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EXAMINING THE RELATIONSHIP BETWEEN 5-8TH GRADE STUDENTS' TEST ANXIETY AND MATHEMATICS ANXIETY

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Abstract: The purpose of this study was to examine the relationship between test anxiety and math anxiety and determining whether some of the variables have differences in test anxiety and mathematics anxiety scores of 5th, 6th, 7th, and 8th grade students. The study was conducted with 337 students in two middle school selected by random sampling method in Istanbul during the 2016-2017 academic year. The data of the study was collected with the Test Anxiety Scale for Children, Mathematical Anxiety Scale and Personal Information Form, and the scores were tested for mean, t-test, F-test (ANOVA) and correlation coefficient analysis and when it was necessary, the Scheffe test was done. As a result of the research, middle school students' math anxiety points average and test anxiety points average were found to be moderate. It is observed that the students' math anxiety averages point, and test anxiety point averages are increased according to the level of classroom they are in and they are unchanged according to gender. At the same time, there is a positive relationship between students' math anxiety and test anxiety.

Key words: Middle school students, Math anxiety, Test anxiety.

1. Introduction

Mathematics has been and remains a dominant role in the educational life of all levels of students from past to present. In daily life, people often encounter mathematical situations and need to use many skills such as estimating, analyzing data, numerical processing, reasoning during decision-making. In addition to mathematics education, it contributes to the understanding of life and the world and to produce new ideas about them and to help solve many problems in a more systematic way.

Although its teaching is always a matter of great importance and emphasis, mathematics is still perceived as hard to understand and learn by many students. For children from a young age, mathematics is abstract, with fear of the unknown, the child is afraid of mathematics and this continues in adulthood. Many students who see mathematics as an increasingly tedious, boring and fearing lesson are looking at mathematics negatively. For this reason, the success achieved in mathematics is low, many of the students 'and teachers' times go to waste and the desired manpower cannot be reached (Yenilmez & Duman, 2008). The mathematics course is one of the most important courses for students at all levels and the failure of this course is considered as an important problem for students, parents, teachers and administrators. Failure to succeed is one of the most important obstacles to learning. The primary concern that mathematics teaching must overcome is the failure to succeed and the prejudice that mathematics is difficult (Usta, 2014). This requirement maximizes mathematics amongst the difficult and unpopular subjects for many students. One of the most important problems in this area is the anxiety that students experience for their mathematics achievement. Therefore, studies on math anxiety have been widely used in order to increase mathematics achievement. A meta-analysis was conducted by Şad, Kış, Demir and Özer (2016), which examined the relationship between mathematics achievement and mathematics anxiety, and it was found that there was a negative and moderate relationship between mathematics achievement and anxiety.

It is seen that the attitudes of all students who met mathematics in the early years of primary education even in the pre-school period did not have the same attitude towards mathematics. The main reason why the student is concerned about mathematics and does not like the lesson is that s/he thinks that he cannot succeed in mathematics. It is known that the students who have high math anxiety and failing

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to understand the subjects to be covered in the course are a natural result of anxiety. It should also be remembered that if the necessary measures are not taken, it will grow like a snowball pile and become inevitable (Yenilmez & Özbey, 2006). According to the findings of many studies, the majority of students who have high math anxiety do not hear such concerns for other subjects (Richardson & Suinn, 1972; cited. Erktin, Dönmez & Özel, 2006). In addition to being difficult compared to the other courses, anxiety also reduces the academic success of the mathematics course.

The acquisition of knowledge and skills related to mathematics depends on the effective realization of mathematics teaching. In various studies (Dursun & Dede, 2004; Sarıtaş & Akdemir, 2009; Tang, 2010; Savaş et al., 2010; Andaya, 2014) the importance of the factors affecting the teaching of mathematics in mathematics has been emphasized. For this reason, it is important to eliminate the factors that negatively affect the learning-teaching process in order for mathematics teaching to be realized effectively and to reach the goals. The affective characteristics of students related to the lesson and learning-teaching process are difficult to recognize and it takes time to change (Erden & Akman, 2002). Therefore, it is important to recognize the affective characteristics of the students in relation to the lesson and the learning-teaching process early (İlhan & Öner-Sünkür, 2012). Anxiety is one of the factors that affect learning by taking place among the affective behaviors that individuals have. According to the school learning model developed by Bloom (1976), students enter any subject with "cognitive input behaviors" and "affective input characteristics". Bloom (1995), on the other hand, reveals that about one-fourth of the variability in learning achievement is due to affective characteristics (cited in Baykul, 2002).

