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Grade Level Differences in the Cognitive, Behavioral, and Physiological Components of Test Anxiety

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Abstract

The capacity to cope with test anxiety that contain high concentrations of cognitive, behavioral, and physiological manifestations, is becoming increasingly important in educational contexts as well as evaluative settings. The developing ability to deal with test anxiety relative to the increasingly strict evaluative practices students encounter points that students' test anxiety may decline as they move through school years. This study examined three test anxiety components (*thoughts*, *off-task behaviors*, and *autonomic reactions*) with students from 3 public schools in İstanbul, Turkey. Using a diverse sample of elementary (Grade 4; N = 414) and middle (Grade 6; N = 201) school students, grade level differences in these components were investigated. Applying a multivariate approach, significant differences were found in the overall test anxiety, favoring fourth grade students. The results also revealed Grade 4 advantage for *off-task behaviors* and *autonomic reactions*, η^2= .014 and η^2= .011, but no grade level differences in the *thoughts*. Educational implications of the findings are discussed.

Keywords: test anxiety, thoughts, off-task behaviors, autonomic reactions, grade level, individual differences

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Diferencias en el Nivel de Grado en los Componentes Cognitivos y Fisiológicos de la Ansiedad ante los Exámenes

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Abstract

La capacidad de hacer frente a la ansiedad ante los exámenes que contienen altas concentraciones de manifestaciones cognitivas, conductuales y fisiológicas, es cada vez más importante en contextos educativos, así como en los entornos evaluativos. La capacidad de desarrollar para tratar la ansiedad ante los exámenes con respecto a las prácticas de evaluación cada vez más estrictas de los estudiantes encuentra puntos que la ansiedad ante los exámenes de los estudiantes puede declinar mientras que se mueven a través de años escolares. Este estudio examinó tres componentes de la ansiedad ante los exámenes (pensamientos, comportamientos fuera de la tarea, y reacciones autonómicas) con los estudiantes de 3 escuelas públicas en Estanbul, Turquía. Utilizando una muestra diversa de estudiantes de primaria (Grado 4, N = 414) y medio (Grado 6; N = 201), se investigaron las diferencias por curso en estos componentes. Aplicando un enfoque multivariado, se encontraron diferencias significativas en la ansiedad ante los exámenes en general, favoreciendo a los estudiantes de cuarto grado. Los resultados también revelaron la ventaja del Grado 4 para los comportamientos fuera de la tarea y las reacciones autonómicas, η^2= .014 y η^2= .011, pero no hay diferencias por curso en los pensamientos. Se discuten las implicaciones educativas de los hallazgos.

Palabras clave: ansiedad ante los exámenes, pensamientos, comportamientos fuera de la tarea, reacciones autonómicas, nivel de grado, diferencias individuales

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The undeniable fact is that the educational accountability movement in all over the world has greatly increased the importance of testing has on educational and occupational outcomes of students (Baş, 2016; Schwarzer & Bowler, 1982; Segool, Carlson, Goforth, von der Embse, & Barterian, 2013). Besides, testing is a common practice in contemporary society (Lowe, Lee, Witteborg, Prichard, Luhr, Cullinan et al., 2008) as "we live in a test-conscious, test-giving culture in which the lives of people are in part determined by their test performance" (Sarason, 1959, p.26). When one considers the influence of the results of tests used for making important decisions about a student's status in school, university, and further in work (Zeidner, 1998), it is likely that evaluations and evaluative contexts may produce test anxiety in students.

Testing is widely used in Turkish schools. That is, students taking national standardized test and classroom examinations are a common occurrence in Turkish schools. Nationwide standardized tests, such as Transition from Basic Education to Secondary Education Exam (Grade 8) and Undergraduate Placement Exam (Grade 12) conducted by the Ministry of National Education and the Measurement, Selection and Placement Centre, respectively, have contributed to increased testing and testing requirements in Turkish schools (e.g., Berberoğlu & Kalender 2005). The prevalence and stakes of standardized testing for elementary, middle, and high school students have also dramatically increased in other countries by requiring annual testing of nationwide academic achievement in the areas of mathematics, science, and/or reading (e.g., Bodas & Ollendick, 2005; Segool et al., 2013).

Drawing on these assertions, it is no wonder that test anxiety will continue to be a serious and pervasive problem among elementary (e.g., Bodas & Ollendick, 2005; Ergene, 2003), middle (e.g., Putwain & Best, 2011; Wren & Benson, 2004), high (e.g., Lowe 2014; Lowe et al. 2008) school students, and even among undergraduate and graduate students (e.g., Chapell et al., 2005; Hembree, 2008; Huntley, Young, Jha, & Fisher, 2016). In general, test-anxious students feel worried and nervous before, during, or after tests (Spielberger & Vagg, 1995), and thus exhibit apprehensive and inattentive behaviors in testing situations (Putwain, 2007). These students perform overwhelmingly poor on standardized achievement tests (Bodas &

Ollendick, 2005; Everson, Millsap, & Rodriguez, 1991) and/or experience academic failure (Chapell et al., 2005; Lowe, Grumbein, & Raad, 2011).

With the rise in test anxiety among elementary, middle, and high school students, it is possible that the test anxiety construct may not be the same for children and adolescents due to developmental differences (Wren & Benson, 2004) and/or scholastic differences (Wigfield & Eccless, 1989). As the test anxiety among students appears as early as Grade 2 (Hill, 1972) and heightens throughout school years (Hembree, 1988), there is a need to investigate the grade level differences in students' test anxiety.

