THE VALIDITY AND RELIABILITY STUDIES OF THE COMPUTER ANXIETY SCALE ON EDUCATIONAL ADMINISTRATORS (CAS-EA)

Prof. Dr. Esmahan AGAOGLU
Associate Prof. Dr. Esra CEYHAN
Associate Prof. Dr. A. Aykut CEYHAN
Assistant Prof. Dr. Yucel SIMSEK
Anadolu University
Education Faculty Eskisehir, TURKEY

ABSTRACT

This study aims at investigating the validity and reliability studies of the "Computer Anxiety Scale" (Ceyhan & Gurcan Namlu, 2000) on educational administrators. The data gathered from 143 educational administrators of state schools located in Eskişehir show that the scale consists of 2 factors. The first of these factors, affective anxiety regarding computers independently explains 37.99 % of the variance; the second factor, cognitive anxiety regarding computers forms 12.49 % of the variance. These two factors, which consist of 20 items altogether, explain 50.48 % of the variance. It was found that the scale was able to discriminate the computer anxiety level of educational administrators with respect to computer efficacy. With the scale, the correlation between Spielberger State and Trait Anxiety Inventory (Öner and Le Compte,1983) was calculated as 0.34 and 0.25. In addition, the correlation coefficient between the scale and Happner and Petersen's Problem-Solving Inventory (Şahin, Şahin, Happner,1993) was found to be 0.40. The internal consistency coefficient was calculated as (α) 0.87. Item total score reliability coefficients were calculated between 0.23 and 0.71. As a result, the "Computer Anxiety Scale of Educational Administrators" (CAS-EA) was developed.

Keywords: Computer Anxiety; Educational Administrators; Anxiety, Scale Development

INTRODUCTION

Because of the possibilities they offer their users, computers come at first place as much as educational technology is concerned. The use of computers has reached such an extent where the term computer literacy has come into existence, and is now one of the indispensable qualifications expected from individuals (Gunes, 2006). Consequently, education that used to be carried out with the use of traditional tools and materials has now been replaced with multiple learning which makes use of information technologies. This also leads to the use of information technologies in educational administration (Yilmaz, 2005). That is why educational administration is one of the function areas of computers in education (Alkan, 1998). Regarding the use of computers in the sector of educational administration, Bal et. al. (2002) list the following: tracking personnel information, correspondence, tracking fixed assets, officials' payrolls, student affairs, entering grades, preparing and persuading exam schedules, preparing yearly lesson plans, and preparing course distributions (cited in Güneş, 2006).

The vast area of utilization provides the educational administrators with less workload and economic time so that he/she can participate in the educational setting more effectively.

When we take into account that the use of computers will increase and be more widespread in the upcoming years, there are certain precautions to be taken.

Studies can be conducted related to improving conditions so as to make all administrators and teachers computer literate (Yilmaz, 2005), encouraging administrators and teachers to use computers and education-based software, increasing their computer efficiency, encouraging them to develop positive attitudes towards computer use and working towards eliminating computer anxiety (Imer & Bayrak, 2000; Ozer, 1998).

Conducting these studies is of vital importance because even though some schools possess a sufficient number of computers, still some teachers and administrators do not make enough use of them or they show resistance against computer use (Deniz, 1994). One of the fundamental reasons for this resistance seems to be the anxiety level of educational administrators.

According to Widmer and Parker (1984), computer anxiety implies computer apprehension or fear, and even closeness to its use. Since 1980s, computer anxiety has gained importance in the literature of research. There are two basic areas of study; namely whether computer anxiety is important or not, and how to decrease anxiety. Studies investigating whether computer anxiety is important or not conclude that individuals with high computer anxiety level are at a disadvantage (cited in Maurer & Simonson, 1994). Anxiety usually comes into existence in situations where new learning takes place and resistence is appearant, thus causing a negative effect on cognitive performance and learning (Namlu & Ceyhan, 2002). Baring in mind that school principals play a key role in computer applications and trigger the use of computers at schools as leaders (Dupagne & Krendi, 1992), it is quite important that their level of computer anxiety be identified.

Related to our country, even though there are studies on determining the level of computer use of educational administrators (Altun, 2000; Imer & Bayrak, 2000), the computer habits and skills of educational administrators (Çelikten, 2002), the anxiety levels of teacher candidates (Namlu & Ceyhan, 2002), there is no study investigating the computer anxiety levels of educational administrators.

If we consider that some school administrators met with computer technologies at later ages, it is worth studying their anxiety levels and seeking ways to eliminate their anxiety. Within this framework, the first aim is to develop a scale that measures computer anxiety which has the potential of affecting the use of computers within an educational setting.

