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# Validity and Reliability Study for the Turkish Adaptation of the Generalized Anxiety Disorder-7 (GAD-7) Scale

## Yaygın Anksiyete Bozukluğu-7 (YAB-7) Testi Türkçe Uyarlaması, Geçerlik ve Güvenirliği

Ramazan KONKAN<sup>1</sup>, Ömer ŞENORMANCI<sup>1</sup>, Oya GÜÇLÜ<sup>1</sup>, Erkan AYDIN<sup>1</sup>, Mehmet Z. SUNGUR<sup>2</sup>,

<sup>1</sup>Bakırköy Prof. Dr. Mazhar Osman Psychiatry Education and Research Hospital, 9th Psychiatry Unit, Istanbul, Turkey

<sup>2</sup>Marmara University Medical Faculty, Department of Psychiatry, Istanbul, Turkey

### ABSTRACT

**Objective:** Our objective was to identify the validity, reliability and psychometric features of the Turkish adaptation of the Generalized Anxiety Disorder-7 (GAD-7) scale.

**Method:** Patients who were diagnosed with 110 GAD patients and 112 healthy control subjects were included in this study. Three weeks after the initial administration, a certain group of the sample was administered the GAD-7 scale again. The principal components analysis for structural validity and confirmatory factor analysis were performed. Receiver operating characteristics (ROC) curve analysis was performed to identify the distinguishing feature. Positive predictive value, negative predictive value, positive and negative likelihood ratios were calculated at different cut-off levels.

**Results:** The total scores for the GAD-7 scale-Turkish version in the GAD group were found to be statistically significantly higher than those in the control group. A significant correlation was observed between all items of the GAD-7 scale - Turkish version that was found to have good internal consistency and intermittent administration. In the factor analysis performed for assessing the construct validity, the factor structure of the GAD-7 scale-Turkish version was found to be similar to the original form and the construct validity was found to be good. Good compliance to single factor structure was observed in the confirmatory factor analysis. The most acceptable cut-off point of the GAD-7 scale-Turkish version was found to be 8.

**Conclusion:** The GAD-7 scale-Turkish version, similar to the original form, was found to have a high validity, reliability and good psychometric features in a clinical sample. The Turkish version of the GAD-7 scale was regarded as a useful screening tool. (*Archives of Neuropsychiatry 2013; 50: 53-58*)

**Key words:** Generalized Anxiety Disorder-7 (GAD-7) scale-Turkish version, validity, reliability

**Conflict of interest:** The authors reported no conflict of interest related to this article.

### ÖZET

**Amaç:** Çalışmada Türkçeye uyarlanan YAB-7 testinin , geçerlik, güvenilirlik ve psikometrik özelliklerinin belirlenmesi amaçlandı.

**Yöntem:** Çalışmaya YAB tanısı konulan 110 hasta 112 sağlıklı gönüllü katıldı. Başlangıç uygulamasının üç hafta sonrasında örneklemin belirli bir bölümüne YAB-7 testi yeniden uygulandı. Yapısal geçerlilik için ana bileşenler analizi, doğrulayıcı faktör analizi, ayırt edici özelliğin belirlenmesi için ROC analizi yapıldı. Değişik kesme değerlerinde pozitif öngörücü değer, negatif öngörücü değer, pozitif ve negatif olabilirlik oranı hesaplandı.

**Bulgular:** YAB grubunda YAB-7 testi toplam puanları kontrol grubuna göre istatistiksel olarak anlamlı yüksek bulundu. YAB-7 testi tüm maddeleri arasında anlamlı ilişki, iç tutarlık ve aralıklı uygulamada iyi kararlılık gösterdiği görüldü. Yapısal geçerlilik için yapılan faktör analizinde YAB-7 testi faktör yapısının orijinal test ile benzer olduğu ve yapısal geçerliliğinin iyi olduğu saptandı. Doğrulayıcı faktör analizinde tek faktörlü yapıya iyi uyum gözlemlendi. YAB-7 testi için en kabul edilebilir kesme değeri 8 bulundu.