Although a substantial amount of research documented that test anxiety has negative effects on students' learning and academic achievement (Sub & Prabha, 2003) and that individual differences occur in the test anxiety (see Hembree 1988 for an extensive review), there have been few attempts to systematically analyze these differences. A broad body of research focused on investigating gender-related differences in test anxiety (e.g., Bandalos, Yates, & Thorndike-Christ, 1995; Lowe & Lee, 2008; Putwain, 2007; Zeidner, 1990). This study strives to fill this gap in test anxiety research by taking into account the disparity across grade levels. It is important to note that the objective of this study was grade level differences and that gender differences regarding test anxiety were investigated within the previous studies of the author (see Aydin (2019) for details).

As mentioned above, researchers have shown that levels of test anxiety and concomitant patterns of educational outcomes are apparently different for students attending to elementary, middle, and high school students (e.g., Hembree, 1988; Wigfield & Eccles, 1989). The present study investigates this important issue of potential differences between elementary and middle school students using a Turkish sample of fourth and sixth graders. The findings may lead to a better understanding of developmental issues related to test anxiety that is considered to be a significant educational problem affecting students in schools as well as universities (Everson et al., 1991).

Test Anxiety

Test anxiety has been defined as the cognitive, physiological, and behavioral responses surrounding the concerns about the possibilities of poor

performance on a test (Bodas, Ollendick, & Sovani, 2008) or consequences of negative evaluation on an upcoming test (Zeidner, 1998). Taken as a whole, all these reactions occur in association with concerns about the negative outcomes resulting from failure in evaluative situations (Segool et al., 2013).

In the early days, test anxiety was viewed as consisting of two components: *worry* and *emotionality* (Liebert & Morris, 1967). The *worry* component includes evaluative concerns about one's performance, whereas the *emotionality* component involves subjective awareness and/or interpretation of physiological arousal in evaluative situations. Previous research (Lowe & Lee, 2008; Lowe et al., 2008) confirms that psychological (e.g., emotional or cognitive), physiological (e.g., biological), and social (e.g., parent pressure) factors contribute to development and expression of test anxiety. That is, individuals are involved in three different processes to express test anxiety including their cognition (i.e., worry), behavior (i.e., task-relevant and task irrelevant actions), and physiology (i.e., emotional arousal). In association with these factors, Wren and Benson (2004) also conceptualized test anxiety as consisting of three distinct but interrelated components: *thoughts*, *off-task behaviors*, and *autonomic reactions*. The *thoughts* component involves individuals' internal dialogue regarding evaluative situations. It centers on self-critical, test-relevant, and test-irrelevant concerns (e.g., feeling unprepared for evaluative situations or causing sorrow for parents). The *off-task behaviors* component includes attentional symptoms of task-irrelevant stimuli. It focuses on nervous habits and other distracting behaviors (e.g., object manipulation or inattentive behaviors). The *autonomic reactions* component encompasses somatic responses to test-related stress (e.g., physiological manifestations or somatic signs). Viewed together, students with test anxiety perceive evaluative situations as threatening, and thus fail to concentrate on the task at hand because of dividing their attention among the task, their cognitions and emotions about how they are doing.

Given the above-mentioned review of research on test anxiety developed over the years, it can be concluded that the paradigms differ in how they conceptualize the test anxiety (Lowe et al., 2008). There appears, however, an agreement among researchers that test anxiety is a complex (Zeidner, 1998) and a multidimensional (Benson, 1998) construct. Across all the

studies employing this view, the comparability of thoughts, off-task behaviors, and autonomic reactions, and their different relations to performance suggest that it is useful to distinguish among these three components of test anxiety. For instance, high test–anxious students have more test-related concerns (*thoughts*), attend less well to important concepts/procedures needed to solve a problem (*off-task behaviors*). High test-anxious students who repeat nervous habits also have been shown to display somatic responses during problem solving (*autonomic reactions*). Accordingly, test anxiety can be considered to interfere with performance in different school years, and that there might be different components of anxiety in, for instance, elementary school students and in middle school students (Wigfield & Eccles, 1989; Zeidner, 1998).

In this regard, it is sound to assume that students experience anxiety in different ways and for different reasons (Wigfield & Eccles, 1989). To further build on this assumption, researchers need to examine more fully individual differences in how students display test anxiety in evaluative situations.

Grade Level Differences

Grade level differences have been documented on test anxiety in the elementary, middle, and high school (e.g., Bodas et al., 2008; Wigfield & Eccles,1989) as well as undergraduate and graduate (e.g., Hembree, 1988) student populations, with participants reporting higher levels of overall test anxiety in the early school years (e.g., Bodas et al., 2008; Lowe et al., 2008). In practical terms, test anxiety scores are shown to rise to a high point in junior high (Grade 9) and level off through the rest of high school (from Grade 10 to Grade 12). Researchers on test anxiety have also suggested that students attending to diverse grade levels may differ in some components of test anxiety (e.g. Bodas et al. 2008; Lowe 2014; Wren & Benson 2004). Some of these differences may be explained in terms of developmental differences. For example, students in lower grades are found be less aware of their cognitions and emotions (Harter, 1983), and thus tend to have higher test anxiety in terms of their thoughts, off-task behaviors, and autonomic reactions (Lowe et al., 2008) or their worry and emotionality (Bodas et al., 2008).

