



## Original Article

# Developing Utkan Epidemic Anxiety Scale and analysing its psychometric properties

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### Abstract

**Objectives:** To develop the “Utkan epidemic anxiety scale” for measuring the anxiety levels regarding an epidemic in the general population.

**Methods:** Trial survey forms comprising 20 linguistically and psychometrically verified statements were distributed to 1037 people; the mean age of the participants was  $28.6 \pm 9.9$  years (age range, 15–68 years), and 72% of the participants were women. Structural and internal validity of the scale was assessed to determine overall validity of the scale. Factor analysis was performed to check the structural validity, and subgroup-super group comparisons were performed to determine internal validity. The reliability of the scale was measured by calculating the Cronbach’s alpha ( $\alpha$ ) reliability coefficient and parallel form consistency.

**Results:** The Utkan epidemic anxiety scale was one-dimensional, consisted of 9 items, and provided explanation regarding 70.8% of the variance related to epidemic anxiety. The scale consists of points ranging from 0–36, and higher points indicate a higher level of epidemic anxiety. The Cronbach  $\alpha$  reliability coefficient was 0.94, which indicated a high reliability of the scale.

**Conclusion:** Results of this study showed that the “Utkan epidemic anxiety scale” provided valid and reliable measurements of epidemic anxiety among the general population.

**Keywords:** Anxiety; epidemic; validity and reliability.

#### What is presently known on this subject?

- Determining the anxiety levels regarding various past epidemic diseases, current epidemics, and future epidemic diseases, and providing suitable interventions is an important aspect for primary prevention of such anxiety.

#### What does this article add to the existing knowledge?

- This scale has enabled the measurement of epidemic anxiety in Turkey.

#### What are the implications for practice?

- To date, the Utkan epidemic anxiety scale is the only valid and reliable measurement tool to be used in this field.

Anxiety is a feeling of uneasiness and fear against unknown events that are perceived as dangerous and threatening by individuals.<sup>[1]</sup> Anxiety is defined as a mood of waiting, usually regarding the future, that upsets and bothers people. Anxiety is a mood of excitement coupled with feelings of distrust.<sup>[2]</sup>

Being anxious is normal in situations where one is unable to predict the outcome. The feeling of anxiety typically transmits the signal of “Get ready for danger!” to our brain. Different people may have different reactions of varying intensities to the same situation.<sup>[3]</sup> In fact, anxiety evokes emotions that

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serve as a warning or as reactions for several dangerous situations. An increase in the severity and perpetuity of anxiety causes an undesired psychological pressure, which affects the performance and adaptation of an individual. The intensity and continuity of this pressure may prevent an individual from performing his/her daily tasks. Anxiety is associated with symptoms such as shivering, sweating, palpitation, and increased pulse rate.<sup>[4]</sup> Individuals with high anxiety levels develop physiological symptoms such as muscles stiffness and nervous system disorders and psychological symptoms such as restless waiting mood and inattentiveness.<sup>[5]</sup>

Everyone may experience anxiety at some point in his or her life. The two different types of anxiety are “state anxiety” and “trait anxiety.” Trait anxiety is a perpetually existing form of anxiety that is not dependent on a certain event or situation. On the other hand, state anxiety is the anxiety that develops before or during a dangerous situation. This type of anxiety is mostly based on rational reasons, the causes underlying this type of anxiety can be well understood by others, and usually this anxiety is temporary.<sup>[6]</sup> Epidemic diseases are one of the various factors causing state anxiety.

In the last century, virus epidemics in particular have been the most important of the pandemic outbreaks, which have caused significant problems in Turkey and in the world. Diseases associated with a viral epidemics affect the economic, social, and psychological aspects of people across the world. The most recent of these epidemics is the COVID-19 epidemic that originated in China in 2019 and subsequently spread worldwide as pandemic.

At the end of 2019, a large number of patients developed pneumonia of unknown etiology in Wuhan, China. On December 31, 2019, China reported these cases to the World Health Organization (WHO) and subsequently disclosed them across the world. On January 7, 2020, Chinese scientists identified and termed the coronavirus that caused these infections as “2019-nCoV.”<sup>[7]</sup> The 2019-nCoV spread rapidly across several countries in the world and was declared as a pandemic; in Turkey, many people were infected with the 2019-nCoV since March 10, 2020. As of April 10, 2020, in Turkey, 47.029 people contracted the coronavirus and 1.006 people died, whereas globally, approximately 1.5 million confirmed cases of infection with the coronavirus and >92.000 deaths were reported.