PURPOSE

This study aims at carrying out the validity and reliability studies of the "Computer Anxiety Scale" developed at university students by Ceyhan and Namlu (2000) on educational administrators. Based on this, "the Anxiety Scale on Educational Administrators" is developed to identify the computer anxiety of educational administrators.

METHODOLOGY

Participants: In the academic year of 2005-2006, 350 administrators have worked at state primary and secondary schools of the National Ministry of Education within Eskisehir city borders. The aim was to administer the scale to all educational administrators within this scope.

However, only 143 educational administrators working in Eskisehir returned the scale. Thus, the participants of the study consist of 143 educational administrators. 55 (39%) of these are principals of schools, and the remaining 86 (61%) are deputy principals. 13.40% of these administrators are female and 86.60% are male. 80.90% of the participants are working in primary schools, and 19.10% are working in secondary schools. Seven participants left their administrative position vacant.

INSTRUMENTS

In order to find out the criterion validity of "the Computer Anxiety Scale" (Ceyhan & Gurcan Namlu, 2000), several instruments were used. These are:

Computer Anxiety Scale (CAS): CAS, developed by Ceyhan & Gurcan Namlu (2000), was developed to measure individuals' anxiety and fear when faced with the likelihood of using computers or directly using computers. The CAS consists of 28 items, which require an answer of "never", "sometimes", "frequently", and "always". Higher scores of the scale refer to a higher level of anxiety (Ceyhan & Gurcan Namlu, 2000).

While developing the CAS, the factor analysis of 30 items was piloted on 1091 university students. The factor analysis carried out using the Principal Component Analysis and Varimax Rotation techniques resulted in 28 items and three factors. The factors' Eigen values range between .44 and .76. Total item coefficients of the items range between .40 and .71. The three factors explain 53% of the total variance. The first factor, referred to as affective anxiety, consists of 13 items and independently explains 39.60% of the variance. The second factor, referred to as the anxiety of damaging computers, consists of 9 items and independently explains 8.40% of the variance. The third factor, referred to as the anxiety of learning to use computers, consists of 6 items and independently explains 5% of the variance. As a result of the investigation of the factor structure in terms of gender, it was found out that neither the factor structure nor the factor items show changes. As for the measure criterion validity of the scale, significant relationships were found between the whole scale and three subscales, and Deniz's Computer Attitude Scale, Spielberger's Test Anxiety Inventory, Spielberger at al.'s State-Trait Anxiety Inventory and Problem-Solving Inventory (PSI). Discriminant analysis results in terms of discrimination validity of the scale show that top, middle and bottom groups' CAS scores are able to discriminate in a statistically significant way. The CAS scores of the group with lower computer efficiency were higher when compared to the group with higher computer efficiency (Ceyhan & Gürcan Namlu, 2000).

In the reliability studies of CAS, when the upper 27% and lower 27% groups of CAS were compared, differences were found for all items. The internal consistency (Cronbach Alpha Coefficient) of the scale items was found to be .94. The internal consistency values for the subscales were: affective anxiety about computers is .92, damaging anxiety related to computers .89, and learning anxiety to use computers is .73. The correlation between the scores of test-retest carried out at a two-week interval was .79 (Ceyhan & Gurcan Namlu, 2000; Gurcan Namlu & Ceyhan, 2002).

State-Trait Anxiety Inventory: The inventory, developed by Spielberg, Gorsuch and Lushene based on Spielberg's two factorial anxiety theory, was adapted into Turkish by Öner and LeCompte (1982). The inventory has a total of 40 items, in the form of two scales each of which consists of 20 items. The state anxiety scale measures how the individual feels at a certain time or condition whereas the trait anxiety scale measures how an individual feels irrespective of the situation or condition the person is in (Öner, 1997; Öner & LeCompte, 1983). An increase in the scores refers to an increase of the state or trait anxiety the individual feels.

In the manual prepared by Öner and LeCompte (1983), both scales' validity and reliability study results were given and the values indicated show that the two scales were valid and reliable. The literature shows that both scales are being widely used to determine individuals' anxiety levels in studies (Öner, 1997).

Computer Self-Efficacy Scale: The Scale was developed by Gürcan (2005) to measure university students' computer self-efficacy. It was prepared in the form of a Likert-type scale consisting of the options of "Completely confident", "Confident", "Less confident", "Not confident". The scale consists of 27 items, allowing the lowest score to be 27 and the highest to be 108. Higher scores refer to a higher level of computer self-efficacy (Gürcan, 2005).