Başarır (1990) stated that according to the theories with learning approach, anxiety is a feeling that is gained through conditioning and has impulse characteristic and that the normal or pathological nature of anxiety depends not on the source of the emotion but on the severity and duration and the importance of the external danger. In addition, in daily life, it sometimes calls for creative and constructive behavior, and sometimes it is a feeling that hampers behavior and often creates unrest.

Isik (1996) describes anxiety as a state of unrest and anxiety in the face of a situation or event. Maths anxiety is seen by Miller and Mitchell (1994) as "the irrational fear that causes students to be concerned when they think about mathematics, decreases their performance and thus prevents them from learning mathematics. The fear of mathematics is defined as an alarming phenomenon that leads to a loss of confidence because of not being able to perceive the content of mathematics in individuals (Davarcıoğlu, 2008). Green (1999) pointed out that people have feared the idea of having to deal with mathematics, and that they might not even want to face mathematics. Harper and Daane (1998) investigated prospective teachers' math anxiety and causes. According to them, the foundations of math anxiety are based on elementary schools and are usually initiated by classroom teachers. The normative and rigid classroom environment, the misapplication of the teaching methods and strategies of the teachers, limited time for demonstrations, complex and unrealistic problem-solving activities have been given as the cause of math anxiety in their studies.

In many studies related to mathematics anxiety, a number of solutions have been proposed for students to avoid or reduce math anxiety. Establishing a supportive and democratic classroom environment is the first and most important recommendation (Morris, 1981; Tooke & Leonard, 1998). In addition, teachers should be aware of the emotions and beliefs of the students and pay attention to their behaviors, use of creative material and play activities, make small or collaborative group works, show the relations of mathematics with daily life and other courses, use different ways and strategies in problem solving, the meaning of processes and concepts avoiding long and annoying homework (Alkan & Altun, 1998; Bekdemir, Işık & Çıkılı, 2004; Morris, 1981; Uçar, Pişkin, Akkaş, & Taşçı, 2010).

One of the situations where anxiety is highest when faced with mathematics is anxiety during tests. Test anxiety, which is evaluated as a case-specific type of anxiety, is defined as the tendency of the individual to react in the form of excessive physiological arousal, anxiety, fear of failure and tension in the face of a formal evaluation situation (Speilberger & Vagg, 1995). Test anxiety is a feeling that occurs in childhood and shows its effect in the future. Conditions suitable for the development of test anxiety at a young age: strict discipline in the home, restrictive parental attitudes, authoritarian

education in the school; negative, cold and frustrating teacher criticism, penalties, scarce grades and conditions for passing difficult class. Frequent school failures, negative evaluations of adults, and the sense of threat to the individual that these situations evoke in the individual are important factors in the development of test anxiety (Öner, 1989).

When the results of various studies examining the relationship between test anxiety and performance are evaluated in general; (Benjamin, 1991; Culler & Holahan, 1980; Cassady & Johnson, 2002; Cassady, 2004; Horn & Dollinger, 1989; cited in Dursun & Bindak, 2011) the students with high test anxiety showed lower performance than the students with low test anxiety. Test anxiety is perceived by students as a major threat. The height of test anxiety causes intense symptoms in cognitive dimension. While a moderate level of anxiety is positively reflected on the students 'performance, students' intense anxiety about the test affects their mental performance and leads to a decrease in their success (Casbarro, 2005). As a matter of fact, it is emphasized that there is an inverse relationship between academic performance and achievement of students (Hembree, 1988; Rana & Mahmood, 2010).

The fear of mathematics and the anxiety of test which arise due to various reasons come to the forefront with the international examinations. When the exams such as PISA(Programme for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study) are examined, it is seen that the mathematics achievement ranking of our country is low. There are also studies that show the relationship between success and failure in the negative direction of the test anxiety (Erkan, 1991; Gündoğdu, 1994). Baltaş (2002) stated that anxiety is one of the variables frequently found in the studies conducted in the field of education and pointed out that the most intense experiences of anxiety were the exams in schools. At this point, anxiety has been defined as a particular kind of anxiety and a feeling of uneasiness as a result of fear felt when it comes to the evaluation of the individual. The effect of factors that negatively affect the learning-teaching process has a great importance in mathematics teaching. There are many factors that influence the perspective of mathematics. For example; the represention of mathematics the special symbols and symbols that express the thought, not the self directly; the level of education of the family, the gender of the students, mathematical intelligence, the way of teaching and teacher-student relationship are some of these factors (Meece, 1996; Dursun & Dede, 2004). At the same time, the math anxiety; it is understood that there is a multi-faceted structure that is intertwined with the emotional, behavioral and physiological responses to mathematics and arithmetic (Yüksel Şahin, 2004; Yenilmez & Midilli, 2006).

