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Earthquake fear and flourishing: serial mediation of meaningful living and psychological adjustment

Sinan Okur ^a, Zahide Gül Karaağaç ^b, Fatma Betül Yılmaz ^c, Hasan Kütük ^d
and Seydi Ahmet Satıcı ^b

^aDepartment of Educational Sciences, National Defense University, Turkish Air Force Academy, Istanbul, Türkiye; ^bFaculty of Education, Department of Psychological Counselling, Yıldız Technical University, Istanbul, Türkiye; ^cFaculty of Humanities and Social Sciences, Psychology, Istinye University, Istanbul, Türkiye; ^dVocational School of Health Services, Child Development, Istanbul Gelisim University, Istanbul, Türkiye

ABSTRACT

The earthquake fear seriously influences the psychological wellbeing of individuals. It is necessary to explain in more detail the nature of the link between earthquake fear and flourishing. In this context, the purpose of this study is to examine the serial mediator role of meaningful living and psychological adjustment in the relationship between earthquake fear and flourishing. The sample consisted of 401 individuals (81.8% females, $M_{age} = 24.36$, $SD = 5.30$). Participants completed four scales measuring earthquake fear, flourishing, meaningful living, and psychological adjustment. The results of the correlation analysis demonstrated significant relationships between these variables. In addition, structural equation modelling revealed that meaningful living and psychological adjustment have a serial mediating role in the relationship between earthquake fear and flourishing. These findings prove the relationship between earthquake fear and mental health.

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Flourishing; earthquake fear; meaningful living; psychological adjustment; serial mediation analysis

Introduction

Earthquakes, one of the most devastating natural disasters on earth, negatively influence many aspects of people's lives. Along with the many monetary damages caused by being homeless and losing their belongings, earthquakes may cause certain physical problems. In addition to these problems, the fears and traumas experienced as a result of earthquakes have devastating effects on people and cause many psychological problems. It was determined that individuals influenced by an earthquake showed more depressive tendencies (Prizmić-Larsen et al., 2023), experienced more anxiety, stress, and fear (Rowney et al., 2014; Satıcı et al., 2023), and observed more negative emotions (Frijters et al., 2021). In addition to all these, it has been reported that the traumatising effect of the earthquake causes severe damage to mental health (Grimm et al., 2012). In the study of Sümer et al. (2005), it was revealed that an unexpected earthquake disaster

reduces the wellbeing of individuals. Similarly, in the study of Oishi et al. (2017), it was stated that individuals influenced by an earthquake enjoyed life less and their life satisfaction decreased. Based on all these research findings, it can be said that individuals who are directly or indirectly impacted by an earthquake may experience a significant change in their level of flourishing.

The reason why it is thought that the level of flourishing can vary significantly in individuals is the aspect of this concept that distinguishes it from other positive psychology concepts. The main aspect that distinguishes flourishing from other mental health concepts in the literature is that it addresses general wellbeing, psychological resilience in the face of difficulties, and quality of life in a more comprehensive manner (Makwana, 2019). In addition, flourishing is considered an indicator of how well individuals can live a good life and improve themselves in the face of difficulties (Makleff et al., 2022). Therefore, it may be important to investigate and determine the developmental levels of individuals, especially in traumatic experiences such as earthquakes.

Flourishing, which has an important psychological function in human life, is defined as the optimum level of both performance and psychological flexibility (Fredrickson & Losada, 2005). Emphasising the psychological development of individuals, this concept evokes growth, development, and wellbeing (Huppert & So, 2013). Similarly, Seligman (2011) expresses flourishing as an indicator of wellbeing. Flourishing, which is associated with mental health and life satisfaction in the literature (Garzón-Umerenkova et al., 2018), is explained as having positive emotions and a meaningful life (VanderWeele, 2017). The level of flourishing may be shaped according to positive and negative life events.

Earthquakes, one of the natural disasters, are among the negative life events that play a role in shaping flourishing. Emotions that arise after being directly or indirectly exposed to an earthquake can harm the psychological functions of individuals (Prizmić-Larsen et al., 2023). Earthquake fear, one of these emerging emotions, can disrupt the psychological functions of individuals and reduce their level of development. Apart from this, a negative and stressful life event such as an earthquake disaster may lead to a decrease in positive emotions and the emergence of problems about having a sense of meaning in life. In other words, it may be that earthquakes can have a devastating impact not only on flourishing but also on meaningful life. In this context, the study by Şeker (2016) supports this idea. In the afore-mentioned study, it was revealed that earthquake survivors lose their belief in a just world and question the meaning of their lives. The fact that people's reliable world schema is destroyed along with their homes in the earthquake pushes them to question the meaning of life. This questioning may have an adverse reflect on the psychological health of individuals. The literature emphasises the importance of the feeling of meaningful living in terms of psychological health (Arslan & Yıldırım, 2021). Based on this, the weakening of the sense of meaningful living due to the earthquake fear may also reduce the psychological adjustment of individuals.

Meaningful living and psychological adjustment as serial mediators

Meaningful living, which is one of the important components of mental health, is defined as the state of setting goals in life and achieving existential satisfaction by pursuing these goals (Ryff & Singer, 1998). According to Sharf (2012), meaningful living, a concept of positive psychology, is explained as the main motivation source for individuals. According to

Batthyany and Russo-Netzer (2014), a meaningful life provides an impetus for people to set real goals. Studies have indicated that individuals with an elevated level of meaningful living are more psychologically resilient (Yıldırım et al., 2022), have a higher level of well-being (Garrosa-Hernández et al., 2013; Minkkinen et al., 2020), and have a higher level of quality of life (Braaten et al., 2019). Except for this, it has been stated in the literature that people who have a meaningful life are stronger against stressful and difficult life events (Arslan et al., 2022). In the study of Arslan and Yıldırım (2021), it was emphasised that having a powerful sense of meaningful living in coping with these difficult life events is important for the psychological health of individuals. All these research findings indicate that there may be a relationship between meaningful living and flourishing. It should be also taken into consideration that earthquakes are one of the most difficult life events and that a feeling of fear is triggered in individuals as a result of the earthquake. Since it is thought that triggering this fear may cause individuals to question life, meaningful living may play a mediating role in this research. Based on this, the earthquake fear can predict flourishing through meaningful living. Apart from this, earthquake fear can also predict flourishing via psychological adjustment. Because earthquake fear may cause problems at the psychological adjustment level of individuals.