During the validy and reliability studies of the scale, in the principal component analysis, three factors came out, and the factors explained 64.87% of the variance. According to the Varimax rotation results, the first factor explained 29.443% of the variance, the second factor explained 25.941% and the third factor explained 9.490% of the variance. In the first factor of the scale, there are items related to the self-efficacy perceptions of high level computer skills. In the second factor, there are items related to the self-efficacy perceptions of basic computer using skills.

In the third factor, there are items related to the self-efficacy perceptions regarding skills of searching for help and information on computer.
Factor values range from 0.53 to 0.80. The internal consistency coefficient of the scale was found to be 0.96. In the criterion validity of the scale, the correlation between the Computer Anxiety Scale developed by Namlu and Ceyhan (2003) and the scale was found to be -0.633 ($p<.0001$). This shows that the scale has criterion validity of the scale (Gürcan, 2005).

Problem-Solving Inventory: The scale developed by Heppner & Peterson (1982) aims to determine individuals' self-confidence in problems solving, feeling of personal control and personal approaches towards the problem. Thus, the inventory measures individuals' perception regarding their own problem-solving efficiency (Savasir & Sahin, 1997). The inventory consists of 30 items and scores range from 20 to 200. A high score on the inventory shows that the person perceives himself as insufficient in terms of problem-solving skills. In this study, the version that was adapted with a Turkish sample group by Sahin, Sahin and Happner (1993) was used. Adaptation studies showed that the original and Turkish version of the PSI was quite similar, and the psychometric features of the Turkish version were rather good. The PSI is being used in many studies in Turkey.

The Questionnaire: The researchers prepared a questionnaire to gather personal information about the participants' gender, job title, educational grade, and seniority.

The Scale Development Phase and Process

The aim of this study is to adapt the Computer Anxiety Scale (CAS) developed by Ceyhan and Gürcan Namlu (2000) to educational administrators, which was originally developed for university students. The first step was to go through all the items to check whether they were appropriate for educational administrators. Within this framework, the CAS, which consists of 28 items and is answered on a four-point label, was administered to all educational administrators. The aim was to administer the CAS to all educational administrators in the state schools in Eskişehir city center. Thus, the data collection instrument was distributed to 350 educational administrators. Only 143 of those were returned with full answers. Even though the sample size is small, it can be said that the number is sufficient when the number of items and options are considered. Kass and Tinsley (1979) suggest that in factor analysis, for a sample group up to 300 people, each scale item requires a participant distribution of between 5 to 10.

The data for the study was gathered between June, 2006 and July, 2006. The data analysis was done with SPSS program. While analyzing the data, principal component analysis method and Varimax rotation method in factor analysis, t-test and Pearson correlation coefficient calculations were carried out. Level of significance was taken as 0.05.

FINDINGS

Findings Related To the Validity Studies of CAS-EA

Within the validity studies of CAS-EA construct validity and criterion based validity studies were carried out.

Studies on determining construct validity: factor analysis

To determine the dimensions of the Educational Administrators Computer Anxiety Scale (CAS-EA), factor analysis was carried out in four stages. These stages are: the analysis of data in terms of their compatibility with factor analysis, obtaining the factors, factor rotation and naming factors (Kalaycı, 2005).

In order to test whether the data of (CAS-EA) lends itself for factor analysis, first the Barlett test of Sphericity and Kaiser-Meyer-Olkin (KMO) sample sufficiency tests were conducted. As a results of the Barlett test of Sphericit, the chi-square value was found significant (χ^2=2290.65, sd=378, p<.0001).
The significance of this value supported the assumption that there is high correlation among items in the correlation matrix, thus, the data was accepted convenient for factor analysis.

In addition, the KMO test result was found to be 0.845. As the KMO value was above 0.50, even above 0.80 (Kalaycı, 2005), the data gathered was found to be appropriate for factor analysis. All tests carried out referred to the result that the data was appropriate for factor analysis.

To determine the factorial structure of CAS-EA, exploratory factor analysis and the widely used technique of principal component analysis were used. As a result of the analysis conducted with this technique, factors with the value of one and above (Buyukozturk, 2002; Green, Salkind & Akey, 1997; Kalaycı, 2005), the eight factoral structure of the CAS-EA was arrived at. The eight factors explained 70.27% of the total variance. These factors, respectively, explained 33.83%, 7.85%, 6.16%, 5.27%, 4.82%, 4.42%, 4.11% and 3.81% of the variance.

