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DEVELOPMENT OF EARTHQUAKE FEAR SCALE: VALIDITY AND RELIABILITY STUDY

Hüseyin BAYRAM*

Abstract

In this study, it was aimed to develop a measurement tool that can measure the earthquake fear levels of middle and high school adolescents who experienced an earthquake. The study conducted with the descriptive survey model. The sample consisted of adolescents studying in middle and high schools. Factor analyses were applied to test the construct validity of the scale. First, exploratory factor analysis was conducted. Exploratory factor analysis revealed that the scale consisted of two factors (worry and physical symptoms), and explained 65.52% of the total variance. First and second level confirmatory factor analysis were applied to confirm the structure obtained as a result of exploratory factor analyses. Confirmatory factor analyses confirmed the model structure of the scale. For the reliability research, Cronbach's Alpha coefficient was calculated, the lowest 27% group was compared with the highest 27% group, and the correlation between the two measurements was examined by applying the test-retest procedure. At the end of the study it was determined that the scale was reliable based on the values obtained.

Keywords: *Earthquake fear, Scale, Validity, Reliability.*

DEPREM KORKUSU ÖLÇEĞİ'NİN GELİŞTİRİLMESİ: GEÇERLİK VE GÜVENİRLİK ÇALIŞMASI

Öz

Bu araştırmada deprem anını deneyimlemiş ortaokul ve lise kademesindeki ergenlerin deprem korkusu düzeylerini ölçebilecek bir ölçme aracının geliştirilmesi amaçlanmıştır. Betimsel tarama modeliyle gerçekleştirilen araştırmanın örneklemi ortaokul ve liselerde eğitim gören ergen bireylerin katılımıyla oluşturulmuştur. Ölçeğin yapısal geçerliğini test etmek amacıyla faktör analizleri uygulanmıştır. İlk olarak açımlayıcı faktör analizi yapılmıştır. Açımlayıcı faktör analizi sonucunda elde edilen yapının doğrulanması amacıyla doğrulayıcı faktör analizi uygulanmıştır. Açımlayıcı faktör analizi sonucunda ölçeğin endişe ve fiziksel belirtiler olmak üzere iki faktörden oluştuğu ve toplam varyansın % 65.52'sini açıkladığı belirlenmiştir. Ardından birinci ve ikinci derece doğrulayıcı faktör analizleri yapılmıştır. Doğrulayıcı faktör analizleri sonucunda ölçeğin model yapısı doğrulanmıştır. Ölçeğin güvenirlik araştırması için Cronbach's Alpha katsayısı hesaplanmıştır. Ayrıca örneklemde yer alan alt % 27'lik - üst % 27'lik grupların karşılaştırması yapılmış ve test tekrar test yöntemi uygulanarak iki ölçüm arasındaki korelasyon incelenmiştir. Yapılan testlerden elde edilen değerler itibarıyla ölçeğin güvenilir olduğu belirlenmiştir.

Anahtar kelimeler: *Deprem korkusu, Ölçek, Geçerlik, Güvenirlik.*

*Ağrı İbrahim Çeçen University, Faculty of Education, Department of Turkish and Social Sciences Education, Department of Social Studies Education, AĞRI.
e-mail: hubayram@agri.edu.tr, (https://orcid.org/0000-0001-6065-8865)

1. INTRODUCTION

Various natural disasters sometimes occur on the Earth we live on. Disasters happen because of the natural structure of the Earth. One of these disasters is earthquake. In its simplest definition, an earthquake is defined as vibrations in the Earth's crust (Scawthorun & Chen, 2002). These vibrations are caused by the release of energy accumulated in the Earth's crust (Kanamori & Brodsky, 2004). The energy released during sliding or faulting movements at the fracture points of the Earth's crust propagates and causes vibrations (Salditch et al., 2020). Earthquakes usually occur along active fault lines in the Earth's crust (Rundle et al., 2021). On the other hand, geological structures, groundwater and human activities are among the factors that cause earthquakes (Şengör & Zabcı, 2019). Earthquakes are measured in terms of their magnitude. Magnitude is a measure of the amount of energy released during an earthquake. Magnitude is measured using the Richter scale or the Moment Magnitude scale. While the Richter scale provides information about the intensity and energy of the earthquake, the Moment Magnitude scale measures the seismic energy of the earthquake (Rhoades et al., 2021).

Earthquakes are common phenomena across the Earth. While some earthquakes can be mild, some can be very strong and cause great loss of lives. The magnitude 7.5 and 7.7 earthquakes that occurred on February 6, 2023, in Kahramanmaraş province of Türkiye, were among the earthquakes of the 21st century with significant loss of lives. These earthquakes affected 11 provinces in Türkiye and killed over 45,000 people (AFAD, 2023). The idea for conducting this study emerged during the earthquakes in Türkiye on February 6.