Hembree (1988) investigated the results of test anxiety studies integrated by meta-analysis to show the correlates, causes, effects, and treatment of test anxiety among students in different grade levels (K-12 through graduate). Of the 562 studies reviewed, 360 studies, to some extent, shed light into the grade level differences in test anxiety. Hembree found that students in the early grades have little test anxiety, but its prevalence increases sharply in Grades 3 to 5, stays fairly constant through high school, and lowers in university years. Indeed, Bodas et al. (2008) indicated that middle school students (Grades 5 to 7) displayed higher levels of overall test anxiety; specifically worry and emotionality than did high school students (Grades 8 to 9). With respect to national research on grade level differences in test anxiety (Yenilmez & Özbey 2006), a fairly consistent finding is that lower grade students (Grade 5) tend to be more test anxious compared to higher grade students (Grades 6 and 7). In stark contrast to this downward developmental trend, Lowe (2014) documented that high school students (Grades 9 to 12) exhibited higher cognitive interference, task irrelevant behavior, and worry than did middle school students (Grades 6 to 8).

Little research on grade-level trends on the different components of test anxiety (e.g., Lowe et al., 2011) showed that students in lower grades endorse similar levels of cognitive interference and worry, resulting in nonsignificant differences. Similarly, Wren and Benson (2004) indicated that students' test anxiety regarding the thoughts, off-task behaviors, and autonomic reactions components tends to be stable as they progress through elementary to middle school (Grades 3 to 6). National research also pointed out no significant differences in test anxiety among middle school (Grades 6 to 8) and high school (Grades 9 to 11) students (Oksal, Durmaz, & Akın 2013; Yenilmez & Özabacı 2003).

Viewed together, research on the grade level differences related to the test anxiety and its components has proved to be inconclusive. However, the relevance of the findings is that students experience changes in components and amount of test anxiety as they move through grade levels (Hembree, 1988). Likewise, students' test anxiety may vary somewhat with age (Lowe, 2014). As students develop with a growing understanding of themselves and how they compare with their peers (Yeung, 2011), these variations in specific age groups that reflect, to some extent, the grade level disparity in test anxiety should be carefully examined.

Against this background of the literature, the purpose of the present study was to investigate the grade level differences in three components of test anxiety thoughts, off-task behaviors, and autonomic reactions. In this regard, it was hypothesized that (i) Students in Grade 4 would exhibit higher levels of overall test anxiety than did students in Grade 6, and (ii) Students in Grade 4, compared to students in Grade 6, would have an increased test anxiety in terms of thoughts, off-task behaviors, and autonomic reactions.

Methods

Procedure and Participants

The Children's Test Anxiety Scale (CTAS) was administered to students during 2014/2015 academic year in İstanbul, a major metropolitan city in Turkey. Each student received a copy of the 30-item instrument, which included demographic questions (i.e., school, class affiliation, and grade level), written instructions (i.e., requesting students to respond in terms of how they think, feel, or act during a test), and a sample item for practice (i.e., each question is responded with a stem "While I am taking a test…"). All administrations were completed in the students' classrooms during regular school hours within one class period (40 min). School administrators, teachers, and students were assured of confidentiality.

Participants were from three public elementary and middle schools. With 24 participating classes from Grade 4 (N = 15) and Grade 6 (N = 9), 648 students who were present on the days of data collection were the initial sample. The reason for selecting particularly Grade 4 and Grade 6 students was to provide a supportive lens to the differences among elementary (e.g., Grade 4) and middle (e.g., Grade 6) school students which were consistently documented in previous studies on test anxiety and reviewed in the above lines. In addition, when the developmental level of the students were taken into consideration together with the fact that the CTAS was originally developed for students from Grade 3 to Grade 6, choosing the sample of students from these particular grade levels would be accurate for drawing conclusions about the differences between elementary (e.g., Grade 4) and middle (e.g., Grade 6) school students. Prior to data analysis with this initial sample, missing data analysis was conducted. In this regard, Little's MCAR

test (Little, 1988) was performed to examine the item non-response in the data set (i.e., demographic and outcome variables). Results revealed that the data were missing completely at random (MCAR) (p= .573, p > .05). Given the low percentage of overall nonresponse rate (0.09%) of the data and that, the data are MCAR; the listwise deletion procedure that would give unbiased estimates (Cohen, Cohen, West, & Aiken, 2003) was used. Following that, 25 cases from the Grade 4 sample and 8 cases from the Grade 6 sample were eliminated due to showing insincerity in their responses (e.g., all "1"s or all "5"s), not completing the instrument, multivariate outliers (2 cases), or missing demographic information (e.g., grade level not specified), leaving 414 fourth graders (205 females and 209 males) and 201 sixth graders (100 females and 101 males), with a total of 615 students. The mean age of the participants were 9.62 and 11.73 for Grade 4 and Grade 6, respectively.

Measures

Children's Test Anxiety Scale (CTAS)

In order to measure students' overall test anxiety with particular reference to their *thoughts*, *off-task behaviors*, and *autonomic reactions* the CTAS, originally developed by Wren and Benson (2004) was used.