For effective mathematics teaching, it is necessary to carry out studies to prevent the fear of mathematics. Especially in the primary school years, the prevention of the fear of mathematics is of great importance for the next education levels of the student. Considering that it is not possible to get the required training without experiencing the stress of tests and taking the tests, it is more likely to take measures to reduce the anxiety of the test (Dulkadir, 2017). In this context, students' mathematics and test anxiety levels should be determined and the education process should be arranged with the result of these researches.

In the current study the two variables determined by the researches that affect the students' mathematics achievement are math anxiety and test anxiety. A study conducted with students in 5-8 grades has not been found in the literature. Considering the effects on mathematics achievement, it is thought that the relationship between mathematics and test anxiety levels according to their grade levels and gender will be contributed to the field. The aim of this study is to investigate the levels of mathematics and test anxiety of middle school students. In this context, sub-problems are determined as follows:

1 – What is the level of mathematical anxiety of students?
2 – What is the level of text anxiety of students?
3- Do students' math anxiety scores change according to;
   a) their grade level?
   b) their gender?

4- Do students' test anxiety scores change according to;
   a) their grade level?
   b) their gender?
5- Is there a relationship between the mean scores of the students' math anxiety scores and the mean scores of test anxiety?

2. Method

In this study, since the current mathematics and test anxiety levels of the students will be obtained without any intervention the survey method which is frequently used in quantitative research is used. The relational survey model was used in the research to be used in general survey model types. The relational survey model is a research model that aims to determine the presence and / or degree of interchange between two or more variables (Karasar, 2000).

2. 1. Participants

The research group was selected according to the purposeful sampling method among the schools in Istanbul and willing to work with the university. In the selection of schools, mathematics achievement and family socio-economic levels were taken into consideration. Information about schools was obtained in accordance with the declaration of the school administration. It was conducted on five, six, seven and eighth grade students in two middle schools. Grade levels and gender distribution of the students participating in this study are shown in Table 1.

Table 1. *Grade levels and gender distribution*

Grade	Female	Male	N
5	49	43	92
6	38	40	78
7	48	35	83
8	44	40	84
Total	179	158	337

When the data in Table 1 are examined, it is seen that 179 female and 158 male, 337 students participated.

2.2. Data Collection Tools

In order to collect data, “Personal Information Form”, “Test Anxiety Inventory” and “Anxiety of Mathematics” scale were used.

The personal information form, was prepared by the researcher and it was used to determine the demographic characteristics (gender, grade level, etc.) of the students.

Test Anxiety ınventory, The scale (CTAS, Children’s Test Anxiety Scale) developed by Wren and Benson (2004), which was adapted to Turkish by Aydın and Bulgan (2017), consists of 30 items. The weights of responses given to the items range from 1 to 4 points. The lowest score to be achieved from the whole test is 30 and the highest score is 120. The low scores taken by the students on the scale indicate that they do not feel anxious and that their anxiety levels are low while the high scores they get indicate that they feel anxious when they are in the test and that their anxiety levels are high. The Cronbach's alpha coefficient for the whole test was found to be 0.92 according to the scores from the study group in this study.

Mathematics anxiety scale. A 10-item scale developed by Bindak (2005) was used in the study. It was a 5-point Likert-type scale. The weight of the responses to the items varies between 1 and 5 points. Students were asked to select “Always”, “Most of the time”, “Occasional”, “Almost no” and “Never” for each of the 10 items given in the anxiety scale. If the score is low, then it can be evaluated as that the anxiety of the students about mathematics are low, while if the score is high, then it is evaluated as

that the anxiety of the students toward mathematics are high. The reliability coefficient of this scale is 0.90 for this study.

2.3. Data Analysis

Data were analyzed using t-test, variance analysis and Scheffe test for independent groups. When the normality test of the data is examined, the skewness coefficient is 0.44 and the kurtosis coefficient is -0.25, which comprises a normal distribution because it is found between the interval of -1.5 and 1.5.

3. Findings

The first sub-problem of the study was "What is the level of mathematical anxiety of students?". In order to respond to this sub-problem, the mean of mathematical anxiety scores of the students were calculated and presented in Table 2.

Table 2. *The Mean Score of Matematical Anxiety*

N	$\overline{X}$	SD
337	24.04	10.45

Students' mathematics anxiety scores were collected with 10-item Likert-type form which was scored in the range of 1-5. The total score varies between 10-50. The mean score for anxiety values smaller than 19.25 is low, and anxiety for high scores between 19.25 and 40.45 is moderate and 40.45 is high. The mean score of the students in the study (x orta = 24.04) was found to be at a moderate level.