Earthquakes are disasters that not only cause people to lose their lives, but also cause permanent damage to health, loss of housing and property, transportation problems, power outages, damage to water resources and loss of employment. For this reason, people who have experienced an earthquake can develop various psychological disorders. Especially the fear, anxiety, stress and trauma following an earthquake can affect people's daily lives and reduce the quality of daily life (Beaglehole et al., 2019). The psychological effects of an earthquake may differ from person to person. While some people experience severe stress, fear, panic, anxiety, grief and sadness, some people may perceive the earthquake as a mild event. The psychological effects that occur after an earthquake are generally considered normal and diminish over time. However, for some people, these effects may continue longer and may require professional help (Gerstner et al., 2020). One of the psychological effects of an earthquake is the state of fear that occurs in people who have experienced an earthquake.

Fear is defined as an emotion that occurs as a result of a real or imagined threats or situations of harm (Andersson, 2022). Physiologically, fear is characterized by symptoms such as rapid heartbeat, sweating and muscle tension. Fear is a defense mechanism that naturally exists in humans to survive and avoid danger. On the other hand, extreme and uncontrolled fear can affect quality of daily life of individuals' negatively (Gamwell et al., 2015). Fears can be related to a wide range of issues. Fear of earthquake, a type of fear, is a state of uncontrolled emotion in the context of the possibility of an earthquake. Fear of earthquakes is common among people living in places where earthquakes occur or may occur. This fear can affect people's lives, interfere with ordinary daily activities, and even cause stress disorders. Adolescents may be more fearful during and after earthquakes than adults (Cénat, McIntee & Blais Rochette, 2020; Chen et al., 2022; Ni et al., 2022).

Adolescence is a transition period in which an individual develops physically, mentally, socially, and emotionally. Adolescence generally covers the ages of 10-19 (WHO, 2023). During adolescence, the individual experiences significant physiological changes. In addition, mental, and emotional changes also occur during adolescence. Adolescence is generally accepted as a critical period for identity building. In this period, individuals try to discover their self-identity and express themselves (Gouws et al., 2000). Fears experienced during adolescence can often be resolved with the right support and guidance. In this way, adolescents go through stronger and healthier processes while preparing for adult life. On the other hand, if the fears experienced during adolescence are not resolved, individuals may experience major problems in their future lives (Danese et al., 2020). For this reason, it is necessary to determine the earthquake fear levels of adolescents who experience earthquake, and to develop practices to eliminate their fears. Based on this necessity, this study aims to develop a measurement tool to determine the earthquake fear levels of middle and high school adolescents who have experienced earthquakes.

Since the researcher was in the earthquake zone during the earthquakes that took place on February 6, 2023, experienced the effects of the earthquake personally, was together with middle and high school adolescents who were affected by the earthquakes, and observed their earthquake fear that reduced the quality of their lives, the researcher thought that the earthquake fear levels of adolescents living in the earthquake zone should be determined. Based on this idea, the researcher conducted a literature review to investigate how to determine the earthquake fear levels of adolescents at the middle and high school level and found many studies (Hsu et al., 2002; Giannopoulou et al., 2006; Şalcıoğlu & Başoğlu, 2008; Guerra, Cumsille & Martinez, 2014; Zhou, Wu & An, 2016; Zhou et al., 2018; Sharma & Kar, 2019; Wang, Wu & Lan, 2020; Zhou et al., 2017; Hall et al., 2022; Herdiana, 2022; Zijlstra et al., 2022) that examined the earthquake fear levels of adolescents. It was determined that these studies did not examine the earthquake fear levels of adolescents, but their fear levels about various issues after earthquakes. In the literature review, the fact that there was no scale measuring the earthquake fear levels of adolescents was accepted as a deficiency in terms of literature and it was decided that the Earthquake Fear Scale (EFS) should be developed for adolescents at the middle and high school levels.

It is thought that the EFS will be a useful tool for educators who want to create educational programs for adolescents with earthquake fear at the middle and high school levels, for psychologists and psychiatrists to determine the earthquake fear levels of adolescents at the middle and high school levels and design appropriate treatment methods for them, for sociologists to provide data to government institutions that develop policies to eliminate social fear, and for researchers who plan to conduct study on earthquake fear of adolescents.

Determining the level of earthquake fear of adolescents who have experienced an earthquake is important in terms of designing practices that eliminate fear. As a matter of fact, it is first necessary to determine whether there is fear of earthquake, and if there is fear, it is necessary to determine at what level. In this study, it was aimed to develop the EFS to determine the earthquake fear levels of adolescents studying at middle and high school levels.

2. METHOD

In this study, which aims to develop a measurement tool to determine the earthquake fear levels of middle and high school adolescents who have experienced the earthquake, quantitative descriptive survey model was used. The descriptive survey model is intended to statistically examine the variables subject to a research without any intervention (Büyüköztürk et al., 2022). This study was conducted within the scope of the permission obtained from scientific research ethics committee of a university in Türkiye with the decision dated 28.09.2023 and numbered 213. Ethical rules were followed in the study.