Psychological adjustment is defined as the ability of individuals to keep up with new life events and to tolerate new situations as a result of their differing goals (Peterson, 2015). Many studies in the literature emphasise that psychological adjustment is an important concept for mental health (e.g. Bantjes & Kagee, 2018; Yıldırım & Solmaz, 2021). A high level of psychological adjustment enables individuals to get more satisfaction from life (Yıldırım & Arslan, 2021) and to be happy by living a pleasant life (Chambers et al., 2017). These research findings reveal that the level of flourishing is related to psychological adjustment. As a result of sudden and uncontrollable earthquakes, individuals begin to live a new life. As mentioned before, it was thought that psychological adjustment, defined as the ability of individuals to adapt to new life events, could play a mediating role in this research. Especially the fear experienced after an earthquake can make the psychological adjustment process of earthquake victims difficult. Therefore, it is important to reveal the relationship between earthquake fear and psychological adjustment in this research.

The present study

Earthquake fear is defined as the fear of being caught in the wreckage or losing their lives or those of their relatives after an earthquake and having physiological and psychological reactions when they think about the earthquake (Satici et al., 2023). This fear causes individuals to experience deep uneasiness and therefore lead their lives negatively. Previous research has indicated that excessive earthquake fear has serious adverse effects on mental health (e.g. Frijters et al., 2021; Kyutoku et al., 2012). Similarly, earthquake fear has also been reported to reduce wellbeing in individuals (e.g. Oishi et al., 2017; Sümer et al., 2005). Based on all these findings, it can be said that earthquake fear may influence the flourishing level negatively. When the literature was examined, no research was found examining the relationship between earthquake fear and flourishing. Therefore, it is important to examine the link between the level of flourishing, which is reported to be a more comprehensive mental health concept (Makwana, 2019), and earthquake

fear. Apart from this, as mentioned above, it is thought that strengthening the meaningful lives and supporting the psychological adjustment of individuals influenced by earthquake fear may increase their flourishing.

This research was designed to explore the pathway from earthquake fear to flourishing. In this pathway, the serial mediator role of meaningful living and psychological adjustment is examined. No further studies addressing these four variables have been found. In this study examining the relationship between earthquake fear and flourishing, the main reason why we think that meaningful living and psychological adjustment variables may play a serial mediating role is that these two concepts have a significant impact on individuals' quality of life and psychological health. Based on this, individuals who lead a meaningful life during difficult life events may also have a higher psychological adjustment. Therefore, these variables mentioned in this research may have a serial mediating role. On the other hand, the creation of a clinically usable scientific resource that reveals the importance of reducing fear in increasing the flourishing of earthquake victims is the basis of this research. Because flourishing refers to a comprehensive psychological state that can be impacted by many factors. Hence, we assumed that people's flourishing may change due to an earthquake, and earthquake fear may be one of these factors. The following hypotheses (*Hs*) were tested in this research, which aimed to examine the serial mediating role of meaningful living and psychological adjustment in the relationship between earthquake fear and flourishing:

H1. Earthquake fear will be negatively related to flourishing.

H2. The relationship between earthquake fear and flourishing will be mediated by meaningful living.

H3. The relationship between earthquake fear and flourishing will be mediated by psychological adjustment.

H4. The relationship between earthquake fear and flourishing will be serially mediated by meaningful living and psychological adjustment.

Method

Participants and procedure

On February 6, 2023, two major earthquakes (7.7 and 7.6 magnitudes) occurred centred in Pazarcık and Elbistan districts of Kahramanmaraş province of Türkiye. Approximately 13.5 million people were directly impacted, and the whole of Türkiye was indirectly affected by these earthquakes felt in 11 provinces of Türkiye. As a result of the earthquake, more than 45,000 people died and more than 100,000 people were injured (AFAD, 2023).

In this cross-sectional study planned after this disaster, the convenience sampling method was used to determine the participants. Data from the participants was collected using an online form between March 3 and 27, approximately one month after the earthquake. The online form was shared with the participants in public groups on the researchers' social media accounts. This research was conducted on the Turkish population that was directly and indirectly affected by the earthquake. Participants live in 48 of Türkiye's 81 provinces (including 11 provinces that are earthquake epicentres). The sample consists of 401 people, 328 of whom are female (81.8%) and 73 of

whom are male (18.2%), between the ages of 18 and 49. The average age of the sample was calculated as 24.36 ($SS = 5.30$). 12 of the participants are in high school or below (2.9%), 306 of them are undergraduates (76.3%), and 83 (20.8%) of them are at the graduate level. In addition, the majority of the participants stated that the perceived socio-economic situation is at a medium level (71.1%). All the descriptive statistics mentioned above and the descriptive statistics of the participants' responses regarding the earthquake are given in [Table 1](#).

Before starting the research, an ethical compliance certificate was obtained from the Social and Human Sciences Research Ethics Committee of Yıldız Technical University (Report Number = 20230301949, Verification Code = b65ef). In addition, this research was conducted adhering to all ethical principles stated in the 1975 Declaration of Helsinki and subsequently updated. All participants gave their informed consent before the study's data were collected. Participation in the research was on a voluntary basis, and no fee was paid to the participants. As previously mentioned, the data was collected using a web-based form. This web-based form is designed so that participants can withdraw at any time and submit the form only after all questions have been answered.

Measures

Personal Information form

It was created by the researchers to obtain information about the participants' gender, age, educational status, socioeconomic status, earthquake-related experiences and traumatic experiences. These are given in [Table 1](#) as demographic information.