The instrument was adapted to Turkish by Aydin and Bulgan (2017). In line with the recommendations of the Standards for Educational and Psychological Testing (AERA, APA, & NCME 1999), two studies were conducted for the cross-cultural validation of the CTAS. Study 1 involved two phases: translation of the CTAS into Turkish and piloting of the instrument. Study 2 involved four phases to test the applicability of the CTAS: test administration, confirmatory factor analyses, reliability analysis, and subgroup validity analysis. In brief, findings from the adaptation process confirmed that the underlying structure of the CTAS is formed by three components that assess thoughts, off-task behaviors, and autonomic reactions. Results of the confirmatory factor analysis provided evidence based on construct validity indicating that the three-factor model fit the data well: (χ^2= 1414.72, df = 356.35, p = .00, χ^2/ = 3.97, RMSEA= .05, SRMR= .05, CFI= .97, GFI= .92, AGFI= .90). Findings demonstrated that the 30-item CTAS was comprised of three subdimensions: Thoughts, Off-Task

Behaviors, and Autonomic Reactions. Findings of the reliability analysis indicated that the internal consistency estimates (coefficient alpha) of scores for the three components were .82, .72, and .75 for thoughts, off-task behaviors, and autonomic reactions, respectively. The reliability coefficient for the total instrument was α= .88. All these estimates were higher than .60 indicating satisfactory reliability for both the whole instrument and its sub-dimensions (Tabachnick & Fidell, 2007) and that scores on the CTAS provide consistent information with regard to students' test anxiety.

The scale included 30 items. Specimen items are: "While I am taking tests I worry about doing something wrong." (*thoughts;* 13 items), "While I am taking tests I tap my feet." (*off-task behaviors*; 8 items), "While I am taking tests I feel warm." (*autonomic reactions*; 9 items). Participants rated themselves on the 4-point scale: (1) *almost never*, (2) *some of the time*, (3) *most of the time*, and (4) *almost always*. The possible scores on the CTAS ranged from 30 to 120. High scores on the scale indicate that the student displays high levels of test anxiety, whereas low scores show that the student demonstrates low levels of test anxiety.

Data Analysis

To examine the grade level differences, a multivariate approach to analysis of variance (One-Way MANOVA) was performed with one within-subject factor (test anxiety; 3 components) and one between-subject factor (grade level).

Three dependent variables were used: thoughts, off-task behaviors, and automatic reactions. The independent variable was grade level. Accordingly, grade level was coded as 1 = Grade 4 and 2 = Grade 6 and total scores for each component (i.e., thoughts, off-task behaviors, and autonomic reactions) and the whole scale (i.e., test anxiety). Following that coding process, preliminary assumption testing on univariate normality and homogeneity of variance matrices (i.e., Levene's test, $p > .05$) was conducted and no violations were detected. For multivariate results, the Wilks' Lambda criterion was applied using the significance level .05. To present the effect size partial eta squared (partial η^2) was calculated separately. All the analyses were conducted by using PASW Statistics 18 (Statistical Package for the Social Sciences Inc., 2010).

Results

Descriptive Statistics

The means and standard deviations of the scores on the three components and the overall test anxiety were presented by grade level in Table 1.

Table 1 Descriptive statistics by grade level

	Thoughts		Off-Task Behaviors		Autonomic Reactions		Test Anxiety	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Grade 4	32.77	8.10	15.63	4.60	18.62	5.47	67.02	15.15
Grade 6	32.81	7.71	14.47	4.25	17.42	4.85	64.70	14.16
Total	32.78	7.97	15.25	4.52	18.23	5.30	66.26	14.86

Note. $N = 615$ with Test anxiety; Grade 4 = 414; Grade 6 = 201

For the overall test anxiety, the mean score was 66.26 indicating that the majority of students felt nervous and stressed before a test, and thus exhibit inattentive or distracted behaviors. When the components of test anxiety were inspected separately, thoughts ($M = 32.78$; $SD = 7.97$) scores were the highest, followed by autonomic reactions ($M = 18.23$; $SD = 5.30$) and off-task behaviors ($M = 15.25$; $SD = 4.52$). These scores reflected that the fourth and sixth grade students had more psychological (*thoughts*) concerns than they had physiological (*autonomic reactions*) and/or behavioral (*off-task behaviors*) worries about taking tests.

More specifically, the differences between grade levels' means were minor on *off-task behaviors* and *autonomic reactions* components, and

almost negligible on the *thoughts* component (see Table 1), but the fourth graders reported slightly higher than sixth graders on all components, except for *thoughts*. This indicated that, for instance, fourth graders are more inattentive than sixth graders, and that they more frequently look around the classroom (*off-task behaviors*) or feel more scared (*autonomic reactions*) while taking a test.

Grade Level Differences

Summary statistics for the one-way MANOVA performed on the CTAS, with grade level as between subjects factor, the three components of test anxiety as within subjects factor was displayed in Table 2.

Table 2 Summary statistics for the One-Way MANOVA

Components	$F(1, 613)$	p	Partial η^2
Thoughts	.00	.959	.000
Off-Task Behaviors	8.94	.003*	.014
Autonomic Reactions	7.00	.008*	.011

*$p < .05$

Results revealed that there was a statistically significant difference between fourth grade students and sixth grade students on the combined test anxiety, $F(3, 611) = 5.45$, $p = .001$, Wilks' Lambda = .97, partial $\eta^2 = .026$. An inspection of the η^2 indicated a small effect (Cohen, 1988), and that the grade level explained 2.6% of the differences in the overall test anxiety of students in Grade 4 and Grade 6. When the results for the components were considered separately, there were statistically significant differences between fourth graders and sixth graders in *off-task behaviors*, $F(1, 613) = 8.94$, $p = .003$, partial $\eta^2 = .014$ and *autonomic reactions*, $F(1, 613) = 7.00$, $p = .008$, partial $\eta^2 = .011$. However, there were no statistically significant differences across fourth and sixth graders in *thoughts*, $F(1, 613) = .003$, $p = .959$, partial $\eta^2 = .000$. Profile plots of estimated marginal means of *thoughts*, *off-*

task behaviors, and *autonomic reactions* (Thoughts = THOUGHTS, Off-Task Behaviors = OFFTASK, and Autonomic Reactions = AUTONOM regarding the coding process) by grade level (Grade 4 = 2 and Grade 6 = 4 regarding the coding process) were presented in Figure 1, Figure 2, and Figure 3, respectively.

