



RESEARCH ARTICLE

Investigation of the factors affecting the cognitive test anxiety in university students

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ABSTRACT

Objective: The aim of the present study was to investigate the relationship between cognitive test anxiety sociodemographic data, anxiety and depressive symptoms and also the mediating role of depression level in the relationship between anxiety and cognitive test anxiety among university students.

Method: The data were collected from 171 volunteer Turkish university students. Sociodemographic information form, Beck Depression Inventory, State and Trait Anxiety Inventory, Cognitive Test Anxiety Inventory were administered to the participants.

Results: There was a statistically significant correlation between all scales used ($p < 0.01$). Cognitive test anxiety was predicted by trait anxiety level, depressive symptom intensity ($p < 0.05$), but it was not predicted by state anxiety level ($p = 0.114$). In mediation analysis, depression was a mediator between trait anxiety and cognitive test anxiety ($p < 0.05$).

Conclusion: Results will contribute to a better understanding of the relationship between different psychological variables such as anxiety and depression.

Keywords: Anxiety, anxiety disorders, depression, students

INTRODUCTION

Test anxiety refers to the physiological and behavioral reactions to tests. These reactions are accompanied by one's thoughts and stress before or after the test (1). Test anxiety is not addressed under a separate heading in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders but can be assessed under specific phobias (2).

One of the most important reasons why test anxiety has occupied researchers' agenda is the negative impact

test anxiety has on performance. The literature on test anxiety includes results showing the link between what one expects to do on the test and final performance (1,3,4). Studies exist that show increases in test anxiety to relate to decreased academic performance and decreases in test anxiety level to relate to better performance (5,6). Test anxiety is associated with sociodemographic characteristics such as ethnic minority participation, socioeconomic status, being female, and mood changes such as depression (2,7-12).

The first methods for assessing test anxiety only

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evaluated test anxiety during the test and did not deal with the state of anxiety before or after the test (4). In the late 1960s, two dimensions for test anxiety were identified as emotionality and worry (13). The affective dimension of test anxiety includes physiological responses such as high heart rates, headaches, and cortisol production that occur from anxiety (14-16).

The worry dimension of test anxiety includes one's self-deprecating thoughts, fear of failure, guilt about not working enough, the idea that he/she is unsuccessful and inadequate compared to others, distraction during study and test, concerns about the result of the test, perception of the tests as a threat to self-esteem and peer status, avoiding situations of preparation and evaluation, and focusing one's attention on oneself (3,8,17,18). By possessing high levels of anxiety and evaluating increased anxiety as a threat, this increases students' beliefs and cognitions related to the cognitive dimension of test anxiety promotes related behaviors and affects learning performance (15). Several studies on the relationship between test anxiety and performance have shown the cognitive dimension to weigh more heavily than the emotional dimension (12,13). Therefore, the focus of studies has turned to evaluate the cognitive dimension (5).

Test anxiety has been found to relate to both state and trait (chronic) anxiety (5). Although test anxiety appears to be a form of state anxiety, it is more closely related to trait anxiety according to Başpınar (19). According to Spielberger et al (20), test anxiety is a form of constant anxiety. Ongoing anxiety in a highly anxious person is triggered by a particular situation (i.e., the test), and emotional responses emerge. Trait anxiety's effect on performance is greater than that of state anxiety (6). Test anxiety is said to begin before and continue after the test (21). Cognitions related to the cognitive dimension of test anxiety are not only present during the test but also before and after (9,18).

Test anxiety has been associated with social phobia, generalized anxiety, and depression (2,12). Beidel et al. (22) found rate of test anxiety 54% in children who had not been diagnosed with any psychiatric disorder other than anxiety disorders. Another study confirmed these findings and found the rate of phobic or anxiety disorders to be present in 61% of 9th and 10th-grade students with test anxiety (11).

Depression is associated with test anxiety but it is not as much as other anxiety disorders (2). Depressive symptoms and hopelessness levels were found to be higher in the group with high test anxiety levels compared to the lower-level group (11). Warren et al. (23) found anxiety and depression levels to be higher in

children with high test anxiety than children with low test anxiety. It has been stated that anxiety related to the test in educational institutions can lead to the development of depression (24).

First, we aimed to determine and measure the variables related to and/or affecting cognitive test anxiety in university students. And second, we aimed to evaluate the role of depression in the relationship between anxiety and cognitive test anxiety. The reason for this study is evaluation this relationship with more advanced methods is not available in the existing literature.