Table 1. Participants' characteristics.

Variable	Frequency	%
<i>Gender</i>		
Female	328	81.8
Male	73	18.2
<i>Educational status</i>		
High School or below	12	2.9
University	306	76.3
Master / Ph.D.	83	20.8
<i>Perceived Socio-Economic Status</i>		
Poor	92	22.9
Moderate	285	71.1
Good	24	6.0
<i>Experience of Earthquake Status</i>		
Yes	250	62.3
No	151	37.7
<i>Status after earthquake</i>		
No differences	380	94.8
I moved different city	14	3.5
I moved in same city	7	1.7
<i>Type of earthquake experience</i>		
Directly affected	23	5.7
No effect	10	2.6
My acquaintances have been affected	86	21.4
Have been affected by social media and news	282	70.3
<i>Have you had a traumatic experience?</i>		
Yes	151	37.7
No	250	62.3

The Flourishing Scale (TFS)

The TFS was developed by Diener et al. (2010; Turkish version: Telef, 2011). The eight items (e.g. '*I actively contribute to the happiness and wellbeing of others*') are rated on a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*) with scores ranging from 8 to 56. High scores mean that the participants have an elevated level of flourishing. Confirmatory factor analysis results indicated that the scale's validity was assured. In the analysis of reliability, a Cronbach alpha value of .80 was reported (Telef, 2011).

Earthquake Fear Scale (EFS)

The EFS was developed by (Satıcı et al., 2023). The seven items (e.g. '*I am very fear of losing my life by being caught in an earthquake*') are rated on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*) with scores ranging from 7 to 35. High scores from the scale demonstrate that the participants have a high earthquake fear. The results of confirmatory factor analysis proved the validity of the scale. The Cronbach's alpha reliability value of the scale was calculated as .89 (Satıcı et al., 2023).

Meaningful Living Measure (MLM)

The MLM was developed by Arslan (2020). The six items (e.g. '*My life has an ultimate purpose and meaning*') are rated on a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*) with scores ranging from 6 to 42. Possible high scores indicate a high level of meaningful living. The scale was revealed to be valid as a result of confirmatory factor analysis. The Cronbach's alpha reliability value of the scale was found as .80 (Arslan, 2020).

Brief Psychological Adjustment Scale (BPAS)

The BPAS was developed by Cruz et al. (2020; Turkish version: Yıldırım & Solmaz, 2021). The six items (e.g. '*How irritable, angry, and/or broken did you feel this week?*') are rated on a seven-point scale from 1 (*not at all to*) to 7 (*extremely*) with scores ranging from 6 to 42. Possible lower scores indicate higher overall psychological adjustment. The scale is valid in the confirmatory factor analysis. In the analysis of reliability, a Cronbach alpha value of .88 was reported (Yıldırım & Solmaz, 2021).

Statistical analyses

First, the suitability of the research data for parametric tests was examined by performing a normality test. After it was determined that the data indicated a normal distribution, the Pearson product-moment correlation coefficient with the relationships between the variables were examined. Moreover, reliability analyses (Cronbach's α , McDonald's ω , Guttman's λ_6) were calculated. Analyses throughout the research were performed with IBM SPSS Statistics 26.0, IBM AMOS 24.0 and JASP 0.17.1.

In order to realise the hypotheses of the research, a two-stage approach was adopted as suggested in the literature (Anderson & Gerbing, 1988) and Structural Equation Modeling (SEM) was carried out. While performing SEM, first the measurement model and then the structural model were tested. In these analyses, parcellation was used to reduce the measurement errors of single-factor scales (Little et al., 2002). In this context, each of the four measures used in the research was divided into two parcels. As a result of the

analysis, standardised root mean squared residual (SRMR), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), normed fit index (NFI), goodness of fit index (GFI), and incremental fit index (IFI) values were considered. Hoyle and Panter (1995) suggest that SRMR and RMSEA values should be less than .08 and CFI, TLI, NFI, GFI, and IFI fit index values should be greater than .90. In addition, this research enables the investigation of the indirect effects of serial multiple mediator variables, as suggested by Van Jaarsveld et al. (2010). Lastly, age and gender were included in the model as control variables in this study.

Results

Preliminary analyses

As a result of the preliminary analysis of the research, it was determined that the skewness values were between $-.961$ and $-.178$ and the kurtosis values were between $-.676$ and $.897$. These findings are at an acceptable level according to the recommendations of Tabachnick and Fidell (2013). In addition, it was determined that all reliability coefficients were greater than .87, taking into account the criteria of Nunnally and Bernstein (1994). Regarding the multicollinearity problem, Variance Inflation Factor (VIF) values are between 1.107 and 1.265, and tolerance values are between .866 and .903. Additionally, the Durbin-Watson value is calculated as 1.98. All these results reveal that there is no multicollinearity problem. Based on the preliminary analysis, all the assumptions suggested by Field (2016) were provided.

Table 2 includes the descriptive statistics of the variables, their reliability coefficients such as Cronbach's α , McDonald's ω , Guttman's λ_6 and their correlations with each other. Correlation analysis and discriminant validity are given in Table 3. As a result of the correlation analysis, earthquake fear has a negative relationship with flourishing ($r = -.125, p < .05$), meaningful living ($r = -.114, p < .05$) and psychological adjustment ($r = -.361, p < .01$). At the same time, flourishing is positively related to meaningful living ($r = .787, p < .01$) and psychological adjustment ($r = .375, p < .01$). Lastly, a significant positive relationship was found between meaningful living and psychological adjustment ($r = .327, p < .01$). In addition, Table 3 shows the correlation of individuals who were directly or indirectly affected by the earthquake with earthquake fear ($r = .013, p > .05$). This finding shows that earthquake-related experiences are not related to earthquake fear. In other words, an individual who experienced the earthquake personally or witnessed the earthquake through social media may fear the earthquake at the same rate. Similar interpretations can be made for meaningful life ($r = -.087, p > .05$) and psychological adjustment ($r = -.072, p > .05$). How the earthquake was experienced was not significantly correlated with meaningful life and psychological adjustment levels. However, a low level of significant correlation was found for flourishing ($r = -.117, p < .05$). Individuals who directly experienced the earthquake have lower flourishing levels than other individuals.