**Sonuç:** YAB-7 Türkçe formunun klinik örneklemede orijinal forma benzer olarak yüksek geçerliğe, güvenilirliğe ve iyi psikometrik özelliklere sahip olduğu saptandı. YAB-7 Türkçe formunun yararlı bir tarama testi olarak değerlendirildi. (*Nöropsikiyatri Arşivi 2013; 50: 53-58*)

**Anahtar kelimeler:** Yaygın Anksiyete Bozukluğu-7 (YAB-7) testi, Türkçe uyarlama, geçerlik, güvenilirlik

**Çıkar çatışması:** Yazarlar bu makale ile ilgili olarak herhangi bir çıkar çatışması bildirmemişlerdir.

**Yazışma Adresi/Correspondence Address:** Dr. Ramazan Konkan, Bakırköy Prof. Dr. Mazhar Osman Psychiatry Education and Research Hospital, 9th Psychiatry Unit, Istanbul, Turkey Gsm: +90 505 230 41 06 E-mail: ramazankonkan@gmail.com **Received/Geliş tarihi:** 12.09.2011 **Accepted/Kabul tarihi:** 27.09.2011

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## Introduction

Generalized anxiety disorder is described as a disorder which may be accompanied by findings including excessive anxiety or stress about many events or activities almost each day for at least 6 months, difficulty in controlling sorrow, restlessness, fatigability, difficulty in concentrating mentally, irritability, muscle tension and sleep disorders. Tremor and pain in the muscles are also observed frequently because of muscle tension. Depressive symptoms frequently accompany. It is very frequently associated with other anxiety disorders, major depression, alcohol/substance abuse and somatic disorders including irritable bowel syndrome and headache (1). According to DSM-III-R criteria the annual prevalence of GAD is 3.1% and the lifetime prevalence is 5.1%. However, the lifetime prevalence may increase up to 10.3% in women above the age of 45 (2). The lifetime prevalence in women is 2-fold higher compared to men (3). As in other anxiety disorders, all areas of social, occupational and familial functionality in addition to the emotional health and daily activities are affected in GAD. Because of physical complaints which can not be explained the frequency of referring to general medical specialties is increased (4). Patients with GAD mostly refer to primary care health institutions instead of psychiatry units (5,6,7,8). Therefore, the rate of diagnosis is low, though it occurs substantially frequently (4,5). Generally, symptoms are present 5-10 years before the diagnosis is made (9). Presence of a brief, easily applicable screening tool in the primary care setting may increase the rate of diagnosis. Spitzer et al. developed a 7-item scale for generalized anxiety disorder (10). This brief screening test has started to be used with a gradually increasing rate in clinical practice and in investigations. It has been reported that the Generalized Anxiety Disorder (GAD-7) Scale is a valid brief test in clinical, investigational and general population samples (10,11,12). In this study, it was aimed to adapt the GAD-7 test to Turkish and test its validity and reliability.

## Method

### Sample

110 patients who presented to the outpatient units of Bakırköy Prof. Dr. Mazhar Osman Psychiatry Education and Research Hospital, who were diagnosed as generalized anxiety disorder by experienced psychiatrists and who volunteered to participate in the study after being informed about the study were included in the study. The results of the GAD group were compared with the results of the healthy control group who were also volunteered to participate in the study after being informed about the study. The local ethics committee approved that there was no non-ethical component in the study.

### Method

The sociodemographic properties of the patients were evaluated with the form prepared considering DSM-IV SCID-I clinical interview guideline. A diagnosis of GAD was made using the version of SCID-I adapted by First et al. (1997) according to DSM-IV of which the validity and reliability was studied by Çorapçioğlu et al. (13,14). The Beck Depression Inventory (BDI) which was developed by Beck (1961) and of which the Turkish validity and reliability was studied by Hisli (1988) was used to determine the depression scores (15,16). The State-Trait Anxiety Inventory (STAI) which was developed by Spielberger et al. and of which the Turkish validity and reliability was studied by Öner and Le Compte was used to determine state-trait anxiety levels (17,18).