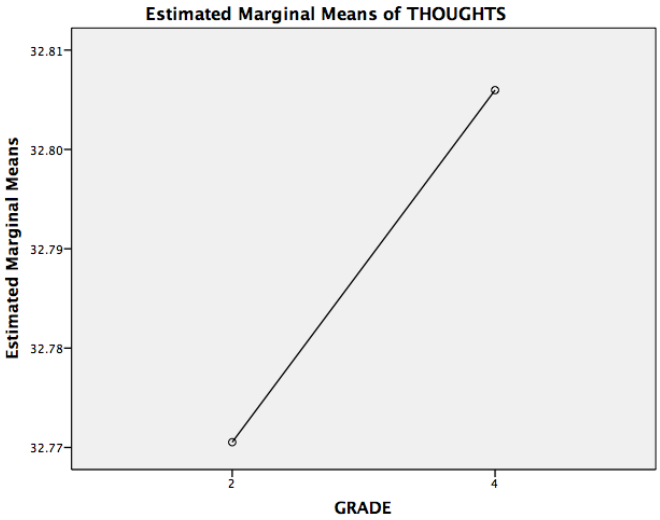

Figure 1. Profile plot of thoughts

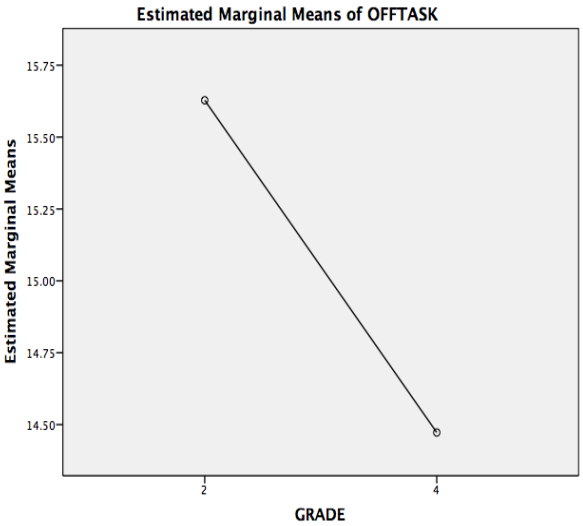

Figure 2. Profile plot of off-task behaviors

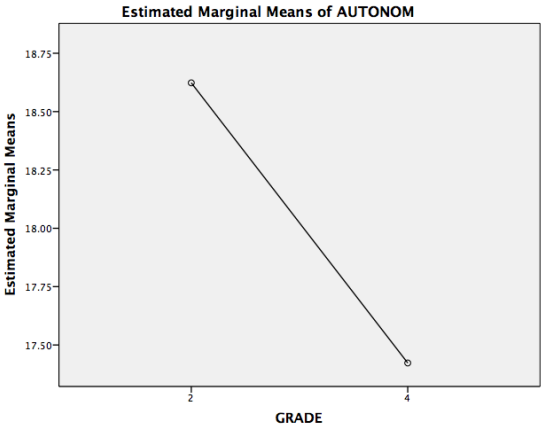

Figure 3. Profile plot of autonomy reactions

Viewed together, across each of the components except *thoughts*, the fourth grade students' mean scores were higher than that of the sixth grade students (see Table 1) with this trend most evident across the *autonomic reactions* and to a lesser extent, *off-task behaviors*. This showed that students in Grade 4 had more test-related concerns and thus react stressfully (*autonomic reactions*) or displayed more auto-manipulation (off-task behaviors) than did students in Grade 6.

Furthermore, the partial η^2 values of .000, .014, and .011 could be interpreted as negligible to small effect (Cohen, 1988) indicating that 0%, 1.4%, and 1.1% of the variance in *thoughts*, *off-task behaviors*, and *autonomic reactions*, respectively can be explained by grade level.

Discussion

The aim of this study was to examine the hypothesis that there exists grade level disparity in students' not only overall test anxiety, but also their thoughts, off-task behaviors, and autonomic reactions. Students in Grade 4 reported higher levels of overall test anxiety and specifically displayed more off-task behaviors and autonomic reactions than did students in Grade 6. Sixth graders, on the other hand, reported slightly higher on thoughts than did fourth graders. Upon these variations in the means, significant differences were found between fourth grade and sixth grade students for the off-task behaviors and autonomic reactions, whereas nonsignificant differences were found for thoughts.

These findings are of key importance in using thoughts, off-task behaviors, and autonomic reactions components of test anxiety to demonstrate that different components as well as the construct itself vary among grade levels, specifically for students in Grade 4 and Grade 6. It is possible that the increased use of self-regulation and motivation strategies (Cleary & Chen, 2009) may be related in some way to typical development of coping with test anxiety as students proceed from lower to higher grade levels, as suggested by Wigfield and Eccles (1989). These patterns might also emerge as a function of curricular differences across grade levels. For example, Turkish students at higher grade levels are employed in testing situations (e.g., national standardized tests, classroom examinations) more

often and more used to being evaluated, and so they report feeling less worried about failing in a test.