Gender difference analyses of the four variables are as follows: flourishing $t(-.959) = 1.35, p = .340$, meaningful living $t(-.899) = 1.15, p = .371$, earthquake fear $t(4.594) = 10.93, p < .001$, psychological adjustment $t(-2.51) = 0.16, p < .001$. According to the findings, earthquake fear was higher in women ($M = 24.07, SD = 6.3$) than in men ($M = 19.02, SD = 8.1$). Conversely, psychological adjustment was lower in women ($M = 21.56, SD = 8.7$)

Table 2. Descriptive statistics, CR, AVE, reliabilities, and t-test results for gender differences for the study variables.

Variable	Skewness	Kurtosis	CR	AVE	α	ω	λ_6	Women		Men		t test results		
								M	SD	M	SD	t	df	p
1. Earthquake fear	-.219	-.676	.92	.86	.89	.89	.90	24.07	6.33	19.02	8.1	4.594	399	.013
2. Meaningful living	-.961	.897	.90	.82	.89	.88	.87	32.98	6.11	33.77	6.85	-.899	399	.371
3. Psychological adjustment	-.178	-.606	.92	.85	.91	.91	.90	21.56	8.79	24.45	8.86	-2.518	399	< .001
4. Flourishing	-.707	.521	.86	.76	.89	.89	.88	42.01	8.22	42.95	7.41	-.959	399	.340

Table 3. Correlations, discriminant validity, and t-test results for age differences for the study variables.

Variable					ERE	EA		A		t test results		
	1	2	3	4		M	SD	M	SD	t	df	p
1. Earthquake fear	.93				.013	23.08	6.99	24.30	6.25	-1.227	399	.224
2. Meaningful living	-.114*	.91			-.087	32.95	6.34	34.52	5.31	-1.848	399	.069
3. Psychological adjustment	-.361**	.327**	.92		-.072	22.07	8.81	22.26	9.35	-.131	399	.869
4. Flourishing	-.125*	.787**	.375**	.87	-.117*	41.78	8.15	45.24	6.80	-3.165	399	.002

Diagonals (in bold) represents square root of AVE while off diagonals represent correlations. *ERE*: Earthquake-Related Experiences, *EA*: Emerging Adulthood, *A*: Adulthood.

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

than in men ($M = 24.45$, $SD = 8.8$). While women experience fear at a higher level, they show a lower level of adjustment. Meaningful living scores did not differ significantly in women ($M = 32.98$, $SD = 6.1$) and men ($M = 33.77$, $SD = 6.8$). Similarly, flourishing scores did not differ significantly in women ($M = 42.01$, $SD = 8.2$) and men ($M = 42.95$, $SD = 7.4$).

Measurement model

The measurement model was examined with four latent variables and eight observed variables. As a result of the examination, it was determined that the measurement model indicated a good fit ($\chi^2_{(14, N=401)} = 41.285$, $\chi^2/df = 2.949$; CFI = .989, TLI = .977, NFI = .983, GFI = .989, IFI = .989, RMSEA = .070, SRMR = 0.020, AIC = 85.285, ECVI = .213). The factor loadings, mean, standard deviation, composite reliability (CR), average variance extract (AVE), and reliability coefficients used to determine the convergent validity of constructs are presented in Table 2. According to the results, all factor loadings ranged between .85 and .97 and were statistically significant. This finding revealed that all indicators represent their own variables. Moreover, the results demonstrated that the CRs and AVEs were greater than .70 and .50, respectively. The model had sufficient convergent and discriminant validity according to the standards proposed by Bagozzi and Yi (1988) and Fornell and Laeacker (1981). Each of the reliability coefficients was outstanding. Each of the reliability coefficients was outstanding ($\alpha \geq .89$, $\omega \geq .88$, and $\lambda_6 \geq .87$). These results indicated that the observed variables were reliable indicators of the latent constructs.

Structural model

After examining the measurement model, the structural model was started. In this context, the serial mediating role of meaningful living and psychological adjustment in the relationship between earthquake fear and flourishing was tested. As a result of the analysis, it was determined that each pathway was significant except for from fear of earthquake to flourish and all fit indices were at an acceptable level ($\chi^2_{(28, N=401)} = 79.781$, $\chi^2/df = 2.849$; CFI = .979, TLI = .966, NFI = .968, GFI = .961, IFI = .979, RMSEA = .068, SRMR = .063, AIC = 133.781, ECVI = .334). The model was re-tested by deleting the non-significant path from earthquake fear to flourishing in the model. The re-tested model was found to fit well ($\chi^2_{(29, N=401)} = 79.901$, $\chi^2/df = 2.755$; CFI = .979, TLI = .968, NFI = .968, GFI = .961, IFI = .979, RMSEA = .066, SRMR = .063, AIC = 131.901, ECVI = .330). In addition, it was determined that each path was significant. Comparing partial and full models, the full mediation model was chosen due to the lack of significance of the direct path and quadrature in the partial model ($\Delta\chi^2 = .72$, $df = 1$, $p > .05$) and the low AIC and ECVI indices. In the full mediation model, gender and age effects were accounted for. Figure 1 presents the findings from the serial mediation analyses.