When the factor loadings of the items of those factors were examined, some items were found to have more than one factor loadings and some factors had only one item. Thus, to decide on the number of factors, criteria other than eigen values were considered.

Firstly, in order to decide on the number of factors related to the construct, the scree graphic based on eigen values was examined (Buyukozturk, 2002; Green, Salkind & Akey, 1997; Kline, 1994). At the end of the scree graphic carried out for the CAS-EA, a rapid drop was observed in graphic curve's bevel after the first factor. After the second factor, a gradual decline in this bevel was seen and from the third factor on, the acceleration turned into a horizontal state and declined.

When the number of factors is determined according to the graphics horizontal level (Kalaycı, 2005), it could be claimed that the factorial structure of the scale consists of two or three factors, a scale of two factors could even be suggested. However, when it is taken into account that the original scale developed by Ceyhan and Gurcan Namlu (2000) consists of three factors, it was considered appropriate to keep those three factorial structures in the CAS-EA as well. Thus, it was decided that the data be analyzed with respect to the three factorial structure.

As a result of the CAS-EA's three factorial structure analysis, The three factors explained 47.84% of the whole variance. The factor loadings of the items in those factors were analyzed with the principal component technique.

In addition, varimax rotation method, quite frequently applied to account for independence, clarity and signifance in interpretation of the factor analysis and to put items together which show a meaningful relationship within one factor, was used (Buyukozturk, 2002; Green, Salkind & Akey, 1997; Kalayci, 2005). To find out which items form each factor in this three factoral structure or determine items which measure the same factors, the criteria used in the original scale (Ceyhan & Gürcan Namlu, 2000) were applied. The criteria are as follows:

- **The loading values of items within a factor should be minimum 0.40 and above.**
- **The difference between the factor loading value of an item with a factor loading of above 0.40 within a factor and the factor values of other factors should be at least 0.10 (Büyüköztürk, 2002). At the end of these analyses, a construct as shown in Table 1 was arrived at.**

When the analysis results in Table 1 are examined, it can be seen that factor communality varies between .174 and .688, and that the communalities of some items (like 6., 24., 15.) are low. Thus, even though those items meet the item selection criteria, they were eliminated (e.g. item 15).

When item selection is done according to the above mentioned criteria, it can be seen that factor one (affective anxiety) has 7 items, factor two (anxiety of damaging computers) has 9 items and factor three (anxiety of learning to use computers) has 5 items. When compared to the factors of the original scale, it comes out those items 13, 14, 18. and 22. in the first factor are in the second factor, and items 8. and 10. in the second factor moved to other factors. Moreover, as evident in Table: 1, the factor loadings in the first and second factor of 10 items on the scale (items like 7., 8., 11., 13., 14., 16., 18., 8., 10., 12) are above .40 in both factors, items with factor loadings close to each other and thus are vague items. This result and the findings of the scree graphic led to a reconsideration of the scale as being structured as a two factorial one. Consequently, the factor analysis was conducted again with two factors.

Table: 1
The factor analysis results of Educational Administrators' Computer Anxiety Scale (CAS-EA) in terms of rotated principal component

CAS item numbers based on original factoral structure	Communality	Factor loading values after rotation #		
		I. Factor	II. Factor	III. Factor
I.Factor				
1	.560	.731	.130	.090
2	.520	.716	.021	.081
3	.588	.730	.169	.164
7	.653	.676	.439	-.055
9	.664	.629	.503	-.123
11	.574	.525	.545	.038
13	.591	.480	.584	.139
14	.659	.519	.624	.014
16	.475	.463	.509	.033
18	.459	.403	.529	.128
22	.424	.352	.490	.246
26*	.405	.405	-.301	.389
27*	.347	.400	-.091	.422
II.Factor				
4	.451	.468	.399	.270
6	.230	.375	.193	.228
8	.575	.528	.544	.031
10	.535	.582	.432	.095
12	.688	.540	.625	.073
23	.413	.035	.641	.019
24	.174	.044	.403	.102
25	.594	.199	.722	.179
28	.339	.279	.411	.304
III.Factor				
5	.455	.094	.257	.617

15	**.162**	**.027**	**.401**	**.023**
17*	**.376**	**.012**	**-.013**	**.613**
19	**.471**	**-.169**	**.304**	**.592**
20	**.561**	**.072**	**.413**	**.621**
21*	**.451**	**.191**	**-.053**	**.641**
Explained variance	**%47.83 (total)**	**%19.65**	**%18.65**	**%9.53**

*** These items are reversed while scoring**
 # Bold items are the ones with good communalities, with a factor loading of more than 0.40, and a difference of more than 0.10 with other factor loadings.