2. 1. Sample

The sample of the study was formed in two stages. In the first stage, the group for exploratory factor analysis (EFA) and in the second stage, the group for first and second level confirmatory factor analyses (CFAs) were formed. Criterion sampling method was used to form these groups. Criterion sampling is based on the selection of data sources according to the criteria determined in line with the aim of the study (Eichorn, 2021). The reason for the use of criterion sampling was that the participants were selected among the adolescents at the middle and high school levels who had experienced the February 6 Kahramanmaraş Earthquake. Information about the groups in the sample of the study is shown in Table 1.

Table 1: Information About the Groups in the Sample

	Province	Grade								Total
		5th	6th	7th	8th	9th	10th	11th	12th	
EFA	Kahramanmaraş	31	36	27	31	19	23	15	26	**208**
	Malatya	20	23	15	23	26	25	23	23	**96**
	Hatay	20	33	27	12	20	21	12	23	**178**
	Diyarbakır	16	21	6	9	8	12	8	16	**168**
	Gaziantep	25	17	24	18	18	21	14	16	**153**
	Total	**112**	**130**	**99**	**93**	**91**	**102**	**72**	**104**	**803**
	Province	**Grade**								**Total**
		5th	**6th**	**7th**	**8th**	**9th**	**10th**	**11th**	**12th**	
CFA	Kahramanmaraş	26	23	24	23	24	27	9	20	**176**
	Malatya	20	26	16	13	15	19	16	21	**146**
	Hatay	18	23	18	12	17	15	15	20	**138**
	Diyarbakır	10	13	8	12	7	9	9	10	**78**
	Gaziantep	23	16	16	9	14	20	12	19	**129**
	Total	**97**	**101**	**82**	**69**	**77**	**90**	**61**	**90**	**667**

As seen in Table 1, there are two groups in the sample of the study: EFA and CFA groups. The sample included middle and high school-aged adolescents living in Kahramanmaraş, Malatya, Hatay, Diyarbakır, and Gaziantep provinces.

Table 1 shows that a total of 803 adolescents took part in the EFA group, and a total of 667 adolescents took part in the CFA group.

2. 2. Development of the Scale Form

In the first stage of the development process of the EFS, the relevant literature was reviewed to create an item pool. In the literature, various measurement tools examining earthquake fear have been found. For example, Prizmić-Larsen et al. (2023) developed a scale to measure earthquake fear with the participation of adults in Croatia. The scale developed by Prizmić-Larsen et al. (2023) was adapted to Turkish culture by Usta et al. (2023) in a study involving adults. Similarly, Satıcı et al. (2023) developed a scale to measure earthquake fear with the participation of adults in Türkiye. In the literature review, some scales measuring fear of COVID-19 (Ahorsu et al., 2020; Martinez-Lorca et al., 2020; Perz et al., 2020; Reznik et al., 2021) were also examined. The item pool of the EFS was created by analyzing the scales reached in the literature review.

A total of 29 items were included in the item pool. These items were first sent to a professor of Turkish Education and expert opinion was taken on the suitability of the language of the items. Within the scope of the feedback given by the language expert, the spelling of 23 of the items was changed. Then, 29 items were sent to four Guidance and Psychological Counseling Education field experts (two professors, one associate professor, one assistant doctor) working in different universities in Türkiye to get their opinions on the suitability of the items. The field experts considered that seven items would negatively affect the psychology of adolescents, eight items were not related to fear, and four items were repetitive. Based on the feedback received from the field experts, 15 items were deleted and four items were combined into two items. Thus, 12 items were included in the final version of the EFS. An expert opinion was obtained from an associate professor of Turkish Education in order to get an opinion on the comprehensibility of the items in the final version of the EFS. Depending on the expert's feedback, the spelling of two items in the EFS was changed.

EFS was developed on a 5-point Likert scale. For each item of the scale, Strongly-agree(5-points), Agree (4-points), Undecided (3-points), Disagree (2-points), Strongly-disagree (1-point) options were created. The highest score is 60 and the lowest score is 12 for the scale. The scale is shown in Appendix 1. There are no reverse items in the scale. The Turkish version of the scale is also shown in Appendix 2.

2. 3. Data Collection and Analysis

The data of the study were collected in two stages. In the first stage, EFA data were collected and in the second stage, CFA data were collected. Before starting the data collection process, a total of 31 teachers, 15 from secondary schools and 16 from high schools, working in Kahramanmaraş, Malatya, Hatay, Diyarbakır and Gaziantep provinces were contacted. Teachers were informed about the subject of the study, and asked for their help in collecting the data. Twenty-three of the teachers agreed to help collect the data. The EFS forms were sent to the teachers by e-mail and they were asked to print them out and lead their students fill them in. The teachers sent the forms filled in by the students to the researcher by cargo. The incompleted forms sent to the researcher were sorted and excluded from the study. At the end of the sorting, 803 forms for EFA and 667 forms for CFA were obtained.

