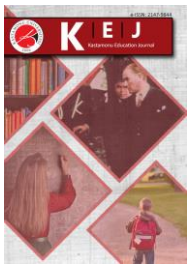
Kastamonu Education Journal, 2024, Vol. 32, No:2, 295-305
doi: 10.24106/kefdergi.1473617



| Research Article / Araştırma Makalesi |

Adaptation of the Environmental Worry Index into Turkish: A Validity and Reliability Study on Teacher Candidates

Çevresel Kaygı İndeksi'nin Türkçeye Uyarlanması: Öğretmen Adayları üzerinde Geçerlik ve Güvenirlik Çalışması

Mustafa İlhan[1], **Melehat Gezer**[2], **Melek Gülşah Şahin**[3]

Keywords

1. Environmental worry index
2. Scale adaptation
3. Validity and reliability

Anahtar Kelimeler

1.Çevresel kaygı indeksi
2.Ölçek uyarlama
3.Geçerlik ve güvenirlik

Received/Başvuru Tarihi
17.02.2024

Accepted / Kabul Tarihi
19.04.2024

Abstract

Purpose: In the present research, it was aimed to adapt the Environmental Worry Index (EWI) developed by Oguntayo et al. (2023) into Turkish.

Methodology: The study was conducted with the participation of 508 teacher candidates. Exploratory graph analysis (EGA), exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed for the validity studies. The reliability of the measurements collected via the Turkish form of the scale was examined via the Cronbach's alpha internal consistency coefficient. Corrected item total correlations were calculated for item discrimination, and Ferguson Delta was computed to provide a discrimination index for the entire scale.

Findings: The EGA outputs and the results of parallel analysis run within the scope of EFA revealed a single-factor structure unlike the two-dimensional original form of the scale. In EFA, the variance explained for the single-factor solution was determined as 45.80% and the factor loadings ranged between .44 and .80. The CFA results showed that the fit indices for the unidimensional model were within the recommended limits and the factor loadings of the items varied between .41 and .71. Cronbach's alpha coefficient was estimated as .84 and corrected item total correlations ranged between .36 and .62. The Ferguson's delta statistic, on the other hand, was found to be .95.

Highlights: The results obtained provide evidence that the measurements collected through the Turkish form of the EWI have adequate psychometric properties.

Öz

Çalışmanın amacı: Bu araştırmada Oguntayo vd. (2023) tarafından geliştirilen Çevresel Kaygı İndeksi'nin (ÇKİ) Türkçeye uyarlanması amaçlanmıştır.

Yöntem: Çalışma 508 öğretmen adayının katılımıyla gerçekleştirilmiştir. Geçerlik çalışmaları kapsamında açımlayıcı grafik analizi (AGA), açımlayıcı faktör analizi (AFA) ve doğrulayıcı faktör analizi (DFA) yapılmıştır. Ölçeğin Türkçe formuyla elde edilen ölçümlerin güvenirliği Cronbach alfa iç tutarlık katsayısı ile incelenmiştir. Madde ayırt ediciliği için düzeltilmiş madde toplam korelasyonları hesaplanmış, ölçeğin geneline ilişkin bir ayırt edicilik indeksi sunmak amacıyla ise Ferguson delta katsayısından yararlanılmıştır.

Bulgular: AGA çıktıları ile AFA'ya ait paralel analiz sonuçları ölçeğin iki boyutlu orijinal formundan farklı olarak tek faktörlü bir yapı ortaya koymuştur. AFA'da tek faktörlü yapının açıkladığı varyans %45.80 olarak belirlenmiş ve faktör yüklerinin .44 ile .80 arasında değiştiği saptanmıştır. DFA sonuçları, tek boyutlu model için uyum indekslerinin önerilen sınırlar içerisinde kaldığını, maddelerin faktör yüklerinin .41 ile .71 arasında değiştiğini göstermiştir. Cronbach alfa katsayısı .84 olarak kestirilmiş ve düzeltilmiş madde toplam korelasyonlarının .36 ile .62 arasında değiştiği tespit edilmiştir. Ferguson delta istatistiği ise .95 olarak bulunmuştur.

Önemli Vurgular: Araştırmada ulaşılan sonuçlar ÇKİ'nin Türkçe formunun yeterli psikometrik özelliklere sahip ölçümler ürettiğine kanıt sunmaktadır.