The statistical significance of the mediating variables was examined by bootstrapping 5,000 samples. In the examinations made with this method, the fact that the indirect effect does not contain zero values in the upper and lower limits indicates significance in the 95% confidence interval (Hayes, 2018). Meaningful living partially mediated the association between earthquake fear and flourishing ($-.122$, $p < .05$; BCa95% lower limit = $-.229$ to upper limit = $-.018$). Psychological adjustment partially mediated the

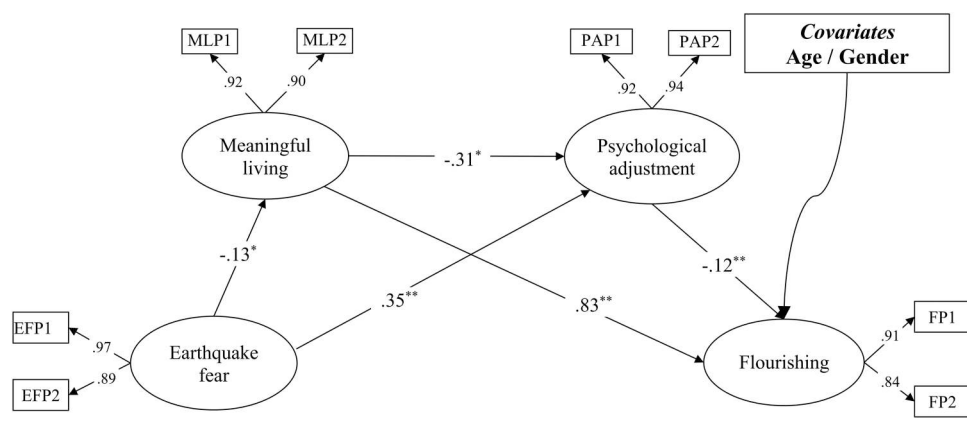


Figure 1. Structural equation modelling for the mediation model. Note. * $p < .05$, ** $p < .01$, MLP: parcel of meaningful living, EFP: parcel of earthquake fear, PAP: parcel of psychological adjustment, FP: parcel of flourishing.

Table 4. Indirect effect of serial mediation model.

Path	Coefficient	95%CI	
		LL	UL
Earthquake fear → Meaningful living → Flourishing	-.122	-.229	-.018
Earthquake fear → Psychological adjustment → Flourishing	-.049	-.092	-.017
Earthquake fear → Meaningful living → Psychological adjustment → Flourishing	-.006	-.015	-.001

Note. CI confidence interval; LL lower limit; UL upper limit.

association between earthquake fear and flourishing ($-.049, p < .05$; BCa95% lower limit = $-.092$ to upper limit = $-.017$). Meaningful living and psychological adjustment completely mediated the association between earthquake fear and flourishing ($-.006, p < .05$; BCa95% lower limit = $-.015$ to upper limit = $-.001$). Table 4 displays the indirect associations between variables.

Discussion

Due to earthquakes that seriously influence their mental health (Frijters et al., 2021), people are afraid of losing their lives by being under the rubble or that their relatives will die as a result of the earthquake (Satici et al., 2023). This fear causes individuals to be unable to fulfil their life skills functionally and to decrease their wellbeing (Oishi et al., 2017). In addition, in a recent study by Prizmić-Larsen et al. (2023), it was stated that earthquakes are a factor that enkindles depressive tendencies and triggers feelings of fear. All these studies reveal that detailed studies should be done in order to better understand the pathway from earthquake fear to flourishing. Therefore, in this study, the serial mediator role of meaningful living and psychological adjustment on the pathway from earthquake fear to flourishing was investigated. Our findings demonstrated that meaningful living and psychological adjustment play a serial mediating role in the relationship between earthquake fear and flourishing. Considering that earthquake fear seriously influences human life, the findings obtained in this research can contribute to

strengthening the mental health of individuals. These findings and their contributions to the literature are discussed and interpreted in detail below, respectively.

Firstly, the hypothesis that there is a significant negative relationship between earthquake fear and flourishing was supported. Although there is no direct research showing that there is a relationship between fear of earthquakes and flourishing, there are different research findings in the literature that support that fear of earthquakes is related to the wellbeing level of individuals (e.g. Prizmić-Larsen et al., 2023; Satıcı et al., 2023). This finding proves that there may be a decrease in the flourishing level of individuals with a high level of earthquake fear. Since earthquakes are a dramatically damaging natural disaster that threatens the integrity of life, it is an expected finding that fear of earthquakes has an inverse relationship with the strengthening of flourishing. The contribution of this finding to the field is that it will offer an important idea to practitioners and theorists working in the fields of psychology and psychological counselling.

The second finding of the study is that meaningful living plays a mediating role in the relationship between earthquake fear and flourishing. This finding reveals that people who experience fear due to earthquakes question life, and therefore their level of flourishing decreases. People whose trust schemes are destroyed due to an earthquake may not find meaning in their lives and may experience emotional depression and psychological distress. Therefore, giving meaning to the lives of individuals who have earthquake fear may also increase their wellbeing. Setting new goals and planning to achieve them can increase individuals' levels of meaningful living and enable them to reach existential satisfaction. In the literature, there are research results supporting this finding (e.g. Braaten et al., 2019; Garrosa-Hernández et al., 2013). These studies demonstrate that individuals with a meaningful life expectancy have higher wellbeing and a better quality of life. In the study of Minkkinen et al. (2020), it was reported that there is a significant relationship between meaningful living and wellbeing. Except for this, Arslan and Yıldırım's (2021) study stated the importance of having a high level of meaningful living when coping with challenging and stressful life events. In the recent study of Arslan et al. (2022), it was reported that meaningful living has a decisive role for mental health in life events in which individuals are psychologically challenged. All these studies indicate that the importance of meaningful living is undeniable in coping with negative emotions such as fear after compelling life events such as earthquakes and will be effective in flourishing. This finding will guide and contribute to mental health practitioners who implement individual or group interventions. For instance, in psychological counselling sessions, it may be useful to enable a client with low psychological functionality due to earthquake fear to focus on meaningful living. Individuals who find or strengthen meaningful living can cope with the fear they experience more easily; thus, their level of flourishing may increase.