In the data collection process, firstly, the EFA forms were sent to 14 teachers to collect EFA data. The collected EFA data were analyzed with SPSS 25 program. Then, EFS forms were sent to nine teachers to collect CFA data. The collected CFA data were analyzed using Mplus 7 program.

3. RESULTS

Factor analysis was conducted to determine the construct validity of the EFS. Factor analysis consists of statistical techniques that aim to collect the parameters to measure a construct or quality and use them to explain the validity of the construct (Tabachnik & Fidell, 2019). Firstly, EFA was conducted to determine the construct validity of the EFS. First and second level CFAs were conducted to verify the structure that emerged as a result of EFA. The results obtained are presented under headings.

3. 1. Results on Exploratory Factor Analysis

EFA was conducted with the data obtained from 803 adolescents to examine the factor structure of EFS. EFA is a procedure for result factors based on the relationships between variables (Tabachnik & Fidell, 2019). Before conducting EFA, it was examined whether the data set was suitable for factor analysis. In this context, Kaiser-Meyer-Olkin Test Chi-square Value (KMO), which reveals the suitability of the sample size and the correlation between the items for factor analysis, and Bartlett's Test of Sphericity (BTS), which questions the normality distribution for factor analysis were investigated. The values obtained are shown in Table 2.

Table 2: Kaiser-Meyer-Olkin and Bartlett Sphericity Test Results of Earthquake Fear Scale

Kaiser-Meyer-Olkin	.89
Bartlett Sphericity Testi Chi-square Value	6222.55
Degress of Freedom	66
Significant Value	.00

As seen in Table 2, the KMO value of the data set collected for EFA is calculated as .89, the BTS Chi-square value is calculated as 6222.55, the degree of freedom is calculated as 66 and the significance value is calculated as .00. As the KMO value was greater than .60 and the BTS value ($X2= 6222.55$; $p<.05$) was within the desired range (Tabachnik & Fidell, 2019), it was determined that the data were suitable for EFA. The following criteria were taken into consideration while determining the factor structure of the EFS:

- The factor eigenvalue of the scale is greater than 1 (Tabachnik & Fidell, 2019),
- In order for an item to be shown under a factor, the item factor loading value must be at least .32 (Tabachnik & Fidell, 2019),

- The item-total correlation values of the items in the scale should be at least .30 (Field, 2017),
- The variance explained in the whole scale is greater than 40% (Scherer et al., 1988).

The principal component analysis technique, which is widely preferred, was used in the EFA of the EFS (Büyüköztürk et al., 2022). Varimax rotation technique was used during the EFA of the EFS.

During the EFA, it was seen that the EFS exhibited a three-factor structure in the first stage and explained 66.38 of the total variance. However, it was determined that one item was simultaneously under three factors and two items were simultaneously under two factors. In addition, it was determined that one factor consisted of only one item (the item under three factors at the same time). It was also determined that there was less than .10 difference between the item loadings of the items under different factors at the same time. In order to clarify the EFS's factor structure, the scree plot was analyzed. The scree plot of the EFS is shown in Figure 1.

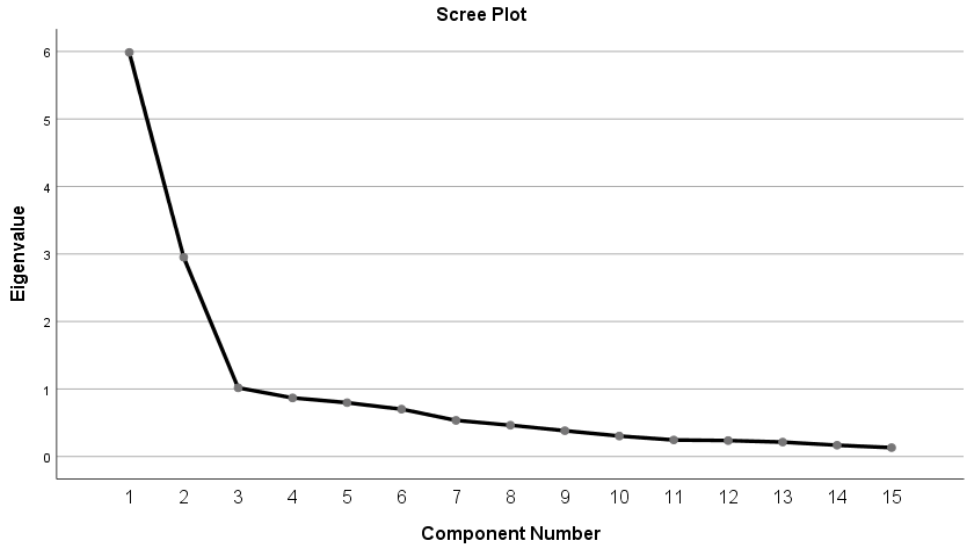

Figure 1: Earthquake Fear Scale's Scree Plot

When Figure 1 is examined, it is understood that the EFS has a two-dimensional structure. As a matter of fact, it is clearly seen that the curve in the scree plot disappears after the second factor (Büyüköztürk et al., 2022).