[1] **Corresponded Author,** Dicle University, Ziya Gökalp Faculty of Education, Department of Mathematics and Science Education, TURKEY;
e-mail: mustafailhan21@gmail.com, https://orcid.org/0000-0003-1804-002X
[2] Dicle University, Ziya Gökalp Faculty of Education, Department of Turkish and Social Sciences Education, TURKEY; https://orcid.org/0000-0001-7701-3203
[3] Gazi University, Faculty of Education, Department of Educational Sciences, TURKEY; https://orcid.org/0000-0001-5139-9777

Citation/Alıntı: İlhan, M., Gezer, M., & Şahin, M. G. (2024). Adaptation of the environmental worry index into Turkish: A validity and reliability study on teacher candidates. *Kastamonu Education Journal, 32*(2), 295-305. doi: 10.24106/kefdergi.1473617

INTRODUCTION

Today, global environmental changes are increasing in frequency and severity. Increasing environmental pollution has many negative impacts on the economy, human health and wildlife. Scientists and various international organizations warn about these negative effects of environmental degradation. One of the most dangerous consequences of environmental degradation is global warming. The sustainable development report of the United Nations warns that the future negative impacts of global warming could greatly exceed the effects of the COVID-19 pandemic, which is still ongoing in various variants [United Nations, 2020]. Similarly, the World Bank (World Bank, 2016) and the Intergovernmental Panel on Climate Change (IPCC, 2018) point out that environmental problems will have increasing negative influences on both human health and economies in the near future.

One of the drivers of global environmental degradation is the deterioration of the aquatic ecosystem. These degradations are generally caused by factors of anthropogenic origin, such as the misuse of agricultural land, pollutants and heavy materials that enter water bodies (petrochemicals, pharmaceuticals and personal care products, pesticides and arsenic [As], mercury [Hg], lead [Pb], cadmium [Cd]) (Nguyen et al., 2022). For example, algae play a vital role in aquatic ecosystems, contributing to oxygen production and serving as a key component of the food chain. However, when algae are exposed to the above-mentioned pollutants, they show negative reactions and disrupt the balance of aquatic ecosystems (Le et al., 2023). As can be seen, human actions that negatively affect species and ecosystems accelerate global environmental degradation. The most striking of these environmental changes is climate change. In fact, the effects and consequences of climate change have enlarged that threaten the lives of billions of people and many species. It is anticipated that the environmental, social and economic consequences of climate change will be observed much more concretely in the upcoming years, and even directly affect the lives of future generations (IPCC, 2013). The consequences of climate change on a regional and global level are increasingly being reported in the media and the issue is becoming more frightening with its increasing visibility in the media.

Climate change refers to long-term changes in climate patterns, i.e. average seasonal temperature and precipitation regimes. The effects of climate variability have become much more visible, especially in the last few decades. The main problems caused by climate variability are followings: (a) changes and extinction of species, (b) food and water scarcity, (c) decreasing sea ice coverage, (d) sea level rise, (e) changing global and regional boundaries, (f) air, soil and water pollution, (g) increase in weather variability, unpredictable weather conditions and the number of uncontrollable forest fires, and (h) climate refugee crises. These problems are occurring rapidly and unpredictably, and they change the way and duration of people's lives. Due to climate change, many lives are lost worldwide and countries suffer significant economic losses.

In addition to climate change, biodiversity loss, plastic waste, ocean pollution and acidification, desertification, genetic pollution, carbon emissions, water stress, widespread air pollution, and traffic congestion are among today's global environmental problems (Oguntayo et al., 2023). Exposure to global environmental degradation/hazards can negatively affect individuals' mental health. Anxiety, fear, sadness, post-traumatic stress disorder, depression and even suicide are among the effects of environmental degradation on human psychology (IPCC, 2014; Stewart, 2021; World Health Organization, 2022). According to the World Health Organization (2007), today's children are growing up in a world burdened by environmental problems. Children may feel vulnerable to environmental degradation and have to cope with psychological problems such as anxiety (Sobel, 1996). Given the public attention to widespread environmental issues in the media (e.g. climate change, rainforest destruction, endangered species), some scholars argue that children are becoming increasingly eco-phobic. Sobel (1996) defines this as a generalized fear of environmental degradation. Indeed, research proves that children have negative emotions such as fear and pessimism about environmental problems (Hutchinson, 1997; Hicks & Holden, 2007). In her study, Barraza (1999) asked primary school children aged 7-9 in England and Mexico to draw the Earth as it will be in 50 years in order to examine their environmental perceptions, basic expectations and concerns about the future. As a result of the study, she determined that 37% of the children incorporated environmental problems such as pollution, global warming, loss of species, water scarcity and deforestation in their drawings and interpreted this finding as children having a deep sense of anxiety and pessimism about environmental problems. She was also reported that 54% of children think that the world will be in a worse situation in 50 years, meaning that they are pessimistic about the future. Such studies reveal that many children worldwide are deeply concerned about the state of the natural environment and that eco-phobia is on the rise (Sobel, 1996).