The first hypothesis of our study is that cognitive test anxiety is associated with depression and anxiety, and the second hypothesis is that it is more associated with trait anxiety than situational anxiety. Depression is associated with both chronic anxiety and test anxiety. The possibility exists for a mediating role between these two variables. Therefore, our third hypothesis is that depression is a mediating variable in the relationship between trait anxiety and cognitive test anxiety. We think that our study may contribute to a better understanding of the relationship between cognitive test anxiety, depression and anxiety. the results may help to develop more effective intervention methods for test anxiety.

METHOD

The sample of the study consists of 171 university students attending undergraduate education. The students were reached through announcements at the Corum Hitit University. Non-probability convenience sampling was used for sampling. The participants were informed in writing through an informed consent form. Corum Hitit University is the universe from which the sample has been selected and consists of approximately 18.000 students.

The condition to be included in the research is that the participant continues undergraduate education, knows Turkish enough to complete the self-report scales without help, and has provided written and verbal consent for participating in the study. The absence of written and verbal consent, the presence of a current psychiatric or medical problem that may prevent them from completing forms and not completing forms are reasons for exclusion. All 302 students accepted participating in the study.

Data Collection Tools

Sociodemographic Data Form: This was prepared by the researchers to determine the participants' sociodemographic characteristics. The form is intended

for collecting information about the participants' age, gender, education, and background.

Beck Depression Inventory (BDI): The original form was developed by Beck et al. (1961) (25) and aims to assess the severity of depression symptoms. It is a self-report scale consisting of 21 questions. Each question is scored between 0 and 3 by the participant. The total score ranges from 0-63. Hisli (1989) adapted the scale to Turkish (26).

Cognitive Test Anxiety Inventory-Revised (CTAS-R): This was designed by Cassady and Finch (2015) to evaluate the cognitive aspect of test anxiety as a revision of the Cognitive Test Anxiety Inventory developed by Cassady and Johnson (2002). (3,15) The validity and reliability of the Turkish adaptation by Bozkurt et al. (2017) (9). It is a 4-point Likert-type self-report scale consisting of 25 questions and is a reliable and valid method for assessing the cognitive dimension of test anxiety.

State and Trait Anxiety Inventory (STAI): The original form was prepared by Spielberger et al. (1983) (27). The validity and reliability of the Turkish adaptation by Öner et al. (1985) (28). It is a 4-point Likert-type self-report scale consisting of two separate scales each with 20 items that measure state and trait anxiety. Higher scores obtained from the scales indicate higher levels of anxiety and concern.

Procedure

Before beginning the study, written permission was obtained from the local ethics committee in Turkey. Participants were informed about the nature of the study and written informed consent has been obtained with the informed consent form.

To form the research sample, advertisements containing information about the nature of the study that summarized the participation requirements and contained contact information were posted on boards in places students frequently use in the university, and the people included in the sampling were reached by these means. Pre-interviews were conducted with the participants, verbal and written informed consent was obtained, and the researchers evaluated participants' sociodemographic information using the sociodemographic data form. The participants completed the self-report forms. Data were collected between May 2018 and November 2018. The researchers completed the data collection process in a separate room just for this purpose in a single session, working in the university the students attended for about 1 hour outside the classroom environment. During the study, 302 people were reached;

131 people completed neither the forms and nor the data collection process, even though they agreed to participate in the study. Data from the 171 people who had completed the data collection were included in the statistical analysis. No payment or extra test grades were given to the participants.

Statistical Analysis

The obtained data were evaluated by computer using the Statistical Package for Social Sciences (SPSS version 20.0.0 on Mac OS 10.14.3) and by correlation, regression, and mediation analyses and appropriate comparison methods such as t-test or ANOVA. The t-test was used to determine the difference between independent groups, and the Pearson correlation test and regression analysis were used to examine the relationships among the scales. The results were evaluated using a 95% confidence interval, and statistical significance was accepted as $p < 0.05$.