The findings arrived at with the two factorial structure of the CAS-EA show that some items (items 2., 6., 15., 23., 24., 26., 27.) exhibited very low variance as factors. In addition, it was seen that some items (like 6., 15., 24., and 26.) did not match the criteria mentioned. These items were eliminated from the scale and the analysis was reconducted. At the end of this analysis, it was found that except for item 28., all other items met the criteria. The joint variance of item 28. was .37, first factor loading was .46 and second factor loading was .40. The results of the factor analysis carried out after the elimination of item 28 is shown in Table: 2.

Table: 2
The Factor Analysis Results of Educational Administrators' Computer Anxiety Scale (CAS-EA) in Terms of Rotated Principal Component after Item Elimination

CAS item numbers based on original factorial structure	Communality	Factor loading values after rotation#	
		I. Factor	II. Factor
I.Factor			
1	**,396**	**,628**	**.045**
3	**,429**	**,645**	**,112**
7	**,645**	**,802**	**-.033**
9	**,660**	**,810**	**-.067**
11	**,543**	**,728**	**,112**
13	**,599**	**,746**	**,206**
14	**,666**	**,808**	**,118**
16	**,464**	**,673**	**,106**
18	**,455**	**,651**	**,176**
22	**,332**	**,529**	**,229**
II.Factor			
4	**,442**	**,600**	**,286**
8	**,560**	**,744**	**.077**
10	**,524**	**,715**	**,112**
12	**,696**	**,818**	**,164**
25	**,432**	**,605**	**,257**
III.Factor			
5	**,470**	**,204**	**,655**
17*	**,560**	**-.027**	**,610**
19	**,373**	**.032**	**,685**
20	**,470**	**,286**	**,679**
21*	**,543**	**.090**	**,624**
Explained variance	**%50.48 (total)**	**%37.99**	**%12.49**

***These items are reversed while scoring**
 # Bold items are the ones with good joint variance, with a factor loading of more than 0.40, and a difference of more than 0.10 with other factor loadings.

As demonstrated in Table 2, at the end of the factor analysis, a scale of 20 items which explain 50.48% of the total variance came into existence. The first factor of CAS-EA consists of 15 items and independently explains 37.99% of the variance. The factor loadings of the items in this factor range between 0.81 and 0.52. This factor, as Table 2 also shows, combines the items in the first factor of the original scale (affective anxiety in the original scale) and the second factor of the original scale (anxiety of damaging computers in the original scale) under one factor. This new factor can be referred to as "affective anxiety" so as to cover the "anxiety of damaging computers" in the original scale as well. The second factor of CAS-EA, independently explains 12.49% of the variance and consists of 5 items. The factor loadings of the items in this factor range between 0.65 and 0.62.

This factor consists of the items of the factor referred to as "anxiety of learning to use computers" in the original one. This factor can be referred to as "anxiety of learning to use computers" as done in the original one, or called "cognitive anxiety" as it covers the cognitive structure of anxiety. In the two factorial structures, it was verified that 8 items in the original scale either do not match the applied criteria or do not function. These items are, as taken from the original scale factor one, "I do not feel at ease when working on the computer" (item no.2), "While working on the computer, I am cheerful and joyous" (item no.26) and "I look forward to working on the computer" (item no.27); as taken from the original scale factor two, "When working on a document important to me, I feel my heart beats fast" (item no.6), "knowing that a wrong command on the computer will cause a loss of a lot of information makes me panic" (item no.24), "When working on a document important to me, I feel tense and uneasy" (item no.28); and as taken from the original scale factor three, "I feel the anxiety of not being able to learn using the computer" (item no. 15).

Studies on determining criterion validity

In the studies related to criterion validity, distinguishing validity and validity studies actualized with similar scales were performed.

Discriminant validity studies

To determine the discriminant validity of CAS-EA's, educational administrators' weekly computer use (in terms of hours) and their proficiency in computer use were taken as criteria. In the literature, one of the most determining factors for computer anxiety is the individual's proficiency in using computers (cited in Namlu & Ceyhan, 2002). Table 3 demonstrates the relationship between educational administrators' average weekly use of the computer, their self-efficacy regarding computer use and computer anxiety scale scores.