## The Generalized Anxiety Disorder Test-7 (GAD-7)

GAD-7 is a brief self-report test developed by Spitzer et al. according to DSM-IV-TR criteria evaluating generalized anxiety disorder (10). It is a paper and pencil likert type quartet scale (0= none, 1= many days, 2= more than half of the days, 3= almost every day) containing 7 items which assess the experiences asked in the scale items during the last 2 weeks. The total scores of 5, 10 and 15 obtained in the scale are cut-off points for mild, moderate and severe anxiety, respectively. Patients with a total score of 10 and above should be investigated using other methods and the diagnosis should be confirmed. When the threshold for the total score is selected as 10, the sensitivity for the diagnosis of GAD is 89% and the specificity is 82% (4).

### Constitution of the Turkish Version of the Scale

Approval was obtained from the investigators who developed the original form of the scale and who performed the validity study for constituting the Turkish version. The GAD-7 scale was translated to Turkish by a psychiatrist who had a command of English and Turkish languages independently from each other. The Turkish translation was broached to another expert who was educated English academically and who was currently giving English education. The Turkish translation of the scale was completed with the participation of three experts after the translation which represented the items best was selected by this expert. The compatibility of the scale was tested by translation from Turkish to the original language by a person who had command of both languages and psychometric examinations.

### Statistical Analysis

In the statistical analysis of the study, mean, standard deviation, frequency and percent values were described. Chi-square and Fisher's exact tests were used in comparison of frequency and percent values between the groups. The t-test was used in comparison of the variables which had a normal distribution and paired-sample t-test was used in dependent measurements (test-re-test). The Spearman correlation analysis was used to evaluate the relation between state-trait anxiety and depression measurements and GAD-7. The consistency of the questions in GAD-7 scale with each other and their success in displaying the same property (internal consistency) were assessed using Cronbach's alpha. The Principle Component Analysis was performed to test the structural validity of GAD-7. The factors with a characteristic value above 1 were hidden. Varimax rotation was not done, since a single factor structure arised. The Conformative Factor Analysis was done using SPSS AMOS 18 package program which contained the required module to perform this analysis. The Receiver Operation Characteristic (ROC) curve was used to separate the groups, to determine the strenght and to determine the sensitivity and specificity at different cut-off values (19,20). The positive predictive value was defined as the sample rate diagnosed as GAD in screening made using GAD-7. The negative predictive value was defined as the control group who was found not to have GAD by GAD-7. A probability value below 0,05 was considered significant. In interpretations, the significance limit was defined as  $p=0,05$  and  $0,001$ . All statistical analyses were done using SPSS-15.0 for Windows (SPSS, Chicago,IL, USA).

## Results

In our study, the mean age was  $40.30 \pm 10.13$  years in GAD patients and  $34.67 \pm 12.55$  years in the control group. 84.5% of the GAD group were female, while the same rate was 70.9% in the control group. The mean time of education was  $8.14 \pm 3.52$  years

in the GAD group and 12.85±2.60 years in the control group. 86.4% of the GAD group were married, while the same rate was 54.52% in the control group. The Beck Depression Inventory score was 21.50±11.70 (0-48) in the GAD group and 9.28±10.10 (0-40) in the control group. The State Trait Anxiety Inventory score was 47.25±10.92 (23-75) in the GAD group and 37.08±9.91 (23-61) in the control group. The Continuous Anixety Inventory score was 53.44±10.22 (28-80) in the GAD group and 39.52±9.69 (21-74) in the control group.

**Item Analysis**

In comparison of GAD-7 items and total score with the control group, it was found that all scores in the GAD group were statistically significantly high (Table1).

The Pearson Product-Moment Correlation Analysis was used in the analysis of the relation between GAD-7 test item. The weakest relation (0.395) was found between GAD-7 item number 4 and number 7. The strongest relation was found between item number 1 and 2 (0.720). All inter-item correlations had a significance level of 0.01 (Table 2).