Items that were under more than one factor at the same time and had less than .10 difference between item loadings (Büyüköztürk et al., 2022) were removed from the scale and the EFA process was repeated. After the EFA process performed with principal component analysis and Varimax rotation technique, a structure consisting of two factors and 12 items was reached. The factor loadings, total variance explained, and total correlation values of the items in the EFS are shown in Table 3.

Table 3: Factor Analysis Results, Total Variance Explained and Item Total Correlation Values of the Earthquake Fear Scale

Item	Factor Loadings		Item total correlation value
	Worry factor	Physical symptoms factor	
I cannot go indoors because I worry about an earthquake.	.82		.65
I find it hard to fall asleep because I worry about an earthquake.	.91		.77
I worry that the house I live in will break down in an earthquake.	.87		.70
I worry that I will lose my relatives in an earthquake.	.88		.75
I worry that my relatives may be injured in an earthquake.	.83		.69
I worry that I will lose my life in an earthquake.	.76		.63
I worry that I may be injured in an earthquake.	.68		.59
When I hear or see something about an earthquake, my worry about earthquake increases.	.69		.55
I sweat when I think about an earthquake.		.87	.32
My heart beats fast when I think about an earthquake.		.81	.35
My appetite changed because of thinking about an earthquake.		.73	.32
I have contractions anywhere in my body because of thinking about an earthquake.		.53	.34
Eigenvalue	**5.50**	**2.36**	
Variance explained	**%45.82**	**%19.70**	
Total variance explained	**%65.52**		

As seen in Table 3, two factors constitute the EFS, namely worry and physical symptoms, and 12 items. Items 1-8 are under the worry factor and items 9-12 are under the physical symptoms factor. The worry factor explains 45.82% of the total variance and the physical symptoms factor explains 19.70% of the total variance. Thus, it was determined that the two factors of the EFS explained 65.52% of the total variance. Explaining between 50% and 75% of the total variance in multifactor scales shows that the scale is valid (Dunteman, 1989).

It was determined that a two-factor and 12-item structure emerged as a result of EFA within the scope of the eigenvalues of the factors of the EFS being above one, the factor loadings of the items under the factors being greater than .32, the variance explained in the whole scale being greater than 40%, and the item total correlation values of the items being greater than .30 (Tabachnik & Fidell, 2019).

3. 2. Results on Confirmatory Factor Analysis

First and second level CFAs were conducted to verify the structure of the EFS that obtained as a result of EFA. The CFAs were conducted with data collected from 667 adolescents. Since the first level CFA values of the scale were found to be normal, no modifications were made among the items of the scale. The goodness-of-fit indices of the scale are shown in Table 4.

Table 4: Model-Data Fit for the Earthquake Fear Scale

Fit indices	Acceptable fit range	The values of the EFS	References
χ2/sd	0≤ χ2/sd ≤ 5	2.79	Tabachnik & Fidel, 2019; Fidel, 2017; Kline, 2011
RMSEA	.00≤RMSEA≤0.10	.05	
TLI	.90 ≤TLI<1.00	.94	
CFI	.90 ≤ CFI <1.00	.95	
SRMR	.00≤SRMR≤0.10	.03	

As seen in Table 4, x2/sd was calculated as 0≤2.79≤5. RMSEA value was calculated as .00≤.05<.10; TLI value as .90≤.94≤1.00; CFI value as .90≤.95≤1.00 and SRMR value as .00≤.03≤.10. Based on the calculated values, it can be said that the factor structure of the EFS obtained as a result of EFA was confirmed through the first level CFA.

As a result of the first level CFA of EFS, the relationship between the observed variables and error variances were investigated. The results are visualized in Figure 2.