RESULTS

Sociodemographic Data

The research sample consists of 111 (64.9%) women and 60 (35.1%) men. The mean age of the sample is 21.51 years \pm 1.60, with the mean age of women (n=111) being 21.32 \pm 1.70 and the mean age of men (n=60) being 21.85 \pm 1.37. The entire research sample answered the question about the class. Of the whole sample, 15 (8.8%) are freshmen, 42 (24.6%) are sophomores, 59 (34.5%) are juniors, and 55 (32.2%) are seniors. For income level, the categories are low (monthly household income is less than one minimum salary), medium (monthly household income is between 1-3 minimum salaries), and high (monthly household income is more than 3 minimum salaries). Among the participants, 28 (16.4%) have low, 84 (49.1%) have medium, and 59 (34.5%) have-high income levels.

Measuring Test Anxiety and the Psychological Variables

The distribution of continuous variables measured by STAI and its sub-dimensions, BDI, and CTAS-R has been examined using a histogram and Q-Q plot graphs, and the distribution of these variables has been concluded to correspond to a normal distribution. Descriptive statistics for the scales are shown in Table 1.

The independent sample t-test for variable with two distinct categories and ANOVA for variable with three or more distinct categories tests have been used to examine the differences among groups. Gender, class,

Table 1: Descriptive statistics and Pearson correlation test among scales

(n: 171)	Mean (\pm SD)	BDI	STAI-t	STAI-s	KSKÖ
BDI	11.80 \pm 10.75	—			
STAI-t	42.63 \pm 10.19	0.662*	—		
STAI-s	43.85 \pm 8.88	0.491*	0.557*	—	
CTAS-R	47.48 \pm 17.16	0.548*	0.553*	0.427*	—

SD: Standard. Deviation, BDI: Beck Depression Inventory, CTAS-R: Cognitive Examination Anxiety Inventory - Revised, STAI: State and Trait Anxiety Inventory, STAI-t State and Trait Anxiety Inventory, Trait Anxiety Scale, STAI-s State and Trait Anxiety Inventory, State Anxiety Scale

Table 2: Results of linear regression analysis for CTAS-R as dependent variable and BDI, STAI-t, STAI-s as independent variable

	R ²	B	β	t	p
BDI	0.375	0.476	0.298	3.584	0.001
STAI-t		0.560	0.290	3.321	0.001
STAI-s		0.200	0.119	1.583	0.115

CTAS-R: Cognitive Examination Anxiety Inventory - Revised, BDI: Beck Depression Inventory, STAI-t State and Trait Anxiety Inventory, Trait Anxiety Scale, STAI-s State and Trait Anxiety Inventory, State Anxiety Scale

and financial status groups have been taken as the independent variables and the CTAS-R score as the dependent variable (29).

The one-way t-test has been used to determine the differences in cognitive test anxiety according to gender. No statistically significant difference exists between genders in terms of cognitive test anxiety ($F=3.05$, $t=-1.10$, $p=0.28$). The one-way ANOVA test has been used to determine the differences in cognitive test anxiety according to the year of study. In the ANOVA analysis, no statistically significant difference is found among freshmen, sophomores, juniors, and seniors in terms of cognitive test anxiety ($F(3, 145)=0.10$, $p=0.958$). To assess the relationship between income level and test anxiety, the participants were divided into three groups according to their families' income levels, and the one-way ANOVA test was performed to determine the differences among groups. In the ANOVA analysis, no statistically significant difference was found among cognitive test anxiety levels according to income ($F(3, 140)=0.73$, $p=0.484$).

Relationships Among Scales

In the first step in order to investigate the describe the strength and direction of the basic relationship between among the cognitive test anxiety, trait anxiety level, state anxiety level and depressive symptom intensity, Pearson correlation test was used. Levels of $0.10 < r < 0.29$ were considered to have a low-, $0.30 < r < 0.49$ to have a medium-, and $0.50 < r < 1.0$ to have a high-level correlation (29). Table 1 also shows the r and p values.

In the second stage, linear regression analysis was used to evaluate how well trait anxiety level, state anxiety

level and depressive symptom intensity were able to predict the cognitive test anxiety. Aim of regression analysis was explore more sophisticated exploration of the relationship among these variables (29).

The sub-dimensions of trait anxiety and state anxiety for STAI and BDI were considered as the independent variables and the CTAS-R score as the dependent variable. According to the regression analysis, the CTAS-R score is predicted by the intensity of depression symptoms and trait anxiety ($p < 0.01$), but not by state anxiety ($p=0.115$). The results from the regression analyses are given in Table 2.