<sup>[7]</sup> Several studies were conducted and some continue to assess the psychological and physical effects of the pandemic. <sup>[8–10]</sup> Results of these studies showed that some diseases are more frequently observed during a pandemic, and these diseases have an adverse effect on people. Some of these diseases include depression, anxiety, phobias, social isolation, and loneliness. Although several anxiety scales are available, a scale to determine anxiety specifically due to a pandemic has not been developed to date.<sup>[11]</sup> Therefore, this study aimed to develop a valid and reliable tool to assess anxiety caused by the virus epidemic among people.

## Materials and Method

The Utkan epidemic anxiety scale was developed in several phases. The phases include examining theoretical structure, submitting applications for ethical approval, determining the question pool, constructing the draft questionnaire form, pilot run, expert opinion, construction of trial form, administering the trial form to the sample, findings (validity and reliability), and finalizing of the scale.

*Examining Theoretical Structure:* In this phase, the conceptual framework of the topic was determined by reviewing the literature on epidemic and anxiety, and previous studies regarding this topic were reviewed.<sup>[12–15]</sup>

*Submitting Applications for Ethical Approval:* Ethical permissions necessary for conducting the study were obtained from Artvin Çoruh University Scientific Research and Publication Ethics Committee (on 15.05.2020 and the session number of 2020/5). Informed consent forms were obtained from the participants. In addition, the necessary approval was obtained from the Ministry of Health Scientific Research Platform (2020-5-09T20-40-43).

*Determining the Question Pool:* This phase included literature review, composition writing, and focus group interview. In the literature review phase, studies on epidemic disease and anxiety available online and in print were examined, and the statements pertaining to the topic were included in the question pool. In the phase of composition writing, 14 individuals, including housewives, students, academicians, seasonal workers, and officers, were asked to write compositions about their opinions on epidemic diseases, their responses against epidemics, and their feelings about epidemics. Subsequently, after content analysis, relevant statements from their write-ups were included in the question pool.

*Constructing the Draft Questionnaire Form:* In this phase, expert opinions were taken from a measurement and evaluation expert and a statistician, and on the basis of their opinions, a 5-point Likert-type questionnaire was determined to be useful and practical for this study. Likert-type scales are commonly used scales in the tools assessing thoughts, beliefs, and attitudes<sup>[17]</sup> by combining multiple Likert-type items.<sup>[16]</sup> Likert-type scales are one of the tools to classify individuals depending on their psychological status according to a previously determined stimulus, criterion, or criteria.<sup>[18]</sup> After finalizing the format of the questionnaire, expert opinions were obtained again, and a questionnaire consisting of 5-point Likert-type responses of “Totally Disagree,” “Disagree,” “Moderately Agree,” “Agree,” and “Totally Agree” was created.

*Pilot Run:* After the draft form was prepared, a pilot run was conducted to determine whether the sample population correctly understood the statements in the questionnaire. Literature review indicated that 30–50 individuals would be sufficient for a pilot run.<sup>[19]</sup> Therefore, the draft form with 35 statements was administered to a sample of 32 people with similar characteristics to those of study participants. At the

end of the pilot run, 5 statements, which were not understood or misunderstood by the sample population, were eliminated from the draft form, and a draft form consisting of 30 statements was obtained.

*Expert Opinion:* To determine content validity of the draft form after corrections following the pilot run, the draft form was sent to 8 experts in the field of scale development studies and in health sciences (1 statistician, 1 assessment and evaluation expert, 2 psychologists, 2 nurses, and 2 Turkish language experts). After expert recommendations, 10 statements were determined as inappropriate for assessment and evaluation, and these statements were excluded from the form, and subsequently, the number of statements decreased to 20.

*Constructing the Trial Form:* Statements in the draft form were organized as 1 = Totally Disagree, 2 = Disagree, 3 = Moderately Agree, 4 = Agree, and 5 = Totally Agree, and a trial form consisting of 20 items was obtained.