The second sub-problem was "What is the level of text anxiety of students?". Test anxiety score averages are calculated and given in Table 3 in response to this problem.

Table 3. *The Mean Score of Test Anxiety*

N	$\overline{X}$	SD
337	64.83	18.10

The test anxiety scores of the students were collected with 30-item Likert type form. The total score varies between 30-120. According to statistical calculations, the mean score was lower than 56.9, the test anxiety was lower, the test anxiety was moderate in the range of 56.9-93.10 and the anxiety of exam was higher for the values greater than 93.10. According to these evaluations, the average of 64.83 points obtained in the study shows that the students are at the moderate level of exam anxiety.

The first item of the third sub-problem was "Do students' math anxiety scores change according to their grade levels?". In order to be able to respond to this sub-problem, students' mathematics anxiety scores were calculated according to their grade levels and given in Table 4.

Table 4. *Mathematical Anxiety Score Averages According to Grade Levels of Students*

Grade	N	$\overline{X}$	SD
5	92	20.73	8.85
6	78	22.76	10.91
7	83	27.21	10.61
8	84	25.71	10.40
Total	337	24.04	10.45

The F-test (Anova) was used to determine whether the students' test and anxiety levels differed according to their grade levels and the results are presented in Table 5.

Table 5. *F-Anova Results of Math Anxiety Scores According to Grade Levels of Students*

	Sum of Squares	df	Mean Squares	F	p
Between Groups	2201.50	3	733.83	7.07	0.00
Within Groups	34520.82	333	103.66		
Total	36722.33	336			

p< .05

According to Table 5, the math anxiety scores of the students vary according to their grade level, indicating that this change is statistically significant between the groups (p <.05). The results of the Scheffe test are shown in Table 6 to show that difference is caused by grade levels between the groups.

Table 6. *Scheffe Results Related to Grade Levels of Mathematics Anxiety Scores*

Grade	5	6	7	8	Direction of Difference
5		Difference is Insignificant	Difference is Significant*	Difference is Significant*	5<7, 5<8
6	Difference is Insignificant		Difference is Significant*	Difference is Insignificant	6<7
7	Difference is Significant*	Difference is Significant*		Difference is Insignificant	7>5, 7>6
8	Difference is Significant*	Difference is Insignificant	Difference is Insignificant		8>5

In Table 6, it can be said that the statistically significant difference is formed due to the fact that the math anxiety scores of the 5th and 6th grade students are lower than the math anxiety scores of the 7th and 8th grade students. In other words, mathematics anxiety of 5th and 6th grade students is lower than mathematics anxiety of 7th and 8th grade students and this statistical difference is revealed. According to this result, it can be said that as the grade levels of the students increase, the levels of math anxiety change and increase.

The second item of the third sub-problem was “Do students' math anxiety scores change according to the gender?”. The t-test was performed to respond to this problem and the results are given in Table 7.

Table 7. *T-Test Results According to Mean Mathematics Anxiety Levels of Students per Gender*

Gender	N	$\overline{X}$	SD	t	p
Female	179	23.55	10.74	-0.91	0.35
Male	158	24.60	10.12		

According to Table 7, the mathematical anxiety score of female students is 23.55, while the mean math anxiety level of male students is 24.60. There was no statistically significant difference between the students' math anxiety scores according to their gender (p> 0.05).

The first item of the fourth sub-problem was “Do students' test anxiety scores change according to the grade levels?”. In order to respond to this sub-problem, average scores of test anxiety according to grade levels are given in Table 8.

Table 8. *Test Anxiety Score Averages According to Grade Levels of Students*

Grade	N	X	SD
5	92	62.02	16.51
6	78	63.79	19.73
7	83	69.67	17.49
8	84	64.10	18.18
Total	337	64.83	18.10

The Anova test was conducted to determine whether the students had different levels of test anxiety points according to their grade levels, and the results are shown in Table 9.

Table 9. *Two-Way ANOVA Results About the Text Anxiety According to Grade Levels*

	Sum of Squares	df	Mean Square	F	p
Between groups	2801.09	3	933.69	2.89	0.03
Within groups	107372.92	333	322.44		
Total	110174.02	336			

Table 9 shows that the anxiety scores of the students vary according to their grade level, indicating that this change is statistically significant between the groups. (P <.05). The results of the Scheffe test are shown in Table 10 to show that this change is caused by which grade levels.