The third finding of this study is that psychological adjustment plays a mediating role in the relationship between earthquake fear and flourishing. In other words, earthquake fear predicts flourishing through psychological adjustment. This finding indicates that individuals who have earthquake fear have a decrease in their psychological adjustment, and therefore their wellbeing is adversely influenced. The state of fear experienced after the earthquake can make it difficult for individuals to adapt to their environment, and this may negatively impact their flourishing level. Although there is no study in the literature examining the concepts of earthquake fear, psychological adjustment, and flourishing, this finding can be interpreted indirectly. For instance, Bantjes and Kagee (2018) stated

that psychological adjustment is an important concept for mental health. Similarly, Yıldırım and Arslan (2021) reported that individuals with a high psychological adjustment level have higher wellbeing. The results of this research support the relationship between psychological adjustment and flourishing. Except for this, considering that psychological adjustment is expressed as being able to adapt to stressful life events and adapting quickly to new situations (Peterson, 2015), psychological adjustment should be supported to cope with the emotions experienced after the earthquake disaster. Controlling the earthquake fear by gaining psychological adjustment skills can have a positive effect on individuals' flourishing levels. Mental health practitioners, just like in meaningful living, can apply theoretical techniques to strengthen the psychological adjustment of clients with low flourishing levels due to earthquake fear in psychological counselling sessions. For instance, emotions and thoughts related to the negative situation experienced by individuals can be studied by using cognitive behavioural therapy or emotion-focused therapy techniques. This emotion and thought activity will help increase psychological adjustment. It has been proven in the literature that the use of techniques related to these therapies is effective in strengthening psychological adjustment (e.g. da Silva Machado Vaz, 2018; Zhang et al., 2019). A recent study by Velázquez-Jurado et al. (2023) reported that cognitive behavioural techniques can be used to increase psychological adjustment. All these results prove that the findings of this research contribute to the field.

The fourth and main finding of the study is that meaningful living and psychological adjustment play a serial mediating role between earthquake fear and flourishing. With this finding, the main hypothesis of the research is confirmed. In this study, it was determined that earthquake fear directly predicted flourishing, and this prediction emerged indirectly when meaningful living and psychological adjustment were included in the model. It has been reported in the literature that earthquake fear influences the wellbeing of individuals (Sümer et al., 2005), the level of psychological distress (Roney et al., 2014), and mental health in general (Grimm et al., 2012). This research revealed that meaningful living and psychological adjustment levels should be supported in order to increase the flourishing of individuals experiencing fear after the earthquake. Based on the findings of this research, many important implications can be made for both mental health practitioners and researchers who will examine these concepts in the future. The implications reached in this original research will be pioneers for future studies or applications in the field of psychology and psychological counselling.

Implications

Although there are some limitations to this study, we believe that the obtained findings offer important implications. Earthquake disasters are experienced in many parts of the world, and mental health services are needed afterwards. The results obtained in this research will be useful for professionals providing mental health services after the earthquake. This research facilitates the understanding of the negative effects of emotions experienced after the earthquake on wellbeing. Supporting the belief in meaningful living and the psychological adjustment skills of individuals who have earthquake fear will strengthen their flourishing. Thus, the wellbeing of individuals, who will cope with adverse emotions and thoughts more strongly after the earthquake, will increase. While providing therapeutic assistance to individuals directly or indirectly affected by the

earthquake, it is important to address their fears, strengthen the schemas related to meaningful living, and increase psychological adjustment. All these will ensure the protection of individuals' mental health. Therefore, preventive and protective intervention programmes may be developed to strengthen mental health after the earthquake, and these programmes can be implemented in psychotherapy groups. It is also emphasised in the literature that intervention programmes implemented, especially after natural disasters, are effective. For example, Makwana (2019) mentions the effectiveness of programmes to improve the wellbeing of individuals in coping with the negative effects of natural disasters. In Makleff et al.'s (2022) research, the applied intervention programme reveals the effect of disasters on flourishing. Based on these studies, it can be said that individuals with earthquake fear can strengthen their psychological health with preventive, protective, or curative intervention programmes based on different theoretical foundations. At this point, we believe that it is necessary to apply different theoretical approaches that will support individuals in determining their own meaning and values. For instance, as mentioned before, people who experience psychological distress or persist in negative emotions such as fear after the earthquake can be helped by using theories such as cognitive-behavioural approaches (Velázquez-Jurado et al., 2023), emotion-focused therapies (da Silva Machado Vaz, 2018), existential approaches (Allen, 1973), or acceptance and commitment therapy (Whiting et al., 2020). These theoretical techniques may include activities to improve individuals' levels of meaningful living and psychological adjustment.

Limitations and future research

The present study has some limitations. First of all, this study was designed with a cross-sectional design. A longitudinal or experimental design may be preferred in future studies in order to both reveal the nature of the variables examined in the research more clearly and investigate the pathways found to be significant in detail. Another limitation is that the sampling method used in the research was convenience sampling. Different sampling methods can be used in future studies. The third limitation of the study is that the scales used are limited to the features they measure and are self-report scale. Therefore, researchers can design future studies with different measurement methods. Lastly, it should be kept in mind that although the participants voluntarily participated in the research, their answers may contain social desirability errors.

Conclusions

After earthquake disasters in many parts of the world, people need psychological as well as physical support. In order to provide this support, it is necessary to determine the needs of individuals who are directly or indirectly affected by the earthquake and experience negative emotions. Therefore, in this study, the importance of the indirect effect of meaningful living and psychological adjustment on the pathway from earthquake fear to flourishing was revealed. The results of the research will contribute to the field of mental health.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Availability of data and material

Data will be available on request.

Consent to participate

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

Ethical approval

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.