*Administering the Trial Form to the Sample:* The trial survey form of 20 statements was administered to a sample population of 1037 people; the mean age of the participants was 28.6±9.9 years (range, 15–68), 72% were women, 63.6% were single, 85% lived in a nuclear family, 74.3% lived in a city and metropolis, 18.5% lived in a town, and 7.2% lived in village. Data collection in person was no feasible because of the Covid-19 epidemic; therefore, the research data were collected online. Since an optimal sample size to develop the scale was suggested to be 1000, this study aimed to achieve this sample size.<sup>[20]</sup>

*Validity and Reliability:* Validity indicates the accuracy with which the scale measures the relevant characteristics, reflects the quality of the data, and indicates whether the data are useful for the intended purpose. Reliability can be defined as capacity of the scale to reproduce the results at different occasions, at different times, and in different populations.<sup>[21]</sup>

Principal component analysis among the exploratory factor analysis techniques was used to determine the structure validity of the scale developed to determine epidemic anxiety. Exploratory factor analysis is used to reduce the items in the

assessment tool to smaller sub-factors.<sup>[22]</sup> To determine the internal validity of the scale, 27% subgroup-super group comparison was performed. To determine reliability of the scale, the Cronbach  $\alpha$  reliability coefficient, and the parallel form consistency were used.

## Results

The findings regarding the pre-statistics, validity, and reliability of the scale are presented in this section.

*Pre-Statistics:* In this phase, suitability of the data for factor analysis was examined. To determine this suitability, determination of item reliability, calculation of the Kaiser-Meyer-Olkin (KMO) coefficient, and Bartlett's sphericity test were performed before factor analysis.<sup>[18,20]</sup>

Item reliability, in other words, the mean of item-total score correlation coefficients: Deriving the correlations between scores on each item and the total scale scores both in 5 or 7 degree attitude scales (indices) and in double-digit degree knowledge and success scale/tests.<sup>[23]</sup> An item-total score correlation below 0.30 indicates a problem in the item, which may require the item to be changed or excluded from the scale.

Total item correlation coefficients ranged from 0.365–0.854. Since none of the items had a total item correlation coefficient score lower than 0.30, all items included in the trial form were included in the factor analysis (Table 1).

*KMO Coefficient and Bartlett's Sphericity Test:* The KMO coefficient indicates whether the data matrix is suitable for factor analysis and data structure can generate factor. The KMO score is expected to be more than 0.60. The Bartlett's test examines the relationship between variables based on partial correlations. The significance of the calculated chi-square statistic can be seen as an evidence of the normality of scores.<sup>[20]</sup> For the 20 items evaluated to develop the epidemic anxiety scale, the KMO value was 0.96, and the Bartlett's test result was 15765.623 ( $p < 0.001$ ). These values indicate that the trial form is suitable for factor analysis.

**Table 1. Total item correlation values**

Item No	Item total correlation	The Cronbach's Alpha in case of elimination of the item	Item No	Item total correlation	The Cronbach's Alpha in case of elimination of the item
M.1	.365	.956	M.11	.761	.951
M.2	.572	.954	M.12	.854	.950
M.3	.663	.952	M.13	.772	.951
M.4	.753	.951	M.14	.785	.951
M.5	.764	.951	M.15	.764	.951
M.6	.729	.951	M.16	.779	.951
M.7	.770	.951	M.17	.829	.950
M.8	.604	.953	M.18	.783	.950
M.9	.625	.953	M.19	.432	.955
M.10	.736	.951	M.20	.605	.953

## Validity

The structural and internal validity of the scale were examined. Factor analysis was performed to determine structural validity, and subgroup-super group comparison was performed to determine the internal validity.

**Structural Validity:** The structural validity was analyzed through factor analysis. Factor analysis is a multiple variable statistic aimed to determine conceptually significant variables (factors, dimensions) by combining  $p$  variables, which are connected with each other.<sup>[20]</sup> Several criteria for item selection in factor analysis have been described in the literature. The first of these is related with the factor load value of the item. Although a factor load value of  $\geq 0.45$  is considered as a good criterion for selection, a value as low as 0.30 may also be acceptable. In this study, items with a factor load value  $\geq 0.45$  were selected. The second criterion is some items have a high load values for one factor and low load values for the others. The difference between the two high load values was suggested to be at least 0.10.<sup>[20,22]</sup> This criterion was taken into account in this study, and the items with the difference of 0.10 between two load values were considered as binary items and were eliminated. On the basis of the results of the factor analysis, one item with a factor load value of less than 0.45 was eliminated from the study, and no binary item was found.