Table: 3.
The relationship between educational administrators' average weekly use of computers (hours) and computer efficacy level, and CASEA scores

	N	M	SD	Correlation coefficient with Factor 1 (r)*	Correlation coefficient with Factor 2 (r)*	Correlation coefficient with total CASEA scores (r)*
Weekly use of the Internet (hours)	117	18.43	10.22	-.17	-.08	-.16
Computer self-efficacy scale scores	123	75.85	17.51	-.65*	-.34*	-.65*

*Pearson correlation coefficient **p<.01

As evident from Table 3, weekly use of computer and CAS-EA scores and subfactors exhibit a low negative relationship, yet insignificant. This result shows that educational administrators' weekly computer use does not have a discriminant effect on computer anxiety scale scores.

However, significant relationship has been identified between educational administrators' efficacy level and computer anxiety total scores and subscales. This is an indication of the fact that the higher the level of computer efficacy of educational administrators, the lower the level of computer anxiety.

The validity actualized with similar scales

To determine the similar scales validity of the CAS-EA, The State and Trait Anxiety Inventory (Oner & LeComte, 1983) correlation was calculated.

The correlation coefficient between CAS-EA total and subscales and The State Anxiety Inventory were found as 0.34, 0.31 and 0.22 ($p<.01$), respectively.
The correlation coefficient between CAS-EA total and subscales and The Trait Anxiety Inventory were found as 0.25, 0.21 and 0.19 ($p<.05$), respectively. As a result, a significant relationship, though low, was identified between CASEA and the State-Trait Anxiety Inventory. In addition, the correlation coefficient between CAS-EA total and subscales and Problem-Solving Inventory were found as 0.40, 0.33 and 0.36 ($p<.05$). This shows that the CAS-EA has a medium relationship with perceptions regarding problem-solving skills.

Findings Related To Reliability Studies of the CAS-EA

Within the scope of the reliability studies of CAS-EA, internal consistency, item total score correlation, comparing extreme group score averages, and split-test methods were used.

Studies related to determining internal consistency

The internal consistency coefficient obtained from the answers to the 20 items given by the sample group of 143 educational administrators was found as (α) 0.87. The internal consistency coefficients of the three factors forming the scale were found as factor 1 (affective anxiety) 0.92 and factor 2 (cognitive anxiety) 0.67. These results suggest that the internal consistency coefficient of the CAS-EA is quite high, like the original scales coefficient (.92).

Studies related to item total score correlation

Item total score correlation, which determines the relationship between the score obtained for each item by the 143 educational administrators and the total scores they got for the scale, was also conducted. As a result of the varimax rotation carried out on the scale, both the item total correlation coefficients and scale average and scale internal consistency coefficients (α) excluding the related item were calculated. The results are shown in Table: 4.

Table: 4.
Scale Average without Item, Internal Coherence of the Scale Without Item and Total Item Correlation Coefficients of the Items Include In CAS-EA

Factors and Item No#	Item total score correlation coeffcient	Scale average without item	Alpha (α) coefficient without item
FACTOR I : Affective Anxiety			
1	.4988	26.92	.8599
3	.5675	27.12	.8595
4	.5793	26.81	.8571
7	.6012	27.13	.8589
8	.6080	27.12	.8585
9	.5885	27.14	.8593
10	.5859	26.90	.8571
11	.6152	27.08	.8578
12	.7179	27.14	.8558
13	.6716	27.09	.8562
14	.6863	27.14	.8566

16	.5627	27.11	.8592
18	.5757	27.14	.8590
22	.4875	27.04	.8603
25	.5553	26.93	.8578
FACTOR II: Cognitive Anxiety			
5	.4174	26.48	.8633
17*	.2369	27.77	.8811
19	.3096	26.88	.8698
20	.5092	26.50	.8593
21*	.3424	26.16	.8776

[#] ***Items are ordered according to their original item numbers.***
* ***These items are reversed when scored.***

As Table: 4 shows, item total score reliability coefficients range between 0.2369 and 0.7179. When the item total correlation coefficients of the two factors are examined, it can be seen that the coefficients for factor one range between 0.5183 and 0.7953, and the coefficients of factor two range between 0.3832 and 0.5089.

In addition, when one item is eliminated from the scale, the average calculated with the remaining items changes between 26.16 and 27.77.

The general average of the scale is 28.29 with a standard deviation of 6.41. When related items are eliminated, the internal consistency coefficients are found to be between .8558 and .8776. These values are very close to the previous scale, with an internal consistency coefficient of .87. Thus, it can be said that all items on the scale support the scale and should be on the scale.

When the total scores of the scale are compared to the subscale correlations, the correlation coefficient between the total scores of the scale and factor one is found as 0.90, the correlation coefficient between the total scores and the second factor is 0.70 ($p<.01$). When the correlations of the subscales are compared, a correlation coefficient of 0.31 ($p<.01$) between factor one and factor two.