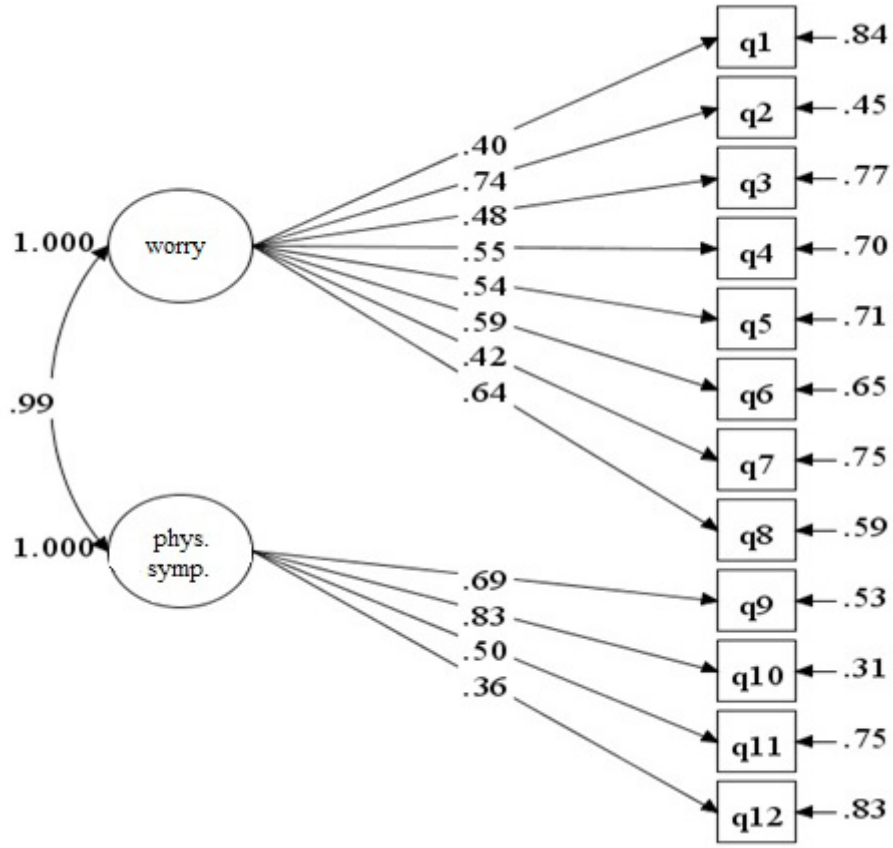

Figure 2: Earthquake Fear Scale's First Level Confirmatory Factor Analysis Diagram

Figure 2 shows that the correlation coefficients of the EFS items ranged between .36 and .83. Considering the values in Figure 2 and the χ2/sd, RMSEA, TLI, CFI and SRMR values of the model shown in Table 4, it can be said that the model has acceptable goodness-of-fit indices.

After the first level CFA for EFA, a second level CFA was conducted to determine whether the factors that consitute the scale explain the latent variable earthquake fear. The results are visualized in Figure 3.

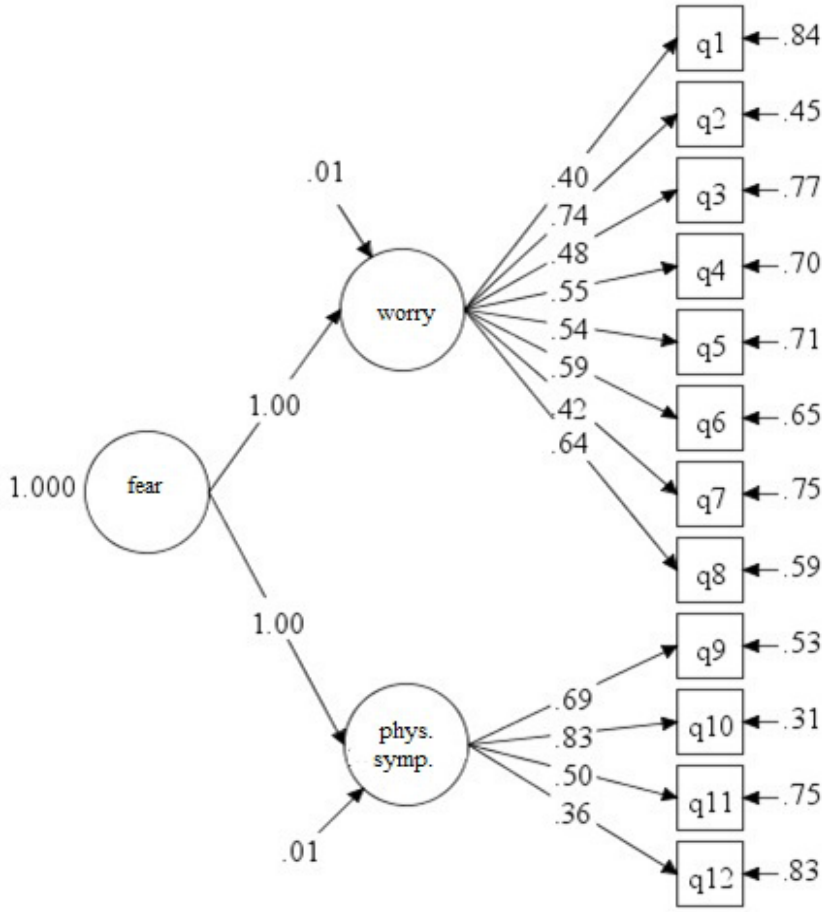

Figure 3: Earthquake Fear Scale's Second Level Confirmatory Factor Analysis Diagram

As seen in Figure 3, the correlation coefficients of the EFS items were still ranged between .36 and .83. For the second level CFA, x2/sd was calculated as 0≤2.19≤5. RMSEA value was calculated as .00≤.02<.10; TLI value as .90≤.91≤1.00; CFI value as .90≤.92≤1.00 and SRMR value as .00≤.03≤.10.