An exploratory factor analysis was performed to determine the scale factoring. The exploratory factor analysis is a statistical technique that is used to determine the number of headings to categorize the items (variables) in an assessment tool which is prepared and applied as a draft, and to find factors regarding the relations between variables, and is a frequently used method to examine the structural validity of the scale.<sup>[20,22]</sup> In factor analysis, the eigenvalue of a sub-dimension is expected to be  $\geq 1$ . When determining the number of factors in a scale, each sub-dimension should have an eigenvalue  $\geq 1$ , and should explain at least 5% of the variance. In addition, the main principle of this analysis is that the variance explained should be higher than the variance unexplained by the scale.<sup>[22]</sup> Further, examination of the line graphics of the factor

analysis is another method to determine the number of factors that the scale is comprised of. Results of factor analysis conducted in accordance with these criteria and examination of the line graphics showed that the structure which has the highest explained variance of the scale is in one-dimension, and the scale was decided to be one dimensional. In addition, since an economic scale was intended to be developed with the least item numbered and the highest variance, some items with a factor load value higher than 0.45 were eliminated from the study, which resulted in a 9-item structure (Table 2). The 9-item (M.12, M.17, M.14, M.16, M.13, M.18, M.15, M.7, and M.5) one-factor structure explained 70.8% of the epidemic anxiety. The factor load values of those items ranged from 0.801–0.883.

**Internal Validity:** An independent group t-test was performed to determine whether the items included in the scale had internal validity. The test scores obtained were sorted from the smallest to the largest, and of the 1037 participants, 280 or 27% of the participants with the lowest scale scores were re-classified as the “subgroup,” while 280 participants with the highest scale scores were re-classified as the “super group.” The remaining participants were not included in the process. Subsequently, the significance of difference between the subgroup and super group was examined using the independent group t-test (Table 3).

Results of examination of internal validity showed a significant difference between the mean scores of the subgroup and the super group ( $p < 0.001$ ). These results showed that the Utkan epidemic anxiety scale significantly distinguished people with high and low anxiety levels. These were significant results indicating the internal validity of the scale.

## Reliability

Internal consistency is of primary importance in the Likert-type scales. Internal consistency is related with the pairwise correlations between the scale items. The most method for determination of reliability is calculation of Cronbach  $\alpha$  reliability coefficient.<sup>[19,24]</sup> In this study, the Cronbach  $\alpha$  reliability coefficient

**Table 2. Factor load values and variance ratios of the Utkan epidemic anxiety scale**

Item No	Scale statement	Factor load value
M.12	Although I take necessary precautions against the pandemic, I cannot cope with my fears.	.883
M.17	I cannot help but think about the epidemic.	.878
M.14	Even the idea of an epidemic makes me to break out in a cold sweat.	.858
M.16	I live in fear of death due to an epidemic disease.	.844
M.13	Although I have no symptoms, I feel as if I have been exposed to the virus.	.842
M.18	I feel an apprehension of being infected by the virus at every moment.	.830
M.15	I feel uneasy even if I have a slight symptom and makes me think whether I am sick.	.825
M.7	I feel as I am short of breath when I think about the epidemic.	.811
M.5	I jump up and down because of anxiety of the epidemic.	.801

The percentage of explained variance = 70.8%

**Table 3. The 27% subgroup-super group comparison of the Utkan epidemic anxiety scale**

Group	n	Mean	Standard error	t	p
Subgroup	280	0.84	.397	-59.750	.000
Super Group	280	23.45	.332		

cient was calculated, and the parallel test method was used to test the reliability of the scale. For the parallel test method, the “Generalized Anxiety Disorder (GAD 7) Scale,” which is typically used to determine common anxiety disorder, was used as the parallel test method. The GAD 7 scale developed by Spitzer et al.<sup>[25]</sup> according to the Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> edition, Text Revision ([DSM]-IV-TR) criteria is a self-reported 7-item 4-point Likert-type scale. This scale is used to assess general anxiety disorder within the past two weeks. Turkish adaptation of the scale was conducted by Konkan et al.,<sup>[11]</sup> and its validity and reliability was determined. The most acceptable cut-off point of the Turkish version of the scale was 8.