Böhm (2003) categorized the negative emotions that individuals may experience in relation to environmental risks and found that individuals experience feelings of regret, sadness or sympathy for environmental consequences that have occurred before them. On the other hand, she ascertained that they feel fear, anxiety or hopelessness for negative consequences that have not yet occurred and that are thought to occur in the future. Experiences of global environmental degradation play a decisive role in individuals' environmental concerns (Strife, 2008). For example, Chawla (1998) found that experiences of habitat degradation, destruction of a special natural area, pollution, radiation, and/or environmental disaster affected adults' environmental concerns. Stewart (2021) specified that exposure to bad weather can lead to anxiety and stress. Van der Linden (2017) mentioned that climate-related uncertainties can create feelings of anxiety and fear in people. Searle and Gow (2010) detected that women, individuals under the age of 35, environmentally oriented people and people with high levels of future anxiety were more likely to be concerned about climate change. Clayton et al. (2017) stated that individuals exposed to environmental degradation have a serious fear of death beyond the concern about climate change and environmental degradation; they also emphasized that even individuals who have not personally experienced any direct effects of climate change experience environmental anxiety.

Purpose and Originality of the Research

Environmental anxiety includes psychologically based reactions such as worry and fear related to many environmental disasters such as degradation of ecosystems, extinction of plant and animal species, air, water, soil and environmental pollution, deforestation, sea level rise and global warming. Today, the increase in the frequency and severity of natural disasters, forest fires and extreme weather events has paved the way for studies to determine the environmental anxiety levels of individuals/communities, and in parallel, various measurement tools have been developed for this purpose. When the measurement tools in the Turkish literature for measuring the anxiety caused by environmental degradation in people are reviewed, we come across the Climate Change Worry Scale (Gezer & İlhan, 2021), Climate Change Hope Scale (Gezer & İlhan, 2020), Climate Change Anxiety Scale (Cebeci et al., 2022), Ecological Identity Scale (Gezer & İlhan, 2018), and Eco-Anxiety Scale (Uzun et al., 2022; Türkarslan et al., 2023). These instruments generally focus only on the climate change component of environmental degradation. Nevertheless, environmental degradation has a multidimensional structure ranging from water, soil and air pollution to the depletion of ecological resources (Tabak & Özav, 2023). The eco-anxiety scale in the Turkish literature (Uzun et al., 2022; Türkarslan et al., 2023) was developed to measure individuals' psychological reactions to global warming, ecological destruction, resource depletion, species extinction, ozone depletion, ocean pollution, and deforestation. The Environmental Worry Index (EWI) recently developed by Oguntayo et al. (2023) in the international literature consists of items that aim to measure how much people worry about environmental risks/problems. This scale includes thoughts about the dangerous, immediate and long-term side effects of the degradation of our ecological system (Oguntayo et al., 2023). The EWI is intended to gauge personal concerns about both climate change and environmental degradation. The scale presents the different environmental problems to the participants in separate items and the respondents were asked to indicate how much the relevant environmental problem worried them. In this respect, the EWI differs from the existing instruments in the Turkish literature. Oguntayo et al. (2023) stated that the scale is a reliable and valid measurement tool for environmental concerns and suggested that the scale should be used on samples from different countries. Since the it addresses environmental worry in terms of diverse environmental elements and can do this in a very practical way with only 11 items, it is thought that the Turkish adaptation of the EWI will contribute to the literature and researchers who will study environmental anxiety. From this point of view, the current research aimed to adapt the EWI crated by Oguntayo et al. (2023) into Turkish.

METHOD

Participants

The original form of the EWI was developed on a sample aged between 18 and 65 from different educational levels. So, it was thought that it would be appropriate to conduct the adaptation study on a group of participants over the age of 18. The most accessible sample that meets this criterion for the researchers was teacher candidates. Therefore, the study data were collected from teacher candidates. More clearly, the study group was determined according to the convenience sampling technique in which the participants consist of people who can be accessed easily and quickly (Sim & Wright, 2000). Accordingly, the study was conducted on 508 teacher candidates, aged between 18 and 42 (Mean: 21.17, SD: 2.26), studying at Dicle University, Ziya Gokalp Faculty of Education. The distribution of the participants, 165 of whom were male and 343 of whom were female, according to their branches and grade levels were presented in Table 1.

Table 1. Distribution of participants according to their branches and grade levels

	Grade 1	Grade 2	Grade 3	Grade 4	Total
High school mathematics	21	14	1	0	36
Science	44	38	42	1	125
Middle school mathematics	50	35	42	44	171
Elementary school	0	32	35	2	69
Social studies	32	9	1	42	84
Geography	4	8	8	3	23
Total	151	136	129	92	508

Data Collection Tool

The study data were collected through the EWI developed by Oguntayo et al. (2023). During the development of the original form of the EWI, an item pool of 15 items was created and these items were administered to the participants using a 4-point Likert-type rating. They conducted an exploratory factor analysis (EFA) on the data obtained from 925 participants and acquired a two-factor structure explaining 50.059% of the total variance. In this structure, four of the items were excluded from the scale due to factor loadings below .50. Seven of the remaining 11 items were included in the first dimension named proximal with factor loadings ranging from .701 to .797, and the other four were included in the second dimension named personal worry experience with factor loadings ranging from .563 to .765. They found that the corrected item-total correlations of the scale items varied between .364 and .780, and reported Cronbach's alpha internal consistency coefficients as .894 for the proximal subscale, .671 for the personal worry experience, and .849 for the entire scale.