ORCID

Sinan Okur  <http://orcid.org/0000-0002-3439-5907>

Zahide Gül Karaağaç  <http://orcid.org/0000-0001-6702-5243>

Fatma Betül Yılmaz  <http://orcid.org/0000-0002-9630-787X>

Hasan Kütük  <http://orcid.org/0000-0002-8288-4107>

Seydi Ahmet Satıcı  <http://orcid.org/0000-0002-2871-8589>

References

- AFAD. (2023). *About earthquakes in Kahramanmaraş* – 36. Retrieved March 19, 2024, from <https://www.afad.gov.tr/kahramanmarasta-meydana-gelen-depremler-hk-36>
- Allen, J. G. (1973). Existential position and adjustment in a college population. *Transactional Analysis Bulletin*, 3(4), 22–24. <https://doi.org/10.1177/036215377300300408>
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411–423. <https://doi.org/10.1037/0033-2909.103.3.411>
- Arslan, G. (2020). Development of the Meaningful Living Measure: A brief and effective measure of meaningful living. *Mehmet Akif Ersoy University Journal of Education Faculty*, 56, 227–242. <https://doi.org/10.21764/maeuefd.773686>
- Arslan, G., & Yıldırım, M. (2021). Coronavirus stress, meaningful living, optimism, and depressive symptoms: A study of moderated mediation model. *Australian Journal of Psychology*, 73(2), 113–124. <https://doi.org/10.1080/00049530.2021.1882273>
- Arslan, G., Yıldırım, M., Karataş, Z., Kabasakal, Z., & Kılınç, M. (2022). Meaningful living to promote complete mental health among university students in the context of the COVID-19 pandemic. *International Journal of Mental Health and Addiction*, 20(2), 930–942. <https://doi.org/10.1007/s11469-020-00416-8>
- Bagozzi, R. P. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Sciences*, 16, 74–94. <https://doi.org/10.1007/BF02723327>
- Bantjes, J., & Kagee, A. (2018). Common mental disorders and psychological adjustment among individuals seeking HIV testing: A study protocol to explore implications for mental health care systems. *International Journal of Mental Health Systems*, 12(16), 1–10. <https://doi.org/10.1186/s13033-018-0196-0>
- Batthyany, A., & Russo-Netzer, P. (Eds.). (2014). *Meaning in positive and existential psychology*. Springer Science + Business Media. <https://doi.org/10.1007/978-1-4939-0308-5>

- Braaten, A., Huta, V., Tyranny, L., & Thompson, A. (2019). Hedonic and eudaimonic motives toward university studies: How they relate to each other and to well-being derived from school. *Journal of Positive School Psychology*, 3(2), 179–196.
- Chambers, S. K., Ng, S. K., Baade, P., Aitken, J. F., Hyde, M. K., Wittert, G., Frydenberg, M., & Dunn, J. (2017). Trajectories of quality of life, life satisfaction, and psychological adjustment after prostate cancer. *Psycho-oncology*, 26(10), 1576–1585. <https://doi.org/10.1002/pon.4342>
- Cruz, R. A., Peterson, A. P., Fagan, C., Black, W., & Cooper, L. (2020). Evaluation of the Brief Adjustment Scale-6 (BASE-6): A measure of general psychological adjustment for measurement-based care. *Psychological Services*, 17(3), 332–342. <https://doi.org/10.1037/ser0000366>
- da Silva Machado Vaz, F. J. (2018). *Emotional processes in psychological adjustment and disorder – their characteristics and evolution during the therapeutic process* [Unpublished doctoral dissertation]. University of Lisbon.
- Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D. W., Oishi, S., & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research*, 97(2), 143–156. <https://doi.org/10.1007/s11205-009-9493-y>
- Field, A. (2016). *Discovering statistics using IBM SPSS statistics*. Sage.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.2307/3151312>
- Fredrickson, B. L., & Losada, M. F. (2005). Positive affect and the complex dynamics of human flourishing. *American Psychologist*, 60(7), 678–686. <https://doi.org/10.1037/0003-066X.60.7.678>
- Frijters, P., Johnston, D. W., Knott, R., & Torgler, B. (2021). *Resilience to disaster: Evidence from daily wellbeing data*. Institute of Labor Economics (IZA). IZA Discussion Papers 14220.
- Garrosa-Hernández, E., Carmona-Cobo, I., Ladstätter, F., Blanco, L. M., & Cooper-Thomas, H. D. (2013). The relationships between family-work interaction, job-related exhaustion, detachment, and meaning in life: A day-level study of emotional well-being. *Revista de Psicología del Trabajo y de las Organizaciones*, 29(3), 169–177. <https://doi.org/10.5093/tr2013a23>
- Garzón-Umerenkova, A., de la Fuente, J., Amate, J., Paoloni, P. V., Fadda, S., & Pérez, J. F. (2018). A linear empirical model of self-regulation on flourishing, health, procrastination, and achievement, among university students. *Frontiers in Psychology*, 9, 536. <https://doi.org/10.3389/fpsyg.2018.00536>
- Grimm, A., Hulse, L., Preiss, M., & Schmidt, S. (2012). Post- and peritraumatic stress in disaster survivors: An explorative study about the influence of individual and event characteristics across different types of disasters. *European Journal of Psychotraumatology*, 3(1), 7382. <https://doi.org/10.3402/ejpt.v3i0.7382>
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.
- Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, & applications* (pp. 158–176). Sage.
- Huppert, F. A., & So, T. T. (2013). Flourishing across Europe: Application of a new conceptual framework for defining well-being. *Social Indicators Research*, 110(3), 837–861. <https://doi.org/10.1007/s11205-011-9966-7>
- Kyutoku, Y., Tada, R., Umeyama, T., Harada, K., Kikuchi, S., Watanabe, E., Liegey-Dougall, A., & Dan, I. (2012). Cognitive and psychological reactions of the general population three months after the 2011 Tohoku earthquake and tsunami. *PLoS One*, 7(2), Article e31014. <https://doi.org/10.1371/journal.pone.0031014>
- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 151–173. https://doi.org/10.1207/S15328007SEM0902_1
- Makleff, S., Varshney, K., Krishna, R. N., Romero, L., & Fisher, J. (2022). Mental health and community resilience among vulnerable populations affected by natural hazards: Protocol for scoping reviews. *Methods and Protocols*, 5(6), 88. <https://doi.org/10.3390/mps5060088>
- Makwana, N. (2019). Disaster and its impact on mental health: A narrative review. *Journal of Family Medicine and Primary Care*, 8(10), 3090–3095. https://doi.org/10.4103/jfmpc.jfmpc_893_19