In the analysis of the relation between the GAD-7 total score and state-trait anxiety, continuous anxiety and depression measurements which were anxiety and depression measurement used in the sample, GAD-7 was found to be moderately correlated with state-anxiety sclae (0.574), continuity anxiety scale (0.671) and Beck Depression Inventory (0.632). All relations were significant at a level of p<.001.

**Internal Consistency**

The internal consistency of the Turkish version of the GAD-7 scale was assessed using Cronbach’s alpha measurement. The Cronbach’s alpha coefficient was found to be 0.852 for the total score of GAD-7. Cronbach’s alpha coefficients for each item are shown in Table 3. It was observed that the internal consistency coefficients of the Turkish version of CAD-7 were substantially well according to the Cronbach’s alpha coefficients obtained.

**The Test-Re-test Analysis**

39 patients from the GAD group included in the study were retested 3 weeks later and comparison was made with the first tests. No significant differences were found between the two measurements in this comparison (Table 4). It was found that the Turkish version of CAD-7 form gave consistent result in each application.

**Structural Validity**

The Principle Component Analysis was used in the factor analysis which evaluated the structural validity of GAD-7. It was observed that consistency was at an excellent level, when the Kaiser-Meyer-Olkin value which is a measure of sample compliance of the scale items to the principle component analysis was found to be 0.904. The Bartlett test revealed that c2=824.041; p=.001. In the correlation matrix examination, item overlap which would increase the correlation coefficient above 0,9 was not found. In addition, it was found that only a single factor with a characteristic value of >1 arised and this factor explained 60.361 % of the total variance. Rotation was not done, since a single factor structure arised. The factor loads in this

**Table 1.** Comparison of GAD-7 items and total scores with the control group

GAD-7 items	YAB (n=110)		Kontrol (n=134)		F	p
	Mean	SD	Mean	SD		
1) Are you nervous, anxious, concerned?	2.04	.845	1.14	.824	1.849	<0.001
2) Inability to control or stop your concerns	1.66	1.034	.79	.876	10.137	<0.001
3) Feeling very anxious about different issues	1.65	1.044	.85	.771	31.088	<0.001
4) Inability to relax	1.43	1.000	.85	.871	8.248	<0.001
5) Being restless such as to be unable to stand still	1.37	1.148	.63	.771	35.148	<0.001
6) Getting easily nervous, angry or restless	2.06	.960	1.16	.860	8.609	<0.001
7) 7) To be afraid that something	1.82	1.051	.68	.914	5.218	<0.001
very bad will happen GAD-7 Total score	12.0364	5.068	6.1119	4.348	3.348	<0.001

t test, Pearson correlation, significant at a level of a p value of < .001

**Table 2.** The relations between the items of the Turkish version of GAD-7

	GAD1	GAD2	GAD3	GAD4	GAD5	GAD6
GAD2	.720(**)					
GAD3	.580(**)	.586(**)				
GAD4	.451(**)	.472(**)	.457(**)			
GAD5	.502(**)	.571(**)	.497(**)	.428(**)		
GAD6	.604(**)	.559(**)	.592(**)	.477(**)	.489(**)	
GAD7	.579(**)	.603(**)	.508(**)	.395(**)	.575(**)	.581(**)

\*\* Correlation is significant at a level of 0.001 (2-tailed test)

factor ranged between 0.630 and 0.838. Initial and post-ejectional proportional changes (h2) were found range between 0.436 and 0,703. The results showed that the factor structure of the Turkish version of GAD-7 was similar to its original form and its structural validity was well (Table 5).