Studies related to determining reliability with extreme groups comparison

In the extreme group comparison method, individuals are ordered according to the scores they obtained from the scale. The top and bottom 27% group is taken and their scores on each item of the test are compared with a t-test. As a result of a comparison of the top and bottom groups consisting of 80 people showed that the t values are significant at $p<.0001$ level.

Studies related to determining reliability with the Split-Test Method

The reliability of the CAS-EA was also tested with the split-test method. The correlation between the two parts of the scale administered to 143 educational administrators was found to be 0.63. The Cronbach coefficient for each part was found to be 0.87 and 0.73, respectively. This results shows that the reliability for each part is quite high. Moreover, the Gutman split test reliability is found to be 0.77.

DISCUSSION

This study aimed at developing a computer anxiety scale for educational administrators as a self-expression instrument. For this, the Computer Anxiety Scale developed for university students by Ceyhan and Gürcan Namlu (2000), whose validity and reliability studies were carried out, was taken and administered on educational administrators for validity and reliability studies.

Nowadays, it is quite important that educational administrators widely use computers in teaching-learning activities. Thus, the anxiety pattern of educational administrators needs to be determined and focused on.

Within this framework, a Computer Anxiety Scale for educational administrators that can be used in a reliable and valid way was aimed at.

From the data gathered from 143 educational administrators working in Eskişehir city center, it was considered more appropriate that the scale for educational administrators be composed of two factors. At the end of the analysis of the two factorial structure of the CAS-EA, a scale with 20 items which explain 50.48% of the variance was formed. The first factor of the CAS-EA consists of 15 items, and independently explains 37.99% of the variance.

The factor loadings of the items in this factor range between 0.81 and 0.52. This factor is called as "affective anxiety related to computers". The second factor explains 12.49% of the variance and consists of 5 items, two of which are scored adversely. The factor loading values of the items in this factor range between 0.65 and 0.62. This factor is called "cognitive anxiety related to computers".

These two factorial structures developed for educational administrators cover the three factorial structure of the Computer Anxiety Scale originally developed for university students. Ceyhan and Gürcan Namlu (2000) set forward a three factorial structure for university students: affective anxiety related to computer use, anxiety of damaging computers and anxiety of learning to use computers. The results of the scree graphic based on eigen values and three factorial analysis carried out in this study suggest that for educational administrators, the scale structure should be two factorial. The two factorial structures are also more appropriate when considered in terms of the overlapping items in the first and second factors, the decreases in the scree graphics, and the ease of item identification and interpretation.

The first factor of the two factorial structure covers the items of the the first factor in the original scale (affective anxiety in the original) and the items in the second factor (anxiety of damaging computers in the original). Thus, the first factor is called "affective anxiety related to computers" so as to cover the factor of "anxiety of damaging computers" as referred to in the original scale. When the items in this factor regarding damaging computers are examined, it can easily be seen that these are also affective anxiety items. The second factor, on the other hand, is called "cognitive anxiety related to computers" as it covers the items related to "anxiety of learning to use computers", as referred to in the original scale. As a result, it can be said that the factorial structure of the CAS-EA for educational administrators covers the factorial structure of the CAS for university students and is in accordance with it.

During validity studies, as an indication for the discriminant validity of CAS-EA, an insignificant correlation coefficient value was obtained between weekly use of computers and CAS-EA scores. However, a negative significant relationship was found between computer efficacy scores and CAS-EA total scores and subscale scores (-.65, -34., -65, $p<.01$ respectively). This finding supports the literature and the finding of the original scale in terms of computer efficacy (Namlu & Ceyhan, 2002).

As a result, it can be suggested that, even though the CAS-EA does not have a discriminant effect in terms of anxiety and weekly computer use, it does have a discriminant effect between computer anxiety and computer efficacy levels of educational administrators.

In terms of similar scale validity, the relationship between the CASEA and State-Trait Anxiety Inventory investigated. Though low, a positive relationship was found between CAS-EA and the State Trait Anxiety Inventory (.34 $p<.01$ and .25, $p<.05$, respectively). Likewise, while developing the original scale on university students, a meaningful relationship ranging between .44 and .30 was found between CAS-EA total and subscales and the State and Trait Anxiety scores. This result shows that the higher the individuals' state and trait anxiety the higher their computer anxiety.

Besides, a moderate meaningful relationship was found between CAS-EA and the Problem-solving Inventory results (0.40, 0.33 and 0.36, p<.05, respectively). This indicates that educational administrators' low degree of perception about their own problem-solving skills means a high degree of computer anxiety. These results can be considered indicative about the CAS-EA as being a valid measurement instrument.