Previous research has shown that the level of test anxiety declines as students move through school years, but the investigation of the particular components used in the present study adds weight to the view that components of test anxiety are differentially displayed across grade levels. These findings support the previous work by Bodas et al. (2008) and Yenilmez and Özbey (2006), showing that students' overall test anxiety, specifically worry and emotionality tend to increase at the lower grade levels (e.g., Grades 5 to 7). There is, however, additional body of work suggesting that nonsignificant differences in grade level can be found for thoughts, off-task behaviors, and autonomic reactions (Wren & Benson, 2004). This indicates that the level of test anxiety may also operate in the reverse direction to the one reported here for the off-task behaviors and autonomic reactions; students attending to different grade levels tend to exhibit equal levels of thought, off-task behaviors, and autonomic reactions. Although this study clearly showed that there are statistically significant differences between Grade 4 and Grade 6 students in the overall test anxiety and off-task behaviors and autonomic reactions components, future research may wish to include additional grade levels to examine the possibility that students respond differentially to test anxiety, whether increases in test anxiety are reported in all consecutive stages of, for instance, elementary, middle, and high school years or more strongly in those who reported high scores on thoughts, off-task behaviors, and autonomic reactions at the early years of schooling.

The findings supplement the existing research in several respects. First, the results were particularly important in relation to the fact that different methods and perspectives were used to evaluate grade level differences in test anxiety across different components using the CTAS, which was originally developed by Wren and Benson (2004). The CTAS was used in prior cross-cultural research (see Putwain & Daniels, 2010); however, the present study is the first to address the grade level differences in test anxiety with a Turkish sample of students using its adapted version by Aydin and Bulgan (2017). Second, the present study examined the grade level differences in test anxiety in general and thoughts, off-task behaviors, and autonomic reactions in particular. Most previous studies have focused on the

differences in the worry and emotionality components of test anxiety (e.g., Bodas et al., 2008) and/or solely investigated these differences in the overall test anxiety regarding different testing experiences (e.g., Segool et al., 2013).

Limitations and Future Research

The present findings must be considered in light of certain limitations. First, student reports on the CTAS were the sole source of information. Additional qualitative methods (e.g., interviews) might provide deeper insights into the grade level differences in future research. Second, the generalizability of the present results remains uncertain. Findings apply specifically to students in Grade 4 and Grade 6, and to Turkish students. As the variance in test anxiety can be predicted based on cultural settings (e.g., Nyroos et al., 2015) cross-cultural studies are necessary to test the generalizability of the differences found in the current study. Third, a single test anxiety scale (i.e., the CTAS) was used to investigate the grade level differences in the components of the construct. Additional quantitative methods could also be implemented by including psychophysiological measures to index physiological constructs such as stress. By doing so, future researchers would shed light onto the possible interactions between text anxiety and the physiological and their main effects on the grade level differences. Finally, in a related vein, as the present study involved two independent samples (e.g., Grade 4 and Grade 6), future researchers should consider conducting longitudinal studies to draw more generalizable conclusions about the real grade level differences.

Educational Implications

This study also has important implications. How should instruction be designed to reduce test anxiety with particular attention to students in lower grades? Many studies (von Der Embse, 2013; Weems et al., 2010) found promising results that the efficient and effective test anxiety intervention or treatment programs lead to reduction in test anxiety from kindergarten through Grade 12. Likewise, Ergene (2003) suggested that test anxiety intervention programs should be designed specifically for elementary, middle, and high school students. These suggestions are relevant to the grade level differences found in the present study, challenging that well-structured

interventions or treatments to reduce younger children's test anxiety and increase academic performance.

In supporting younger students with test anxiety, teachers can take into consideration the communication of the importance of test outcomes. Casbarro (2005) recommended, for instance, using reinforcing messages rather than strong language; "This test is an opportunity for you to demonstrate your success." versus "If you don't want to fail, you need to perform your best on this test." In addition, teachers can collaborate with the Department of Guidance and Psychological Counseling to use relaxation techniques. Accordingly, von der Embse and Hasson (2012) suggested asking students to complete deep breathing exercises and/or identify their anxious cognitions and emotions before, during, or after an evaluative situation.

In conclusion, knowledge about test anxiety and its components may enhance our understanding of the developmental aspects of test anxiety in students across different grade levels and may inform theory and research in the field of test anxiety as well as educational practice. As research on the affective dimensions of learning and achievement in important school subjects (e.g., mathematics) has tended to focus on possible negative emotions and on domain-specific anxiety (e.g., mathematics anxiety) in particular (e.g., Villavicencio & Bernardo, 2016). The present study extended prior research by demonstrating the importance of not only the overall test anxiety but also its three components: thoughts, off-task behaviors, and autonomic reactions across grade levels.

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References

AERA, APA, & NCME. (1999). *Standards for educational and psychological testing*. Washington DC: Author.