**The Conformative Factor Analysis**

As a result of the conformative factor analysis performed for the single-factor principle model of GAD-7 scale the goodness was not statistically significant by chi-square consistency test ( $\chi^2=14.477, p>0.05$ ), but it showed a consistency at a good level ( $\chi^2/df$  ratio 1.034). In addition, in the confirmatory factor analysis, goodness of fit index (GFI), root mean square error of approximation (RMSEA), comparative fit index (CFI), normed fit index (NFI), relative fit index (RFI), incremental fit index (IFI), Tucker-Lewis index (TLI) and adjusted goodness of fit index (AGFI) were examined as fit indexes. 0,08 was considered as an acceptable fit value and 0.05 was considered as an excellent fit value for RMSEA (21,22). For GFI indexes the acceptable fit value was considered 0.90 and the excellent fit value was considered 0.95 (23,24). The degree of freedom was 14. The criteria obtained for the model (RMSEA 0,018, CFI 0.998, GFI 0,965, NFI 0.944, RFI 0.916, IFI 0.998, TLI 0,997 and AGFI 0.929) were found to be satisfying. The diagram of the conformative factor analysis of the scale and the calculated factor loads are shown in Figure 1.

**Conformation validity**

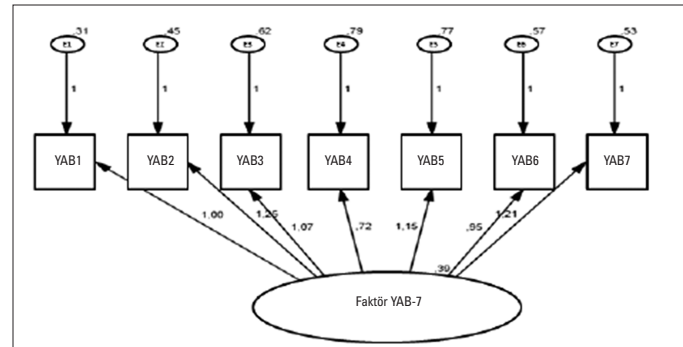
The correlations between the Turkish version of GAD-7 and other anxiety scales [(state-trait  $r=0.573$ ) and continuity ( $r=0.671$ )] was statistically significantly high to a great extent and it was thought that there was a good fit validity. It was observed that there was a correlation between the Beck Depression Scale which was our measure of depression and GAD-7 test ( $r=0.632$ ) and this correlation was statistically very significant.

**Differentiating Strength**

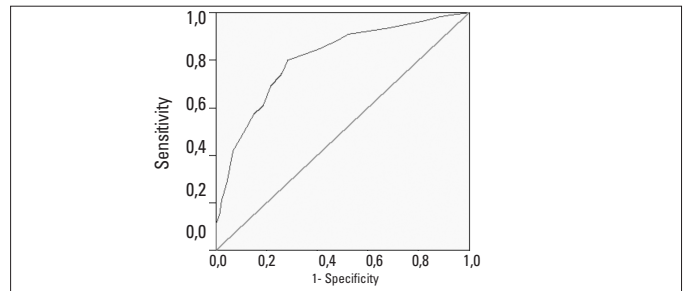
The ROC curve analysis was done to determine the differentiating strength of GAD-7 scale in 110 patients who were diagnosed as GAD by experienced psychiatrists by clinical evaluation and SCID-I and in 116 individuals who were found to have no diagnosis of GAD as the healthy control group. The area under the ROC curve obtained for each possible total GAD-7 score was found to be between 0.514 and 0.801 (Figure 2). These area values and 95% confidence interval values and values of specificity, sensitivity and probability rates for each total score value were determined (Table 6). In addition, specificity and sensitivity tests were shown in the graphic (Figure 3). As expected, as the cut-off point increased in the analysis of the values obtained, the sensitivity of the test decreased, but its selectivity increased. It was thought that the most acceptable common cut-off point of these two properties was obtained with a total GAD-7 score of 8. For the cut-off point of 8 the positive

predictive value was found to be 79 and the negative predictive value was found to be 81. Positive and negative predictive powers for the other cut-off values are shown in Table 6.