In the third, our study evaluates the relationships among the scales using the mediation analysis model established among the sub-dimension of trait anxiety of STAI, BDI and with CTAS-R. Trait anxiety is associated with test anxiety, shown in our analysis and previous studies (2,5). We evaluated the BDI score as an intermediate variable to measure the magnitude of the effect of depression in this relationship between Trait anxiety is associated with test anxiety. Andrew Hayes' hypotheses were used for the mediation analysis (30).

Regression tests, bootstrapping method, and the Sobel test have been used to determine whether the effects of the evaluated mediation model are statistically significant using the program PROCESS for SPSS 2.16.3. The bootstrapping method has been chosen to reduce Type 1 errors and to check for variables that may have the potential to affect relationships. The statistical significance of the mediator variable has been evaluated with 5.000 bootstraps; p values less than 0.001 are considered statistically significant. The independent variable of the study is the variable of the trait anxiety

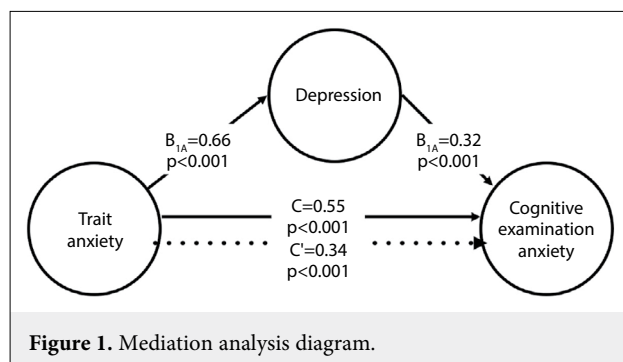
instrument, the intensity of depression symptoms is the mediating variable, and the criterion variable is cognitive test anxiety. (A) The total effect of trait anxiety on cognitive test anxiety is significant ($F=74.61$, $t=8.64$, $SE=0.12$, $\beta=0.55$, $p<0.001$). (B) The effect of trait anxiety on the mediating variable of depression symptoms is significant ($F=131.51$, $t=11.47$, $SE=0.07$, $\beta=0.66$, $p<0.001$). (C) The effect of the mediating variable of depression symptoms on cognitive test anxiety is significant ($F=48.37$, $t=3.96$, $SE=0.13$, $\beta=0.32$, $p<0.001$). (D) When simultaneously evaluating the relationship between trait anxiety and the mediating variable of depressive symptoms, the relationship between trait anxiety and cognitive test anxiety decreases; however, the significance level remains the same ($F=48.37$, $t=4.14$, $SE=0.16$, $\beta=0.34$, $p<0.001$). According to this result, depression symptoms are seen to mediate the relationship between trait anxiety and cognitive test anxiety and all significance levels were found under 0.001 in mediation analysis ($p<0.001$). Both the Sobel test and the value of significance support mediation. ($z=3.73$, $p<0.001$). The mediation analysis model and its results are shown in Figure 1.

DISCUSSION

Various levels of correlation have been found among the used scales. A significant relationship has been found between cognitive test anxiety and depression symptoms and state and trait anxiety. According to our analysis, trait anxiety predicts cognitive test anxiety and depression levels predict test anxiety. When the mediation analysis was performed, the direct relationship between trait anxiety, which is the leading variable, and cognitive test anxiety, which was the outcome variable, was seen to decrease, and the significance level of this relationship did not change.

In the context of test anxiety, while trait anxiety is when one generally assesses examinations as threatening, situational anxiety can be exemplified as evaluating a particular test as threatening. For this reason, we can say that examining the relationship of test anxiety with different psychological structures is more suitable rather than only evaluating its effect on academic performance. These assessments appear to be necessary to better understand the differences in test anxiety among the groups and to better interpret its relationship to performance.

Our study has found no significant difference between genders in cognitive test anxiety levels. Studies in the literature have shown women's level of test



anxiety to be generally higher than that of men (8,12,31). This difference is said to exist for both general test anxiety and cognitive test anxiety, and women are said to have more negative evaluations and expectations about tests and themselves (3,5). However, studies have indicated that such a difference does not exist, or that the detected differences are controversial (9,23).

In one study, no difference was found between women and men in terms of the cognitive dimension of test anxiety, but the emotional dimension was found to be higher in women; these data are similar to those from our findings (18). Gender differences in test anxiety have been reported to decrease during the university period (5). This information is similar to the results of our study. In summary, although the literature generally indicates the level of test anxiety to be higher in women, controversial results can be said to emerge when different statistical analyses are performed or when evaluating the sub-dimensions of test anxiety.