Translation Process of the EWI into Turkish

In order to adapt the scale into Turkish, permission was first obtained from the researchers who developed its original version. To this end, an e-mail was sent to Rotimi Oguntayo, the responsible author of the article in which the scale was developed, on 11.09.2023 and his approval was requested for the adaptation study. Subsequently, the forward translation procedure was operated. The scale was translated into Turkish by four experts, one expert each from English language education, social studies education, chemistry education, and measurement and evaluation. Three of these four experts, who have a good command of English, also have experience in scale adaptation.

In the next step, the translations made by the four experts independently of each other were brought together and the most appropriate Turkish statement for each item in the instrument was tried to be determined. In this process, three of the experts pointed out that the expression "*open defecation*" in item number three of the scale had no equivalent in Turkish culture. Therefore, the third item, which was originally written as "*I feel concerned about the littering of the environment and open defecation*", was translated into Turkish as "*I feel concerned about the littering of the environment*". Considering that scale adaptation is not a literal translation and that there may be differences from culture to culture in terms of the measured content (Behling & Law, 2000), it was thought that such a change would not pose a problem for adaptation. Accordingly, it was not required to obtain further approval from the authors who developed the scale's original form for this change.

After the Turkish form was crafted, opinions were taken from two experts, one from the field of geography education and the other from the field of English Language and Literature, about the equivalence of the Turkish form created with the English version. Both experts remarked that the modification made in the third item was appropriate and found the Turkish and the original form linguistically equivalent. In the Turkish version of the EWI, a 4-point rating was adopted, as in the original form of the scale. However, after consulting two measurement and evaluation experts, a different labeling was utilized for the categories than in the original one. While in the original form, the categories were labeled with time adverbs indicating frequency (*Not at all, a few of the days, more than half the days, almost every day*), in the Turkish form, labels indicating agreement were included as *Strongly Disagree* (1), *Disagree* (2), *Agree* (3) and *Strongly Agree* (4).

Obtaining Ethics Committee Approval and Data Collection

Prior to the data collection process, approval was obtained from Dicle University Social and Human Sciences Ethics Committee for the compliance of the study with current ethical standards (approval letter dated 11.10.2023 and numbered 580293). After the ethics committee permission was obtained, the data collection process was initiated and the data were collected in November and December in the Fall Semester of the 2023–2024 Academic Year. While the scale was administered to 290 teacher candidates in the sample in paper-pencil form in their classroom, 218 participants answered the scale online.

Data Analysis

Preliminary Analysis

Following the data collection, the data set was reviewed to see the data entered incorrectly, if any, and to identify missing values. For this purpose, the frequency values for each item were examined and no incorrectly entered data (a frequency outside the 1-4 range) or missing values were found. Then, the data file was divided into two halves as odd and even numbered participants, so that two separate data sets were attained that were equivalent in terms of participant profile. The exploratory graph analysis (EGA) and EFA was applied to the data containing odd-numbered participants and confirmatory factor analysis (CFA) was applied to the data file containing even-numbered participants. The suggestion that it would be more accurate to perform EFA and CFA on different data sets (Dawson, 2017; Fabrigar et al., 1999) was effective in following such a path.

Subsequent to dividing the data file into two; both data sets were screened for outliers. In order to identify univariate outliers, *Z* scores were examined, and cases with Z scores outside the range [–4, 4] were accepted as outliers with reference to the boundaries suggested by Stevens (2009). In the data set where EFA was conducted, Z scores were found to be between -2.99 and 1.42, and these values were interpreted as no univariate outliers in this data set. In the data set where CFA was applied, it was determined that there was only one observation with univariate outlier (Z= –5.51), and after this observation was removed from the data set, multivariate outlier examinations were started. The number of multivariate outliers was established as 10 for both data sets according to Mahalanobis distances. The normality assumption was tested on the outlier free data. Skewness and kurtosis coefficients were calculated for univariate normality, and Mardia's test was checked to test multivariate normality. Table 2 presents the normality test results.

Table 2. Results of univariate and multivariate normality test

Items	Data file used in EFA		Data file used in CFA	
	Skewness	Kurtosis	Skewness	Kurtosis
EWI-1	–.78	–.40	–.24	–1.94
EWI -2	–.81	.63	–.63	.54
EWI -3	–.72	–1.20	–.70	–.79
EWI -4	–.70	.05	–.45	–.62
EWI -5	–.74	–.72	–.36	–1.87
EWI -6	–.49	–.73	–.66	.22
EWI-7	–.96	.36	–.66	–.52
EWI -8	–.69	.45	–.53	.26
EWI -9	–1.16	.18	–1.07	–.28
EWI -10	–.66	.01	–.54	–.30
EWI -11	–..74	–.45	–.72	.30
Mardia's test	780.40*	15.01*	646.62*	12.13*

*p < .001

The fact that the skewness and kurtosis values of the EWI's items are within the range of ±2 (Pituch & Stevens, 2016) signs that the distribution does not depart greatly from univariate normality. On the other hand, the significant results of Mardia's test implies that multivariate normality is violated.