The internal consistency coefficient (α) of the CAS-EA was found to be 0.87. The internal consistency coefficients of the two factors forming the scale were found as 0.92 for factor one (affective anxiety) and 0.67 for factor two (cognitive anxiety). These results show that the internal consistency and reliability values of the CAS-EA are very high. Item total score reliability coefficients range between 0.23 and 0.71. Likewise, the results of the extreme group comparisons show that all items are significant at the level of p<.0001. The split-test results also indicate that the scale is reliable.

As a result, this study was conducted in order to develop a scale to describe educational administrators' computer anxiety. The findings related to the scale suggest that the scale is both valid and reliable.
Thus, the "Educational Administrators' Computer Anxiety Scale", which consists of 2 factors and 20 items allowing scores between 20 and 80 on a 4 point Likert-type scale, came into existence. The CAS-EA has been developed as a one dimensional continuum which starts with no computer anxiety towards intensively experienced anxiety, covering a wide range of continuity of intensity. Consequently, this scale should be considered as one which aims at determining educational administrators' affective and cognitive computer anxiety by measuring their computer anxiety behaviour. Within this framework, a high score on the scale might indicate that educational administrators' computer anxiety is intense, that they might have some negative feelings about computers, that they might tend to exhibit behaviour of avoidance regarding computer use, and that they can adopt a negative tendency of not using computers in the teaching learning process. Finally, CAS-EA can be suggested as a reliable and valid scale for further studies to measure educational administrators' computer anxiety. In addition, it is strongly suggested that this scale (CAS-EA) should be used before some online/distance education practices for educational administrators whether they have any computer anxiety or not.

BIODATA and CONTACT ADRESSES of AUTHORS

Dr. Esmahan AGAOGLU obtained her bachelor degree from Istanbul University, School of Foreign Languages the Department of French Language and Literature in 1986. She completed her MA programme in Anadolu University, Social Sciences Institute, the Department of Educational Sciences. She completed her Ph.D at Hacettepe University, Social Sciences Institute in the Department of Educational Administration, Supervision, Planning and Economics in 1995. She was a lecturer in 1991, and she was an Assistant Professor in 1995, Associated Professor in 1998 and Professor in 2005. She has written 13 articles and 3 books; she presented more than 40 papers presented

Prof. Dr. Esmahan AGAOGLU
Anadolu University, Faculty of Education, ESKISEHIR, TURKEY
Phone: +90(222) 335 05 80
Fax: +90 (222) 335 05 79
Email: esagaogl@anadolu.edu.tr

professor at Division of Guidance and Counseling Psychology, Department of Educational Sciences, Education Faculty, Anadolu University. She received Ph.D at Program of Guidance and Counseling Psychology, Hacettepe University, in 1999. Her main research interests are counseling psychology, developmental psychology, trauma psychology, pair counseling, computer anxiety, and problematic internet use/internet addiction.

Dr. Esra Ceyhan
is an associate

Associate Prof. Dr. Esra CEYHAN
Anadolu University, Faculty of Education, ESKISEHIR, TURKEY
Phone: +90(222) 335 05 80/3526-1226
Fax: +90 (222) 335 05 79
Email: eceyhan@anadolu.edu.tr

Dr. Aydoğan Aykut Ceyhan is an associate professor at Division of Guidance and Counseling Psychology, Department of Educational Sciences, Education Faculty, Anadolu University. He received Ph.D at Program of Guidance and Counseling Psychology, Hacettepe University, in 1999. His main research interests are guidance services in school, counseling psychology, hopelessness, early separation anxiety, and problematic internet use/internet addiction.

Associate Prof. Dr. Aydogan Aykut CEYHAN
Anadolu University, Faculty of Education, ESKISEHIR, TURKEY
Phone: +90(222) 335 05 80/3526
Fax: +90 (222) 335 05 79
Email: aceyhan@anadolu.edu.tr

Dr. Yucel SIMSEK is an assistant professor at Education Faculty, Anadolu University. In 2003, he received the Ph.D. grade in Educational Management at Anadolu University, Eskişehir. His main research interests are educational leadership, distance education, organizational development and organizational communication.

Assistant Prof. Dr. Yucel SIMSEK
Anadolu University, Faculty of Education, ESKISEHIR, TURKEY
Phone: +90(222) 335 05 80
Fax: +90 (222) 335 05 79
Email: ysimsek@anadolu.edu.tr

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