Aydin, U. (2019). Test anxiety: Gender differences in elementary school students. *European Journal of Educational Research*, *8*(1), 21-30. doi: 10.12973/eu-jer.8.1.21

Aydin, U., & Bulgan, G. (2017). Çocuklarda Sınav Kaygısı Ölçeği'nin Türkce uyarlaması [Adaptation of Children's Test Anxiety Scale to Turkish]. *İlköğretim Online [Elementary Education Online]*, *16*(2), 887-899. Retrieved from http://ilkogretim-online.org.tr/index.php/io/article/view/2282

Benson, J. (1998). Developing a strong program of construct validation: A test anxiety example. *Educational Measurement: Issues and Practice*, *17*(1), 10-22. doi: https://doi.org/10.1111/j.1745-3992.1998.tb00616.x

Baş, G. (2016). Teaching-Learning Conceptions and Academic Achievement: The Mediating Role of Test Anxiety. *International Journal of Educational Psychology*, *5*(3), 308-335. doi: http://dx.doi.org/10.17583/ijep.2016.2271

Berberoğlu, G., & Kalender, İ. (2005). Öğrenci başarısının yıllara, okul türlerine, bölgelere göre incelenmesi: ÖSS ve PISA analizi [Investigation of student achievement across years, school types and regions: The SSE and PISA analyses]. *Eğitim Bilimleri ve Uygulama [Educational Sciences and Practice]*, *4*(7), 21-35. Retrieved from http://kalenderi.bilkent.edu.tr/oss_pisa.pdf

Bodas, J., & Ollendick, T. H. (2005). Test anxiety: A cross-cultural perspective. *Clinical Child and Family Psychology Review*, *8*(1), 65-88. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/15898305

Bodas, J., Ollendick, T. H., & Sovani, A. V. (2008). Test anxiety in Indian children: A cross-cultural perspective. *Anxiety, Stress, & Coping*, *21*(4), 387-404. doi: 10.1080/10615800701849902

Casbarro, J. (2005). *Test anxiety and what you can do about it: A practical guide for teachers, parents, and kids.* Port Chester, NY: Dude.

Chapell, M. S., Blanding, Z. B., Silverstein, M. E., Takahashi, M., Newman, B., Gubi, A. et al. (2005). Test anxiety and academic performance in undergraduate and graduate students. *Journal of Educational*

Psychology, *97*(2), 268-274. doi: http://dx.doi.org/10.1037/0022-0663.97.2.268

Cleary, T. J., & Chen, P. P. (2009). Self-regulation, motivation, and math achievement in middle school: Variations across grade level and math context. *Journal of School Psychology*, *47*(5), 291-314. doi: 10.1016/j.jsp.2009.04.002

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Earlbaum Associates.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Erlbaum.

Ergene, T. (2003). Effective interventions on test anxiety reduction. *School Psychology International*, *24*(3), 313–328. doi: https://doi.org/10.1177/01430343030243004

Everson, H. T., Millsap, R. E., & Rodriguez, C. M. (1991). Isolating gender differences in test anxiety: A confirmatory factor analysis of the Test Anxiety Inventory. *Educational and Psychological Measurement*, *51*(1), 243-251. doi: https://doi.org/10.1177/0013164491511024

Harter, S. (1983). The development of the self-system. In E. M. Hetherington (Ed.), *Handbook of child psychology: Vol. 4. Socialization, personality, and social development* (4th ed., pp. 275-385). New York: Wiley.

Hembree, R. (1988). Correlates, causes, and treatment of test anxiety. *Review of Educational Research*, *58*(1), 47–77. doi: https://doi.org/10.3102/00346543058001047

Hill, K. (1972). Anxiety in the evaluative context. In W. W. Hartup (Ed.), *The young child* (Vol. 2, pp. 225-263). Washington, DC: National Association for the Education of Young Children.

Huntley, C. D., Young, B., Jha, V., & Fisher, P. L. (2016). The efficacy of interventions for test anxiety in university students: A protocol for a systematic review and meta-analysis. *International Journal of Educational Research*, *77*, 92-98. doi: https://doi.org/10.1016/j.ijer.2016.03.001

Liebert, R. M., & Morris, L. W. (1967). Cognitive and emotional dimensions of test anxiety: A distinction and some initial data. *Psychological Reports*, *20*(3), 975–978. doi: 10.2466/pr0.1967.20.3.975

Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198-1202. doi: 10.2307/2290157

Lowe, P. A. (2014). The Test Anxiety Measure for Adolescents (TAMA): Examination of the reliability and validity of the scores of a new multidimensional measure of test anxiety for middle and high school students. *Journal of Psychoeducational Assessment*, *32*(5), 404 – 416. doi: https://doi.org/10.1177/0734282913520595

Lowe, P. A., Grumbein, M. J., & Raad, J. M. (2011). Examination of the psychometric properties of the Test Anxiety Scale for Elementary Students (TAS-E) scores. *Journal of Psychoeducational Assessment*, *29*(6), 503-514. doi: https://doi.org/10.1177/0734282910395894

Lowe, P. A., & Lee, S.W. (2008). Factor structure of the Test Anxiety Inventory for Children and Adolescents (TAICA): Scores across gender among students in elementary and secondary school settings. *Journal of Psychoeducational Assessment*, *26*(3), 231 – 246. doi : 10.1177/0734282907303773

Lowe, P. A., Lee, S. W., Witteborg, K. M., Prichard, K. W., Luhr, M. E., Cullinan, C. M. et al. (2008). The Test Anxiety Inventory for Children and Adolescents (TAICA): Examination of the properties of a new multidimensional measure of test anxiety among elementary and secondary school students. *Journal of Psychoeducational Assessment*, *26*(3), 215-230. doi: https://doi.org/10.1177/0734282907303760

Nyroos, M., Korhonen, J., Peng, A., Linnanmäki, K., Svens-Liavåg, C., Bagger, A., & Sjöberg, G. (2015). Cultural and gender differences in experiences and expression of test anxiety among Chinese, Finnish, and Swedish Grade 3 pupils. *International Journal of School & Educational Psychology*, *3*(1), 37-48. doi: https://doi.org/10.1080/21683603.2014.915773