Validity and Reliability Analysis

EGA, EFA and CFA were applied within the scope of the validity studies of the Turkish form of the EWI. EGA is a relatively new technique that was proposed within the framework of network psychometrics for identifying the number of dimensions underlying multivariate data (Golino et al., 2020). It is based on estimating a network followed by the application of a community detection algorithm (Christensen & Golino, 2021; Golino & Epskamp, 2017). In addition to the number of factors to be retained, EGA also exhibits which items are clustered together and their level of association (Golino et al., 2020).

In EFA, the factorability of the data was first tested. In this context, the Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's test result were examined. The KMO statistic was calculated as .863 and Bartlett's test of sphericity was statistically significant (χ^2=1393.809, df=55, p<.001). According to Kaiser (1970, 1974), KMO values of .70 and above indicate that the sample heterogeneity is sufficient for factor analysis (Meyers et al., 2016). In addition, Bartlett's test being significant reflects that the correlation matrix is not a unit matrix and the data are suitable for factor analysis (Bandalos, 2018). According to these criteria, it was understood that the research data were factorable.

Since the data violated the multivariate normality assumption, the principal axis factoring technique, which does not stipulate any conditions regarding the distribution of the data (Pituch & Stevens, 2016), was operated in EFA. As the number of response categories of the EWI was four, EFA was conducted based on polychoric correlation matrix, taking into account the recommendations in the literature (Kılıç, 2021; Tabachnick & Fidell, 2013). Another important issue in EFA is the method to be utilized in deciding the number of factors. Considering that it produces more accurate results about the number of factors compared to other methods (Glorfeld, 1995; Hayton et al., 2004), parallel analysis technique was used to decide the number of factors in EFA. Since the research data did not meet multivariate normality, the Satorra-Bentler robust maximum likelihood (MLM) estimator (Newman & Constantinides, 2021; Roos & Bauldry, 2022), which is robust to violation of normality, was employed in the CFA. Table 3 demonstrates the fit indices examined to evaluate the model-data fit in CFA and the recommended cut-off points for these indices.

Tablo 3. The fit indices examined in the study and the critical values for these indices

Fit indices	χ^2/df*	RMSEA**	SRMR**	CFI**	GFI**	TLI**	IFI**
Cut-off points for acceptable fit	< 3	< .08	< .10	> .90	> .90	> .90	> .90

* Marsh & Hocevar (1985), ** Pituch & Stevens, (2016)

Later than the analyses that provided evidence of validity, reliability analysis was carried out. To determine the reliability of the measurements obtained with the Turkish version of the EWI, Cronbach's alpha internal consistency coefficient was calculated, as in the original form of the scale. The discrimination power of the scale items in Turkish culture was tested over the corrected item-total correlations. Finally, the Ferguson's delta statistic (Ferguson, 1949) was calculated to obtain a discrimination coefficient for the overall scale. This statistic provides information about the degree to which individuals differ in terms of the scores they get from the instrument (Zhang & Lidbury, 2013). While calculating Ferguson's delta, the formula in Figure 1 was used (Hankins, 2008). Statistical procedures for reliability and item analysis and the Ferguson's delta statistic were conducted on 487 observations from the combination of the EFA and CFA data sets.

$$\delta = \frac{[1+k(m-1)][\, n^2 - \sum f^2)}{kn^2(m-1)}$$

k = Number of items
n = Sample size
m = Number of item response options
f = Frequency of each score

Figure 1. The formula of Ferguson's delta statistics

In the study, to detect multivariate outliers, assess normality and attain EGA network, the web tool designed by Kılıç (2023) was used. Ferguson's delta statistic was computed in Microsoft Excel. All other analyses in the research were performed in the JASP 0.18.1.0 program.

RESULTS

In the research, it was first tested whether the two-dimensional structure in the original version of the EWI was confirmed in Turkish culture. Since CFA results showed that the two-factor model was not confirmed, the factor structure in Turkish culture was tested by applying EGA and EFA. Figure 2a and Figure 2b illustrates the EGA result and the scree plot containing the output of parallel analysis, respectively.