No significant difference has been found among class years in terms of test anxiety. A study with university students in Turkey showed general test anxiety to be higher for freshmen than for seniors, and the cognitive dimension of test anxiety is higher for both freshman and sophomores compared to seniors (31). Although the results of our study differ from Kaprikan's, no recurring results in the literature have shown the relationships among freshmen, sophomores, juniors, and seniors with test anxiety.

Cognitive test anxiety does not significantly differ in terms of income groups. Several papers on test anxiety found a relationship between socioeconomic level and test anxiety (5). In studies evaluating larger samples in the UK and Israel, the result was reached that anxiety increases as socioeconomic levels decrease (10,32). Although no difference exists in our sample, a study with a larger sample may have the potential to find a significant difference.

In the correlation analysis, a high correlation has been found for CTAS-R with STAI and STAI-trait, and

a moderate correlation with STAI-state. Test anxiety can be said to be a kind of anxiety specific to a state. The positive relationship of test anxiety with anxiety occurring in other areas is expected and has been shown in the literature (2,5). Cognitive test anxiety can be said to have more to do with trait anxiety. This may be related to how cognitive test anxiety is maintained before and after the test, rather than just during the test. In the regression analysis, correlation analysis confirmed that trait anxiety also predicts cognitive test anxiety continuously, but not situational anxiety. Different articles have stated test anxiety to display the features of trait anxiety (3,18,19,33). The relationship of cognitive anxiety with state and trait anxiety has been found compatible with our hypotheses.

The correlation between BDI and CTAS-R and BDI's prediction of CTAS-R scores are in line with the information in the literature, which indicates a positive correlation to exist between depression symptoms and test anxiety (11,12). Although the literature has shown the relationship between test anxiety and anxiety disorders to be greater than test anxiety's relationship with depressive symptoms, a similar difference cannot be said to have been found in our study (2).

In accordance with our hypothesis, the statistical analysis in our study has shown depression to be a mediating variable in the relationship between trait anxiety and cognitive test anxiety. The reason for this mediator effect of depression may be insufficient preparation for the test, negative thoughts about self, lack of motivation and loss of concentration which may coexist with depression. These possible factors can lead to worry about the test in the presence of anxiety, so cognitive test anxiety may increase. As mentioned above, previous studies have shown results related to the relationship between depression, anxiety, and test anxiety (2,11,12,22,23). However, no study was found in the literature review in which the relationships among depression, anxiety, and test anxiety had been evaluated using mediation analysis.

The biggest limitation of our research is that academic performance was not evaluated. Evaluating academic performance can help one better understand the relationship test anxiety has with various psychological variables. Another limitation of the study is its cross-sectional structure. Examining the change in test anxiety may be more beneficial with longitudinal observational studies. Another limitation is that the measurement method used in the research is based on self-report scales. This method can be said to be more prone to inaccurate or incomplete evaluations than structured or

intervention-based measurement methods. As a result of reaching students with open advertisements, the less random sample selection decreases the representation of the universe. Even if the obtained results give an idea about university students in Turkey, because of the sampling method these results cannot be generalized to the universe of university students in Turkey. An imbalance can be said to exist between the numbers of the subgroups that make up the sample, as the people included in the sample have been accepted at a specific time interval. When selecting subjects, psychiatric or medical diagnoses and history were not evaluated, which is another limitation. It can be said that the sample size of the study is low, especially considering that self-assessment scales are used and no clinical diagnosis is available. This may be due to the limited duration of the research and the lack of rewards for the participants. Some of the participants have not completed one or more of the self-assessment scales or have left them completely empty. Therefore, the collected data was evaluated and the missing part of the data was not included in the study. Class and gender differences of the participants were not taken into account when creating the sample, a noticeable difference emerged between gender and class distribution.

Our study has importance in the literature in that it has tested information about test anxiety in a sample of university students. The superiority of this study is that it evaluates the relationship of cognitive test anxiety, anxiety and depression differently from the literature. We think the results we obtained, especially the results from the mediation analysis, will provide a better understanding of the relationships among the qualities of cognitive test anxiety and various psychological variables such as anxiety and depression. For future studies, it may be advisable to evaluate the relationship between depression, anxiety and test anxiety with larger samples and prospective studies, and to consider depression in developing interventions to test anxiety.

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