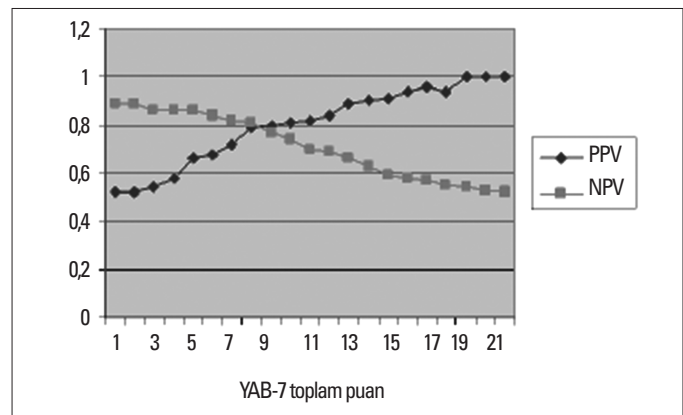
**Figure 1.** GAD-7 scale confirmatory factor analysis path diagram and standardized factor loadings calculated



**Figure 2.** ROC curve analysis for GAD-7 total score



**Figure 3.** 7 specificity and sensitivity experiment GAD-7 total score



**Table 3.** Internal consistency measurements for GAD-7

	Scale mean value when the item is deleted	Scale variance when the item is deleted	Corrected item total correlation	Cronbach alpha when the item is deleted
GAD1	9.53	21.859	.678	.825
GAD2	9.93	20.563	.670	.823
GAD3	9.89	20.921	.641	.828
GAD4	10.01	22.966	.433	.857
GAD5	10.17	20.294	.637	.829
GAD6	9.52	21.886	.594	.835
GAD7	9.80	20.662	.665	.824

## Discussion

Since patients with GAD have both somatic and emotional symptoms and most patients have depressive symptoms, a screening test which can be easily applied in the primary care diagnostic and therapeutic units and psychiatric outpatient units is needed for the diagnosis of GAD. To meet this need the GAD-7 test consisting of 7 items was developed by Spitzer et al. Studies have reported that GAD-7 has good psychometric properties

(11,12). In this study, the GAD-7 test was translated to Turkish and its Turkish validity and reliability and psychometric properties were investigated in a clinical sample.

The Cronbach alpha value of the total score of GAD-7 test was found to be 0.852. Similarly, individual alpha values of the items of the scale were also found to be high. The Turkish version of the GAD-7 test was thought to have a good internal consistency. In comparison of the total score of GAD-7 and individual items with the measurements of the control group, statistically significantly higher total scores were found in the

**Table 4.** Test re-test comparison

	1 <sup>st</sup> and 2 <sup>nd</sup> measurement GAD-7 score			
	Mean	SD	t	p
YAB1	.359	1.267	1.770	>0.05
YAB2	.436	1.465	1.858	>0.05
YAB3	.205	1.559	.822	>0.05
YAB4	-.282	1.413	-1.246	>0.05
YAB5	.154	1.679	.572	>0.05
YAB6	.385	1.407	1.707	>0.05
YAB7	.538	1.393	2.415	<0.05
YAB-7 Toplam	1.79487	7.07174	1.585	>0.05

Pearson correlation, significant at a level of a p value of <0.05

**Table 5.** Proportional changes and factor loadings of GAD-7 items

	h2	Factor loading
GAD2	.703	.838
GAD1	.680	.825
GAD6	.631	.795
GAD7	.614	.784
GAD3	.606	.778
GAD5	.554	.745
GAD4	.436	.660
Eigenvalue	4.225	
Variance (%)	60.361	

**Table 6.** GAD-7 total score, 95% confidence interval values, specificity, sensitivity and probability rate values for each total score value, predictive values