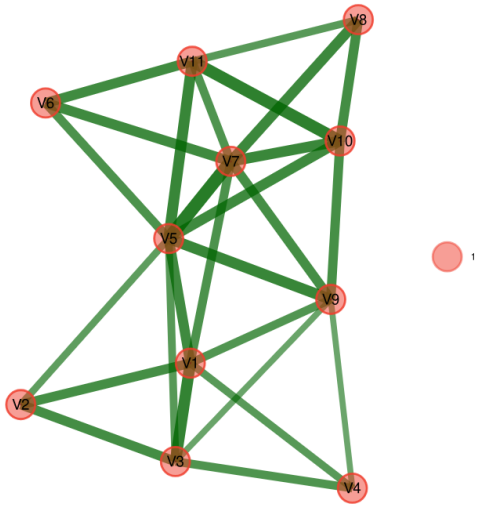


Figure 2a. The EGA results

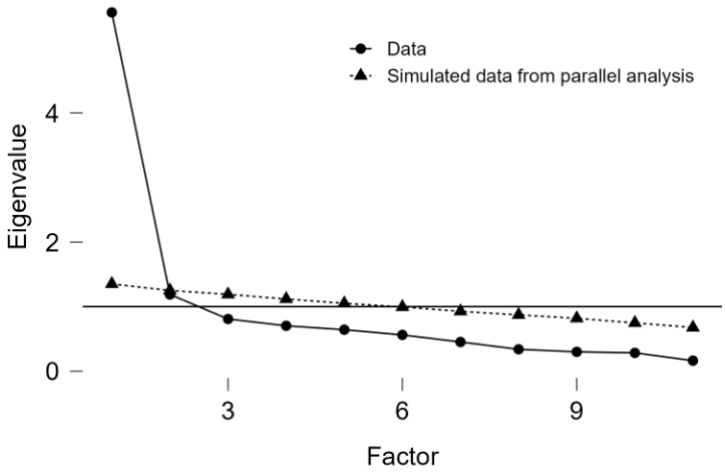


Figure 2b. The scree plot containing parallel analysis result

In parallel analysis, a random data that have the same number of observations and variables as the actual data is generated initially. Then, the eigenvalues estimated from real data are compared with the eigenvalues derived from random data and the factors whose eigenvalues are greater than random are retained (Pallant, 2020). The scree plot displays that only eigenvalue of the first factor exceed the corresponding value from the random data set. Similarly, the network model revealed by EGA, where items are represented by circles and the relationship between two circles (e.g. partial correlation) by lines (Christensen & Golino, 2021), depicts a unidimensional construct. This result infers that the Turkish form of the EWI has a single-factor structure, unlike the original one. Table 4 presents the extracted variance, and the items' factor loadings in the unidimensional structure.

Table 4. EFA results for the Turkish form of the EWI

Items	Factor Loading	Items	Factor Loading
EWI-1	.721	EWI -7	.738
EWI -2	.628	EWI -8	.616
EWI -3	.639	EWI -9	.649
EWI -4	.440	EWI -10	.733
EWI -5	.796	EWI -11	.764
EWI -6	.653	Extracted Variance: 45.80%	

As can be seen from Table 4, the variance ratio explained by the scale is 45.80%, and the factor loadings of the items vary between .440 and 796. Taking into account the single-factor structure emerged in EFA, a unidimensional model was tested in CFA. The fit indices of the unidimensional model were found as follows: χ^2/df = 2.44 (χ^2 = 107.421, df = 44, p < .001), RMSEA = .077 (90% CI [.059, .096]), CFI = .92, GFI = .92, TLI = .90 and IFI = .92. These fit indices remained within acceptable limits means that model-data fit is achieved. Figure 3 illustrates the measurement model for the unidimensional model.

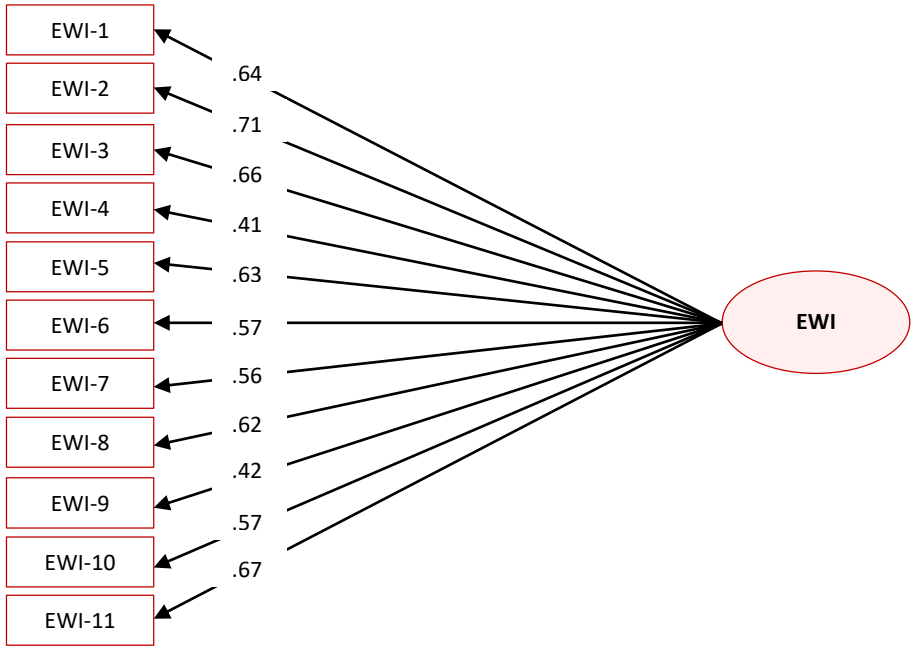


Figure 3. Measurement model of the Turkish form of EWI

Figure 3 shows that the factor loadings obtained from CFA ranged between .41 and .71. Accordingly, it can be said that all items had sufficient factor loadings. Reliability and item analysis were carried out following the analyses that provide evidence of validity. Table 5 shows the Cronbach's alpha internal consistency coefficient calculated for reliability and the corrected-item total correlations obtained as a result of the item analysis.