Based on the calculated values, it can be said that the factor structure of the EFS obtained as a result of EFA was confirmed through the first and second level CFAs.

3.3.Reliability Analysis of the Earthquake Fear Scale

The Cronbach's Alpha internal consistency coefficient of the EFS was also investigated. The Cronbach's Alpha values of the overall and sub-factors of the EFS are shown in Table 5.

Table 5: Cronbach's Alpha Internal Consistency Coefficients of the Earthquake Fear Scale and Its Sub-Factors

Factor	Cronbach's Alpha
EFS (Overall)	.86
Worry	.92
Physical symptoms	.81

As seen in Table 5, the internal consistency coefficient was calculated as .86 for the overall scale, .92 for the worry factor and .81 for the physical symptoms factor. The Cronbach's Alpha coefficient between .80 and 1.0 in the overall scale and its sub-factors shows that the reliability of the scale is high (Field, 2017).

Item analysis was also conducted to investigate the reliability of the EFS. A comparison was made between the 27% groups with the highest and lowest scores. It was investigated whether there was a significant difference between the mean scores of the group of 217 people with the highest score and the group of 217 people with the lowest score. The mean scores of the groups are shown in Table 6.

Table 6: Means of the Highest Scoring Group and the Lowest Scoring Group

Group	*n*	*x*
Highest scoring group	217	60.00
Lowest scoring group	217	46.40

As seen in Table 6, the mean score of the 217 participants with the highest score was 60.00 and the mean score of the 217 participants with the lowest score was 46.40. The difference in scores between the two groups can be interpreted as the scale was able to differentiate the groups significantly.

The test - retest procedure was also applied to examine the EFS's reliability. In this context, the test was applied twice, 30 days apart, to a group of middle and high school students living in Diyarbakır. The test - retest group consisted of a total of 117 adolescent students (13 from grade-5th, 16 from grade-6th, 17 from grade-7th, 17 from grade-8th, 16 from grade-9th, 21 from grade-10th, 5 from grade-11th, and 12 from grade-12th).

Data collected 30 days apart were first analyzed for normality distribution and homogeneity. After determining that the data were normally and homogeneously distributed, Pearson Correlation Coefficient was calculated. In order to talk about the reliability of a scale, the Pearson Correlation Coefficient is expected to be higher than .70 (Field, 2017). The Pearson Correlation Coefficient was calculated as .82 as a result of the test-retest conducted in order to investigate the reliability of the EFS. Within the scope of the calculated value, it was determined that the EFS has high reliability.

The Cronbach's Alpha coefficient of the EFS was calculated as .86 overall, .92 in the worry factor and .81 in the physical symptoms factor. The mean score of the highest scoring group was calculated as 60.00 and the mean score the lowest scoring group was calculated as 46.40. Two measurements were made 30 days apart using the test-retest method and the correlation between the measurements was calculated as .82. As a result of the procedures carried out, it was revealed that the EFS is a reliable scale.

4.DISCUSSION and RECOMMENDATIONS

The aim of this study is to develop a tool to measure the earthquake fear levels of middle and high school adolescents who have experienced an earthquake. EFA and first and second level CFAs were conducted to determine the construct validity of the designed scale. Reliability study was also conducted. At the end of the study, a two-factor and 12-item EFS was developed.

In the study before conducting EFA, it was examined whether the data set was suitable for factor analysis. In this context, Kaiser-Meyer-Olkin Test Chi-square Value (KMO), which reveals the suitability of the sample size and the correlation between the items for factor analysis, and Bartlett's Test of Sphericity (BTS), which questions the normality distribution for factor analysis were investigated. The KMO value of the data collected from 803 participants was calculated as .89, the BTS value as 6222.55 and the significance value as .00. As the KMO value was greater than .60 and the BTS value ($X2= 6222.55$; $p<.05$) was within the desired range (Tabachnik & Fidell, 2019), it was determined that the data were suitable for EFA.

The scale consists of two factors, worry and physical symptoms, and 12 items; items 1-8 are under the worry factor and items 9-12 are under the physical symptoms factor. The worry factor explains 45.82% of the total variance and the physical symptoms factor explains 19.70% of the total variance. Thus, it was determined that the two factors of the EFS explained 65.52% of the total variance. Explaining between 50% and 75% of the total variance in multifactor scales shows that the scale is valid (Dunteman, 1989).