GAD-7 total	Sensitivity %	Specificity %	LR+	LR-	Area under the curve	95%confidence interval for the area under the curve		Standard error	p	PPV	NPV
						Lower limit	Upper limit				
1	98.2	13.8	1.14	-7.04	0.56	0.485	0.635	0.038	>0.05	52	89
2	98.2	13.8	1.14	-7.04	.56	0.485	0.635	0.038	>0.05	52	89
3	96.4	21.6	1.23	-4.42	.59	0.516	0.664	0.038	<0.05	54	86
4	93.6	36.2	1.47	-2.56	.649	0.578	0.721	0.037	<0.001	58	86
5	90.9	55.2	2.03	-1.63	.730	0.664	0.797	0.034	<0.001	66	86
6	88.2	60.3	2.22	-1.45	.743	0.677	0.808	0.034	<0.001	68	84
7	84.5	69.0	2.73	-1.21	.768	0.704	0.831	0.032	<0.001	72	82
8	80.0	80.2	3.92	-0.99	.801	0.741	0.861	0.031	<0.001	79	81
9	74.5	81.0	4.04	-0.91	.778	0.715	0.841	0.032	<0.001	80	77
10	69.1	84.5	4.46	-0.81	.768	0.704	0.832	0.033	<0.001	81	74
11	60.9	87.1	4.72	-0.69	.740	0.673	0.806	0.034	<0.001	82	70
12	57.3	89.7	5.56	-0.63	.735	0.668	0.802	0.034	<0.001	84	69
13	50.0	94.0	8.33	-0.52	.720	0.652	0.788	0.035	<0.001	89	66
14	41.8	95.7	9.72	-0.43	.688	0.617	0.758	0.036	<0.001	90	63
15	29.1	97.4	11.19	-0.29	.633	0.559	0.706	0.037	<0.001	91	59
16	26.4	98.3	15.53	-0.26	.623	0.55	0.697	0.038	<0.001	94	58
17	20.9	99.1	23.22	-0.20	.600	0.526	0.674	0.038	<0.05	96	57
18	15.5	99.1	16.67	-0.14	.573	0.498	0.648	0.038	>0.05	94	55
19	10.9	100	-	-0.10	.555	0.479	0.63	0.038	>0.05	100	54
20	6.4	100	-	-0.05	.532	0.456	0.607	0.038	>0.05	100	53
21	2.7	100	-	-0.02	.514	0.438	0.589	0.039	>0.05	100	52

PPV: Positive predictive value, NPV: Negative predictive value, LR+: positive probability rate, LR-:negative probability rate



GAD group. In the GAD group, it was observed that there was no significant difference between the initial measurements and the measurements performed 3 weeks later in the GAD group and a good consistency was present between the measurements. These results show that the Turkish version of the GAD-7 form is a reliable test.

In the correlation assessment performed between the items to determine the distinguishing property of each item, statistically significantly high correlations were found and individual items were observed to have a good validity value.

Correlations between the Turkish version of the GAD-7 form and the other anxiety measurements used in the study (state-trait and continuity anxiety) were significantly high to a great extent and it was thought that the Turkish version of the GAD-7 form had a good fit validity with the other anxiety measurements.

When Spitzer et al. evaluated the structural validity of the GAD-7 scale, they found that GAD-7 had a good fit with a single-factor structure. In the structural factor analysis they performed with depression measurement items, GAD-7 and depression measurement became differentiated as separate factors. In the studies conducted afterwards, the single-factor structure was confirmed (11,12). In our study, a single-factor structure was also found covering all items. It was observed that the Turkish version was similar to the original form and had a good structural validity. Satisfactory fit indexes were found in the confirmatory factor analysis.

In the original article of GAD-7, the total score was assessed as follows: 0-4: mild anxiety, 5-9: moderate anxiety, 10-14: high anxiety and 15-21: severe anxiety. The cut-off value of 10 for GAD-7 total score was determined to be the threshold value for the diagnosis of GAD (10). In our study, in the ROC curve analyses, the most acceptable crosscut value for the specificity and sensitivity of the total score of the Turkish version of GAD-7 was found to be a total score of 8 in our sample. The specificity, sensitivity, positive predictive value and negative predictive value for this cut-off value were found to have good rates. The results obtained from the ROC curve analysis generally show that the Turkish version of GAD-7 has a perfect distinctiveness.

Conclusively, the Turkish version of GAD-7 has high validity, reliability and good psychometric properties in clinical samples similar to its original form. GAD-7 can be used as a screening tool for generalized anxiety disorder.

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