Table 5. Reliability and item analysis results of the Turkish form of EWI

Item Number	r_{jx}	Mean	Standard Deviation	Cronbach's alpha if item dropped
EWI-1	.560	3.552	.534	.826
EWI -2	.559	3.283	.680	.825
EWI -3	.536	3.618	.507	.828
EWI -4	.360	3.253	.714	.844
EWI -5	.587	3.593	.508	.825
EWI -6	.540	3.310	.673	.827
EWI -7	.546	3.493	.608	.827
EWI -8	.522	3.300	.651	.829
EWI -9	.419	3.688	.490	.836
EWI -10	.568	3.156	.770	.825
EWI -11	.617	3.515	.570	.821
Cronbach's alpha = .842 (90 % CI [.820, .861])				

Table 5 exhibits that corrected item-total correlations vary between .360 and .617, and the internal consistency coefficient of the measurements is .842. In addition, Table 5 provides that there are no items that will provide a clear increase in the Cronbach's alpha coefficient when dropped from the scale. Eventually, the Ferguson's delta (δ) coefficient was calculated to provide an index of the discrimination of the overall EWI and the value obtained was presented in Table 6 together with the frequencies (*f*) used to obtain this statistic. According to Table 6, the Ferguson Delta coefficient for the entire EWI in the Turkish form was found to be .95.

Table 6. Ferguson's delta coefficient for the Turkish form of EWI

Score	f	f^2	Score	f	f^2	Score	f	f^2
26	3	9	33	47	1089	39	41	1521
28	5	25	34	27	1156	40	36	1600
29	5	25	35	35	1225	41	33	1681
30	4	16	36	30	1296	42	25	1764
31	10	100	37	47	1369	43	24	1849
32	22	484	38	31	1444	44	62	1936
Total	49	659	Total	213	759	Total	249	10351
				$\sum f^2$ = 18589				

k=11, n=487, m=4 and $\sum f^2$= 18589 => $\delta = \frac{[1+k(m-1)][\,n^2-\sum f^2)}{n^2k(m-1)} = \frac{[1+11(4-1)][\,487^2-18589)}{487^2\times11\times(4-1)}$ = .95

DISCUSSION AND CONCLUSION

In this study, the 11 item EWI developed by Oguntayo et al. (2023) to determine anxiety caused by environmental risks on individuals was adapted into Turkish. At the beginning of the adaptation process, it was tried to reach a Turkish form linguistically equivalent to the original scale by utilizing experts' opinions. In line with the experts' feedbacks, a culture-specific change was made in the content of one item of the scale. Validity and reliability analyses of the adapted form were conducted within the framework of classical test theory in the paper. Primarily, it was tested whether the two-factor structure in the original version of the scale was valid in Turkish culture. CFA results showed that the two-dimensional structure was not confirmed. Therefore, the data file was randomly divided into two halves. EGA and EFA was applied to the first half, and the structure revealed in EFA was tested through CFA in the second half. Both the EGA, and the parallel analysis results conducted within the scope of EFA disclosed a single-factor structure. A field expert studying on environmental education, who was consulted about the factor solution of the EWI's Turkish form, also stated that the unidimensional construct is reasonable considering the measured trait and the items in the scale.

In EFA, the variance explained by the unidimensional structure was acquired to be 45.80%. Different researchers suggested various criteria about what the explained variance ratio should be. Bayram (2010) and Büyüköztürk (2010) state that the explained variance ratio should not fall below 30%. According to Aksu et al. (2017), on the other hand, the explained variance should be at least 40%. The extracted variance in EFA meets these criteria. When the factor loadings reported in the EFA are examined, values ranging between .440 and .796 were encountered. According to Tabachnick and Fidell (2013), an item should have a factor loading of at least .32 in order to remain in the scale. Likewise, Brown (2015) and Hair et al. (2019) defined values between .30 and .40 as the minimum respectable factor loading. Based on these boundaries, it can be asserted that there is no item that may pose a threat to the construct validity of the EWI's Turkish form. These EFA results were also supported by the CFA outputs. As a result of CFA, it was found that the factor loadings of all items were higher than .40 and the fit indices were within acceptable limits specified in the literature. These results reflect that the Turkish form of the EWI serves the target of measuring environmental worries of teacher candidates.