In the study, the first level CFA was conducted to confirm the structure of the scale that emerged as a result of EFA. As a result of CFA, x2/sd was calculated as 0≤2.79≤5, RMSEA as .00≤.05<.10, TLI as .90≤.94≤1.00, CFI as .90≤.95≤1.00, SRMR as .00≤.03≤.10. In terms of the calculated values (Kline, 2011), it was determined that the factor structure obtained as a result of EFA was confirmed through the first level CFA.

After the first level CFA for EFA, a second level CFA was conducted to determine whether the factors that consitute the scale explain the latent variable earthquake fear. For the second level CFA, the correlation coefficients of the EFS items were still ranged between .36 and .83. x2/sd was calculated as 0≤2.19≤5. RMSEA value was calculated as .00≤.02<.10; TLI value as .90≤.91≤1.00; CFI value as .90≤.92≤1.00 and SRMR value as .00≤.03≤.10.

After the EFA and CFA analyses, Cronbach's Alpha internal consistency coefficient was calculated for the reliability study. The internal consistency coefficient was calculated as .86 for the overall scale, .92 for the worry factor and .81 for the physical symptoms factor. Cronbach's Alpha coefficient between .80 and 1.0 in the overall scale and its sub-factors revealed that the reliability of the scale was high (Field, 2017).

Item analysis was also conducted to investigate the reliability of the EFS in depth. The scores of the 27% highest scoring group on the EAS were compared with the scores of the 27% lowest scoring group. The mean score of the 217 participants with the highest score was calculated as 60.00 and the mean score of the 217 participants with the lowest score was calculated as 46.40. The difference in scores between the two groups revealed that the scale was able to differentiate the groups significantly.

The test - retest procedure was also applied within the scope of the reliability questioning of the EFS. The Pearson Correlation Coefficient of the data collected 30 days apart was calculated. Pearson Correlation Coefficient of the measurements was calculated as .82. For a scale to have high reliability, the Pearson Correlation Coefficient is expected to be higher than .70 (Field, 2017). As a result of the Pearson Correlation Coefficient of the EFS, it was determined that the EFS has high reliability.

The EFS, which was developed to measure the earthquake fear levels of adolescents at the middle and high school levels, can be a useful tool used in research on adolescents' earthquake fear levels. The EFS can also be a useful tool for educators who want to create educational programs for middle and high school adolescents with earthquake fear. The EFS can be a useful tool for psychologists and psychiatrists to identify the earthquake fear levels of middle and high school adolescents and prepare appropriate treatment prescriptions for them. EAS can also be a useful tool for sociologists to determine the level of earthquake fear among adolescents at the middle and high school levels.

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Appendix 1: The Earthquake Fear Scale

Item	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1. I cannot go indoors because I worry about an earthquake.					
2. I find it hard to fall asleep because I worry about an earthquake.					
3. I worry that the house I live in will break down in an earthquake.					
4. I worry that I will lose my relatives in an earthquake.					
5. I worry that my relatives may be injured in an earthquake.					
6. I worry that I will lose my life in an earthquake.					
7. I worry that I may be injured in an earthquake.					
8. When I hear or see something about an earthquake, my worry about earthquake increases.					
9. I sweat when I think about an earthquake.					
10. My heart beats fast when I think about an earthquake.					
11. My appetite changed because of thinking about an earthquake.					
12. I have contractions anywhere in my body because of thinking about an earthquake.					

Worry factor: 1,2,3,4,5,6,7,8

Physical symptoms factor: 9,10,11, 12

Appendix 2: Deprem Korkusu Ölçeği

Madde	Kesinlikle katılıyorum	Katılıyorum	Kararsızım	Katılmıyorum	Kesinlikle katılmıyorum
1. Deprem olacağı endişesiyle kapalı alanlara giremiyorum.					
2. Deprem olacağı endişesiyle uykuya dalmakta zorlanıyorum.					
3. Yaşadığım evin depremde yıkılmasından endişe ediyorum.					
4. Akrabalarımı depremde kaybedeceğimden endişeleniyorum.					
5. Akrabalarımın depremde yaralanabileceğinden endişeleniyorum.					
6. Depremde hayatımı kaybedeceğimden endişeleniyorum.					
7. Depremde yaralanabileceğimden endişeleniyorum.					
8. Depremle ilgili bir şey duyduğumda veya gördüğümde depremle ilgili endişem artıyor.					
9. Depremi düşündüğümde terliyorum.					
10. Depremi düşündüğümde kalbim hızla çarpıyor.					
11. Depremi düşünmekten dolayı iştahım değişti.					
12. Depremi düşünmekten dolayı vücudumun herhangi bir yerinde kasılmalar oluyor.					

Endişe faktörü: 1,2,3,4,5,6,7,8

Fiziksel belirtiler faktörü: 9,10,11, 12

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3. Bu çalışma, intihal tarama programı kullanılarak intihal taramasından geçirilmiştir (This article was screened for potential plagiarism using a plagiarism screening program).