Table 10. *Scheffe Test Results Based on the Test Anxiety Levels*

Grade	5	6	7	8	Direction of the Difference
5		Difference is Insignificant	Difference is Significant*	Difference is Insignificant	5<7
6	Difference is Insignificant		Difference is Insignificant	Difference is Insignificant	
7	Difference is Significant*	Difference is Insignificant		Difference is Insignificant	7>5
8	Difference is Insignificant	Difference is Insignificant	Difference is Insignificant	Difference is Insignificant	

It can be seen in Table 10 that the statistically significant difference is in the 5th and 7th grade students. This can be said to be caused by the fact that the 5th grade students' anxiety scores were lower than the test anxiety scores of the 7th grade students.

The other item of the fourth sub-problem was “Do students' test anxiety scores change according to the gender?” The t-test was performed to respond to this problem and the results are shown in Table 11.

Table 11. *T-Test results Average of Test Anxiety of Students According to Their Genders*

Gender	N	$\overline{X}$	SD	t	p
Female	179	64.10	19.07	-0.79	0.42
Male	158	65.67	16.97		

According to Table 11, there was no statistically significant difference (p> 0.05) found between the middle school students test anxiety averages, since middle school students' test anxiety scores were close to each other according to gender.

The fifth sub-problem was “Is there a relationship between the mean scores of the students' math anxiety scores and the mean scores of test anxiety?”. The correlation between the two point averages in response to this problem is calculated and the result is given in Table 12.

Table 12. *Correlation Coefficient between Mathematics Anxiety and Test Anxiety of Students*

		Mathematics Anxiety	Test Anxiety
Mathematics Anxiety	Pearson Correlation (r)	1	0.577
	P		0.00
	N	337	337
Test Anxiety	Pearson Correlation (r)	0.577	1
	P	0.00	
	N	337	337

p< .05

When Table 12 is examined, it is seen that there is a moderate, positive and significant relationship between students' mathematics anxiety and test anxiety. According to this, it can be said that as the mathematics anxiety of students increases, so does the test anxiety (r = 0.57).

3. Conclusion

The main objective of this research is to determine the mathematical anxiety of the middle school students and the test anxiety in terms of different variables. Within the scope of this main objective, the following results have been found;

The average scores of math anxiety points and test anxiety scores of the students were found to be at the moderate level. Similarly, the level of mathematics anxiety was found to be at moderate levels in studies with middle school students for determining their math anxiety levels (Dede & Dursun, 2008).

Students' mathematics anxiety point’s averages differ according to their grade levels. This difference stems from the fact that the mathematics anxiety scores of the 7th and 8th grade students were higher. Thus, it can be said that as the grade level of the students’ increases, the mathematics anxiety also increases.

Similarly, it was determined that the average scores of the students' test anxiety vary according to their grade levels. As the grade levels of the students progress up to the seventh grade, the test anxiety increases, but in the 8th grade, the average of this anxiety score decreases. In our country there is a high school entrance exam which eighth grade students have to take. Continuing trial exams throughout the eighth grade in preparation for this exam may help them to partially overcome the test anxiety. Koçoğlu and Kaya (2016) emphasized the close environment of the factors affecting the success of the exam, increasing the pressure and increasing the anxiety.

Average math anxiety scores and average test anxiety scores of students do not change according to their gender in this study. However, Bacanlı and Sürücü (2006) found that 8th grade female students had significantly higher test anxiety scores than the male students. According to the results of the study conducted by Oksal, Durmaz and Akın (2013), the female students' anxiety level was significantly higher than that of male students. However, when looked at the relationship between math anxiety and gender, they found that math anxiety anxiety scores were higher in females and mathematics anxiety was higher in males.

Finally, the relationship between the mean scores of mathematics anxiety scores and the mean scores of exam anxiety were examined. Correlation coefficient was calculated to determine this relationship. Correlation coefficient (r = 0.57) showed that there was a positive and moderate level positive

correlation between the mean scores of mathematics anxiety scores and the mean scores of test anxiety. As the mean scores of the students' math anxiety scores increased, the mean scores of test anxiety increased and the mean scores of anxiety scores decreased when the mean scores of math anxiety decreased. In their study, Oksal, Durmaz, and Akın (2013) found a moderate relationship between examination and math anxiety, and stated that the medium level of relationship showed that these two concerns were interrelated. Yilmaz and Bindak (2016) found a significant and negative relationship between mathematical anxiety and test anxiety in their study of mathematics achievement and mathematical anxiety and overall test anxiety for students in the second grade of primary school. In this context, measures to reduce the test anxiety of students will also reduce their math anxiety. Qualitative and quantitative studies should be carried out in order to determine the variables affecting mathematics and test anxiety of the students in line with these results.

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