In the study, the Cronbach's alpha internal consistency coefficient of the measurements obtained with the Turkish form of the EWI was found to be .842. In addition, it was seen that the reliability coefficient estimated was almost identical to that in the original form of the scale. There is no exact value that can be given to the question of what the minimum reliability coefficient should be in order to say that the measurements are reliable. Because the lower boundary to be taken into account for reliability is affected by various factors. The first of these is the context, namely the purpose for which the measurement results will be used. For example, high reliability values such as .80 or even .90 are expected to be reached in medical measurements and high-stakes tests. In cases where the decisions to be taken have relatively less importance for individuals, values of .70 and above are considered sufficient for reliability (İlhan & Çetin, 2023). An important factor that affects which value should be taken as a cut-off point when it comes to internal consistency reliability is the scale length (O'Rourke & Hatcher, 2013). The internal consistency coefficient is a function of the number of items in the instrument and generally tends to increase as the number of items increases (Urbina, 2004). For this reason, a value of .60 instead of .70 is considered adequate in instruments with a small number of items (Sipahi et al., 2010). Accordingly, the data collected with the Turkish form of the EWI are sufficiently reliable.

Item analysis revealed that the item correlations of the EWI ranged between .360 and .617. Item correlation is one of the statistical indicators of item discrimination. Item correlations above .30 mean that item discrimination is good (Field, 2009). Thus, it can be asserted that there were no items in the Turkish form of the EWI that were outside the latent trait intended to be measured and all items had adequate discrimination. In parallel to this, no item was found in the Turkish form of the scale that would increase the internal consistency coefficient markedly if removed. Finally, the Ferguson Delta statistic for the EWI's Turkish form was determined as .95. The Ferguson Delta statistic can take values ranging between 0 and 1. The recommended threshold for this statistic, which corresponds to .93 in a normal distribution, is .90 (Kline, 1993). Therefore, it is possible to say that the Turkish version of the EWI is capable of distinguishing respondents with different levels of environmental worry from each other.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

When the outputs of the analyses carried out to investigate the psychometric properties of the EWI are taken together, it is concluded that the scale provides valid and reliable measures in the study sample. However, the current paper has certain limitations and further researches are needed to overcome these limitations. First of all, in this study, the psychometric qualities of the Turkish form of the EWI were examined on teacher candidates. Correspondingly, the age range of participants in the current study was narrower than the group for which the original form of the scale was developed. In this sense, the validity and reliability of the instrument can be tested on different groups in future studies. Furthermore, the validity evidence presented in the present study was restricted to EFA and CFA, and reliability evidence was limited to Cronbach's alpha internal consistency coefficient. In the future, different evidence regarding the validity and reliability of the scale can be examined. Specifically, convergent and divergent validity evidence and test-retest reliability of the scale can be investigated. Using the EWI, data can be collected from different groups and the measurement invariance of the scale can be tested in terms of variables such as gender, age groups, education level, etc. Evidence for the validity of scale validity can be enriched by conducting mixed method studies in which the data collected by means of the EWI are supported by qualitative data.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

The approval was obtained from Dicle University Social and Human Sciences Ethics Committee for the compliance of the study with current ethical standards (approval letter dated 11.10.2023 and numbered 580293).

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APPENDIX: Turkish Form of the Environmental Worry Index

	Hiç Katılmıyorum	Katılmıyorum	Katılıyorum	Tamamen Katılıyorum
1. Artan hava, su, toprak ve gürültü kirliliğini düşününce endişeleniyorum.	◯	◯	◯	◯
2. Çevremde yaşanan sel felaketlerinden dolayı endişeleniyorum.	◯	◯	◯	◯
3. Çevrenin çöplerle kirletilmesi beni endişelendiriyor.	◯	◯	◯	◯
4. Bulunduğum bölgenin trafik yoğunluğu ve kalabalık oluşu ile ilgili düşünceler beni endişelendiriyor.	◯	◯	◯	◯
5. Doğal afetler ve dünya kaynaklarının giderek tükenmesi hakkındaki konular beni endişelendiriyor.	◯	◯	◯	◯
6. Bazı hayvan türlerinin neslinin tükenmesiyle ilgili düşünceler beni endişelendiriyor.	◯	◯	◯	◯
7. Yaşadığım yerde su ve/veya yiyecek kıtlığına ilişkin bir duyum aldığımda endişeleniyorum.	◯	◯	◯	◯
8. Küresel düzeydeki düşük ya da aşırı yağış raporlarına karşı çıkılması beni endişelendiriyor.	◯	◯	◯	◯
9. Depremler, kasırgalar ve diğer çevresel felaketler beni endişelendiriyor.	◯	◯	◯	◯
10. Ne zaman ozon tabakasının inceldiğine dair bir şeyler duysam endişeleniyorum.	◯	◯	◯	◯
11. Orman yangınları ve karbondioksit açığa çıkması beni endişelendiriyor.	◯	◯	◯	◯