Oksal, A., Durmaz, B., & Akın, A. (2013). SBS'ye hazırlanan öğrencilerin sınav ve matematik kaygılarının bazı değişkenler açısından incelenmesi [An investigation into exam and maths anxiety of students preparing for SBS]. *Cumhuriyet International Journal of Education, 2*(4), 47-62. Retrieved from http://dergipark.gov.tr/download/article-file/48641

Putwain, D. W. (2007). Test anxiety in UK schoolchildren: Prevalence and demographic patterns. *British Journal of Educational Psychology*, *77*(3), 579-593. doi: 10.1348/000709906X161704

Putwain, D. W., & Best, N. (2011). Fear appeals in the primary classroom: Effects on test anxiety and test grade. *Learning and Individual Differences*, *21*(5), 580-584. doi: https://doi.org/10.1016/j.lindif.2011.07.007

Putwain, D. W., & Daniels, R. A. (2010). Is the relationship between competence beliefs and test anxiety influenced by goal orientation? *Learning and Individual Differences*, *20*(1), 8-13. doi: https://doi.org/10.1016/j.lindif.2009.10.006

Sarason, S. B. (1959). What research says about test anxiety in elementary school children. *NEA Journal*, *48*, 26–27.

Schwarzer, R., & Bowler, R. (1982). Text anxiety research in Western Germany: A review. *Studies in Educational Evaluation*, *8*(1), 39-52. doi: 10.1016/0191-491X(82)90015-3

Segool, N. K., Carlson, J. S., Goforth, A. N., Von Der Embse, N., & Barterian, J. A. (2013). Heightened test anxiety among young children: elementary school students' anxious responses to high-stakes testing. *Psychology in the Schools*, *50*(5), 489-499. doi: https://doi.org/10.1002/pits.21689

Spielberger, C. D., & P.R. Vagg (1995). *Test anxiety theory, assessment, and treatment*. Washington, DC: Taylor & Francis.

Statistical Package for the Social Sciences Inc (2010). *PASW statistics 18*. Chicago: SPSS Inc.

Sub, A., & Prabha, C. (2003). Academic performance in relation to perfectionism, test procrastination, and test anxiety of high school children. *Psychological Studies*, *48*(3), 77-81. Retrieved from https://psycnet.apa.org/record/2004-11246-010

Tabachnick, B. G. & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Pearson Education.

Villavicencio, F. T., & Bernardo, A. B. I. (2016). Beyond math anxiety: Positive emotions predict mathematics achievement, self-regulation, and self-efficacy. *The Asia-Pacific Education Researcher*, *25*(3), 415-422. doi: 10.1007/s40299-015-0251-4

von der Embse, N., & Hasson, R. (2012). Test anxiety and high-stakes test performance between school settings: implications for educators.

Preventing School Failure: Alternative Education for Children and Youth, *56*(3), 180-187. doi: 10.1080/1045988X.2011.633285

von der Embse, N., Barterian, J., & Segool, N. (2013). Test anxiety interventions for children and adolescents: A systematic review of treatment studies from 2000–2010. *Psychology in the Schools*, *50*(1), 57-71. Doi: https://doi.org/10.1002/pits.21660

Weems, C. F., Scott, B. G., Taylor, L. K., Cannon, M. F., Romano, D. M., Perry, A. M., & Triplett, V. (2010). Test anxiety prevention and intervention programs in schools: Program development and rationale. *School Mental Health*, *2*(2), 62-71. doi: 10.1007/s12310-010-9032-7

Wigfield, A., & Eccles, J. S. (1989). Test anxiety in elementary and secondary school students. *Educational Psychologist*, *24*(2), 159-183. doi: 10.1207/s15326985ep2402_3

Wren, D. G. & Benson, J. (2004). Measuring test anxiety in children: Scale development and internal construct validation. *Anxiety, Stress & Coping*, *17*(3), 227-240. doi: 10.1080/10615800412331292606

Yenilmez, K., & Özabacı, N. Ş. (2003). Yatılı öğretmen okulu öğrencilerinin matematik ile ilgili tutumları ve matematik kaygı düzeyleri arasındaki ilişki üzerine bir araştırma. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi [Pamukkale University Journal of Education], 2*(14), 132-146. Retrieved from http://pauegitimdergi.pau.edu.tr/Makaleler/651870456_11-YATILI%20%C3%96%C4%9ERETMEN%20OKULU%20%C3%96%C4%9ERENC%C4%B0LER%C4%B0N%C4%B0N%20MATEMAT%C4%B0K%20%C4%B0LE%20%C4%B0LG%C4%B0L%E2%80%A6.pdf

Yenilmez, K., & Özbey, N. (2006). Özel okul ve devlet okulu öğrencilerinin matematik kaygı düzeyleri üzerine bir araştırma [A research on mathematics anxiety levels of the students of private school and the other schools]. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi [Journal of Uludağ University Faculty of Education], 19*(2), 431-448. Retrieved from http://www.acarindex.com/dosyalar/makale/acarindex-1423935591.pdf

Yeung, A. S. (2011). Student self-concept and effort: Gender and grade differences. *Educational Psychology*, *31*(6), 749-772. Doi: https://doi.org/10.1080/01443410.2011.608487

Zeidner, M. (1990). Does test anxiety bias scholastic aptitude test performance by gender and sociocultural group? *Journal of Personality Assessment*, *55*(1-2), 145-160. doi: 10.1080/00223891.1990.9674054

Zeidner, M. (1998). *Test anxiety: The state of the art.* New York: Plenum.

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