earthquake victims may be higher than that of individuals who have not experienced a disaster before. In other studies in the literature, as in this research, it was reported that the wellbeing of individuals decreased due to earthquakes (e.g., Oishi et al., 2017; Sümer et al., 2005; Xu et al., 2019). All these studies prove that the earthquake seriously impacts the mental health of individuals and disrupts the existing routine of daily life. From this point of view, it can be interpreted that individuals who are victims of earthquakes will need psychological support resources more than ever before. Therefore, it may be important to increase social support resources and help earthquake victims regain their sense of safety after an earthquake. At this point, community mental health professionals have a great deal of responsibility.

Except for this, in this study, it was found that earthquake fear was negatively correlated with conscientiousness and positively correlated with neuroticism. There is only one study in the literature emphasising that there is a relationship between earthquake fear and personality traits. In Osborne and Sibley's (2013) research, it was reported that earthquakes influence personality traits in individuals. The fear that people experience may be indirectly related to personality traits. Costa and McCrae (1992) state that neurotic individuals are more prone to emotional instability, anxiety, and depression. Accordingly, there may be an increase in the neurotic personality traits of earthquake victims. This situation stated in the literature supports the finding of the research. In addition, individuals with a high level of conscientiousness are those who take care of the social benefit, focus on being organised and like to be in control (McCrae & Costa, 2003). Salcıoğlu et al. (2018) reported that earthquake victims' sense of control decreased. Conscientiousness traits may be adversely affected in those who have lost their sense of control as a result of the earthquake and are unable to maintain order in their lives. Psychological problems experienced following the earthquake may influence these personality traits in these individuals. For this reason, psychological follow-up of earthquake victims for the rest of their lives and providing the necessary support for the problems they may encounter may be important in terms of preventive mental health.

In the third and final stage of the study, it was determined that psychological distress and harmony in life played a serial and fully mediating role between earthquake fear and mental wellbeing. In other words, individuals who experience excessive fear of earthquakes are more likely to experience psychological distress, and this reduces their ability to achieve harmony in life, thus negatively impacting their mental wellbeing. Thus, increasing the activities related to eliminating the psychological distress of individuals who have earthquake fear may facilitate harmony in life and thus increase the level of mental wellbeing. This finding provides answers to the third research question of the study. In line with our findings, in the study of Frijters et al. (2021), it is noted that the negative emotions that arise as a result of the individuals being exposed to an earthquake or earthquake news will reflect negatively on their wellbeing. In addition, another finding obtained in this study is that psychological distress negatively predicts harmony in life. This finding is supported by the research of Satıcı et al. (2023). In the aforementioned study, it was reported that the level of harmony in life decreases as individuals experience psychological distress. In this context, the ability of individuals to control the level of psychological distress may positively influence harmony in life. The fact that the earthquake is an unexpected and unpredictable event (Kannis Dymand et al., 2015) and the individual's loss of control (Bergiannaki et al., 2003) trigger psychological problems and so reduce wellbeing. Therefore, mental health professionals have a great job of building the trust of earthquake victims and controlling them by making them feel safe.

5.1 | Implications

The EFS developed in this research has filled an important gap in the literature by providing a current issue to be mentioned. The psychometric properties of this scale, which were similarly examined in a recent study conducted in Croatia (Prizmić-Larsen et al., 2023) were discussed in more detail in the Turkish sample. For the EFS, many provinces of Türkiye participated, and the research was carried out on a large sample. Within the scope of this research, the discrimination power of the items in the scale was evaluated by applying IRT, apart from CFA. Additionally, many analyses of reliability have been conducted. Therefore, this valid and reliable scale may be used frequently in new research. This scale, which enables people to reveal their earthquake fear, can guide field practitioners. In addition, the psychological effects of earthquake fear on individuals may be examined using this scale. Lastly, by utilising this scale, preventive and remedial intervention programs may be prepared to cope with the earthquake fear and to increase the mental wellbeing of individuals. To develop these preventive and remedial intervention programs, preparation may be made by making use of the theoretical findings obtained in new research. Moreover, within the scope of this preparation, different theoretical approaches such as Reality Therapy, Cognitive Behavioural Therapy, Acceptance and Commitment Therapy can be used. These intervention programs can be used to meet the basic psychological needs of individuals who have experienced earthquakes and facilitate their adaptation to life. Intervention programs can contribute to mental health by enabling individuals to experience emotional discharge. Within the scope of these intervention programs, earthquake survivors can be taught to develop coping strategies for this traumatic event. In this way, the mental health of individuals may be improved.

5.2 | Limitations and future research

Some limitations should be considered when interpreting the findings of this study. The first limitation of the study is the collection of data using self-report scales. Even if voluntary participation is taken as a

basis, these scales may reveal social desirability errors. Therefore, different data collection methods may be preferred in future research. The second limitation is that it is difficult to establish causality due to the cross-sectional nature of the research design. By making use of these research findings, longitudinal or experimental studies may be carried out in future research. The third limitation is that although more than one reliability analysis was performed in this study, test-retest reliability was not calculated. Within the scope of temporal reliability, the test-retest reliability coefficient of the scale can be determined in future studies. Finally, data were collected only from the Turkish sample. Considering that the earthquake and the fear experienced are universal, future studies may be conducted by collecting data from different cultures.

6 | CONCLUSION

In these days when earthquake fear is common, this concept has been examined in three stages in different samples. In the first stage, it has been demonstrated that the EFS is a valid and reliable measuring tool. Then, the criterion correlation validity of this scale was proved by the scales that were previously accepted as valid and reliable. Lastly, it has been determined that earthquake fear increases psychological distress in individuals and therefore reduces wellbeing. Experimental and longitudinal new studies should be conducted to better understand earthquake fear and reveal its relationship with other concepts.

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CONFLICT OF INTEREST STATEMENT

No conflict of interest exists for this manuscript for any of the authors.

DATA AVAILABILITY STATEMENT

Data will be available on request.

ETHICS STATEMENT

The study protocol has been approved by the Yıldız Technical University's Scientific Research and Ethics Committee. The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its following updates.

PRE-REGISTRATION STATEMENT

This study was not pre-registered.

CONSENT TO PARTICIPATE

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

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