- Minkinen, J., Auvinen, E., & Mauno, S. (2020). Meaningful work protects teachers' self-rated health under stressors. *Journal of Positive School Psychology*, 4(2), 140–152. <https://doi.org/10.47602/jpsp.v4i2.209>
- Nunnally, J. C., & Bernstein, I. H. (1994). The assessment of reliability. *Psychometric Theory*, 3, 248–292.
- Oishi, S., Yagi, A., Komiya, A., Kohlbacher, F., Kusumi, T., & Ishii, K. (2017). Does a major earthquake change job preferences and human values? *European Journal of Personality*, 31(3), 258–265. <https://doi.org/10.1002/per.2102>
- Peterson, A. P. (2015). *Psychometric evaluation of the Brief Adjustment Scale-6 (BASE-6): A new measure of general psychological adjustment* [Unpublished master's dissertation]. University of Washington.
- Prizmić-Larsen, Z., Vujčić, M. T., & Lipovčan, L. K. (2023). Fear of COVID-19 and fear of earthquake: Multiple distressing events and well-being in Croatia. *Psychological Reports*, 332941231156813. *Advance online publication*. <https://doi.org/10.1177/00332941231156813>
- Rowney, C., Farvid, P., & Sibley, C. G. (2014). I laugh and say I have 'earthquake brain!': Resident responses to the September 2010 Christchurch earthquake. *New Zealand Journal of Psychology*, 43(2), 4–13.
- Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry*, 9(1), 1–28. https://doi.org/10.1207/s15327965pli0901_1
- Satıcı, S. A., Okur, S., Deniz, M. E., Karaağaç, Z. G., Yılmaz, F. B., Kütük, H., Satıcı, B., & Kaya, Y. (2023). The development and initial validation of the Earthquake Fear Scale: Its links to personality traits, psychological distress, harmony in life, and mental wellbeing. *Stress and Health*, 40(2), 1–12. <https://doi.org/10.1002/smi.3306>
- Şeker, B. (2016). Evaluation of life satisfaction after the 2011 Van (Turkey) earthquake. *Social Behavior and Personality: An International Journal*, 44(9), 1409–1417. <https://doi.org/10.2224/sbp.2016.44.9.1409>
- Seligman, M. E. (2011). *Flourish: A visionary new understanding of happiness and well-being*. Free Press.
- Sharf, R. S. (2012). *Theories of psychotherapy & counseling: Concepts and cases*. Brooks/Cole.
- Sümer, N., Karancı, A. N., Berument, S. K., & Gunes, H. (2005). Personal resources, coping self-efficacy, and quake exposure as predictors of psychological distress following the 1999 earthquake in Turkey. *Journal of Traumatic Stress*, 18(4), 331–342. <https://doi.org/10.1002/jts.20032>
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.
- Telef, B. B. (2011). *The validity and reliability of the Turkish version of the Psychological Well-being Scale*. Paper presented at the 11th National Congress of Counseling and Guidance, October 3–5, İzmir, Türkiye.
- VanderWeele, T. J. (2017). On the promotion of human flourishing. *Proceedings of the National Academy of Sciences*, 114(31), 8148–8156. <https://doi.org/10.1073/pnas.1702996114>
- Van Jaarsveld, D. D., Walker, D. D., & Skarlicki, D. P. (2010). The role of job demands and emotional exhaustion in the relationship between customer and employee incivility. *Journal of Management*, 36(6), 1486–1504. <https://doi.org/10.1177/0149206310368998>
- Velázquez-Jurado, H., Flores-Torres, A., Pérez-Peralta, L., Salinas-Rivera, E., Valle-Nava, M. D., Arcila-Martínez, D., Hernández-Jiménez, S., & CAIPaDi Study Group. (2023). Cognitive behavioral treatment to improve psychological adjustment in people recently diagnosed with type 2 diabetes. *Health Psychology and Behavioral Medicine*, 11(1), 2179058. <https://doi.org/10.1080/21642850.2023.2179058>
- Whiting, D., Deane, F., McLeod, H., Ciarrochi, J., & Simpson, G. (2020). Can acceptance and commitment therapy facilitate psychological adjustment after a severe traumatic brain injury? A pilot randomized controlled trial. *Neuropsychological Rehabilitation*, 30(7), 1348–1371. <https://doi.org/10.1080/09602011.2019.1583582>
- Yıldırım, M., & Arslan, G. (2021). A moderated mediation effect of stress-related growth and meaning in life in the association between coronavirus suffering and satisfaction with life: Development of the stress-related growth measure. *Frontiers in Psychology*, 12, 648236. <https://doi.org/10.3389/fpsyg.2021.648236>

- Yıldırım, M., Arslan, G., & Wong, P. T. P. (2022). Meaningful living, resilience, affective balance, and psychological health problems among Turkish young adults during coronavirus pandemic. *Current Psychology*, 41(11), 7812–7823. <https://doi.org/10.1007/s12144-020-01244-8>
- Yıldırım, M., & Solmaz, F. (2021). Testing a Turkish adaption of the Brief Psychological Adjustment Scale and assessing the relation to mental health. *Studies in Psychology*, 41(1), 231–245. <https://doi.org/10.26650/SP2020-0032>
- Zhang, P., Mo, L., Torres, J., & Huang, X. (2019). Effects of cognitive behavioral therapy on psychological adjustment in Chinese pediatric cancer patients receiving chemotherapy. *Medicine*, 98(27), e16319. <https://doi.org/10.1097/MD.00000000000016319>