**Cronbach  $\alpha$ :** Different methods are used to calculate the reliability coefficients of tools developed to assess cognitive and emotional characteristics. Cronbach  $\alpha$  reliability is one of these methods. Although the reliability coefficient in a Likert-type scale is expected to be above 0.70, it should be as close as 1.<sup>[17,19]</sup> For research scales, a Cronbach  $\alpha$  value <0.60 is unacceptable, 0.60–0.65 is undesirable, 0.65–0.70 is minimally acceptable, 0.70–0.80 is respectable, 0.80–0.90 is very good, and a value >0.90 indicates that the researcher should consider shortening the scale.<sup>[17]</sup> In this study, the Cronbach  $\alpha$  value was defined as 0.94 for the general scale. This value indicates a high reliability of scale items, and they are related to test the same concept. Thus, this scale can reliably differentiate between the attitudes toward clinical practices (Table 4).

**Parallel Form Consistency:** In addition to the Cronbach  $\alpha$  reliability coefficient, the parallel form consistency was used to determine the reliability of the scale (Table 5). The correlation between the mean scores of the sample for the Utkan ep-

**Table 4. Internal validity of the Utkan epidemic anxiety scale**

Factor	Number of items	Item no	Cronbach $\alpha$ value
Factor	9	M.5/M.7/M.12/M.13/M.14/ M.15/M.16/M.17/M.18/	.94

**Table 5. The relationship between the Utkan epidemic anxiety scale and general anxiety disorder (GAD-7) scale**

Equivalent Form	n	r	r <sup>2</sup>	p
GAD7	1037	.606	.367	.000

idemic anxiety scale and the mean scores of the sample for the common anxiety scale was examined, and a statistically significant correlation was found between the two scales. These results were significant in determining the reliability of epidemic anxiety.

## Discussion

Epidemic diseases have recently become a significant cause of concern in Turkey and worldwide cause significant anxiety among people. The Covid-19 epidemic that originated in China at the end of 2019, spread all over the world, and turned into a pandemic caused mass anxiety. Several studies indicate that Covid-19 infection is related with psychological diseases.<sup>[8,10,26]</sup> For instance, results of an online study conducted with more than 9000 people showed that 67.3% of the participants had too much or extreme anxiety regarding the pandemic, and 48.8% of the participants isolated themselves most of the time to avoid exposure to the virus.<sup>[26]</sup> Although several tools are available for the assessment of anxiety,<sup>[11,27,28]</sup> these tools do not have a structure focusing on the acute developing cases.

Although the literature states that one-dimensional scales should explain 30% of the variance, the common judgment is that the variance explained should be greater than the variance unexplained.<sup>[17,18,20,23]</sup> This means that the explained variance for a scale should be at least 51%. Although the Utkan epidemic anxiety scale developed in this study has the required characteristics for psychometric assessments, the variance explained by the scale is 70.8%, which indicates a very high explanatory variance. The scale explains a high variance with very low number of items, which are significant characteristics indicating that the scale is very economic and useful.

## Conclusion

In this study, a valid and reliable measurement tool was developed to assess epidemic anxiety in the general population. Although this tool provides reliable results for the population of patients  $\geq 18$  years, further studies should be performed to determine the validity and reliability of this scale in the younger population to enable the use of the scale in a wider population.

### Guideline for the Scale

Findings obtained in this study indicate that this scale can be used to measure anxiety in a valid and reliable manner, which was indeed already verified to determine epidemic anxiety in general population with validity and reliability.

The Utkan epidemic anxiety scale developed here is one-dimensional, consists of 9 items, and explains 70.8% of the total variance for epidemic anxiety in the general population 18 years and older. This explained variance is considerably high for a one-dimensional scale. The Cronbach  $\alpha$  reliability coef-

ficient of the scale was 0.94, which indicates a high reliability. The scale score ranges from 0–36. A high score indicates higher epidemic anxiety.

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