Ortaokul Öğrencilerinde Matematik Kaygısı ile Duygu Düzenleme ve Psikolojik Sağlamlık Arasındaki İlişkinin İncelenmesi

Translated as: Examining the Relationship Between Mathematics Anxiety and Emotion Regulation and Psychological Resilience in Secondary School Students

Abdulvahap Yorgun, Sue Johnston-Wilder, **Serdal Mert**, **Cihangir Acar**, **Leyla Güldürek**

Mathematics anxiety is seen as one of the important obstacles to students' learning mathematics. Because when the feeling of anxiety is experienced at an intense level, it can affect brain functionality and inhibit learning. Therefore, regulating intense emotions such as anxiety, in other words, recognizing, naming, expressing and reducing them to a tolerable level, can eliminate this obstacle to learning. Psychological resilience is defined as a person's ability to successfully cope with stressful and challenging situations. Another reason for math anxiety may be low levels of psychological resilience. In this study, the relationship between emotional regulation skills and psychological resilience level and mathematics anxiety was examined. Data was collected from 937 students continuing their education in secondary schools in Bayraklı district of Izmir province. The data collection tools used in this research are the Emotion Regulation Scale for Adolescents (EDRS), Mathematics Anxiety Scale, Child and Youth Psychological Resilience Scale and Personal Information Form. The data was analyzed with the Multiple Regression Analysis technique using the SPSS 23 package program. The results showed that emotional regulation skills and psychological resilience variables explained 25% of mathematics anxiety. Additionally, there is a negative relationship between having internal functional emotion regulation skills and math anxiety; A positive relationship was found between having dysfunctional emotion regulation skills and mathematics anxiety.

Key Words: Mathematics anxiety, emotional regulation, psychological resilience

Introduction

Emotion regulation and psychological resilience are two variables that can be functional in coping with stressful situations or difficult emotions. A high level of psychological resilience can serve a protective function against difficult situations. However, emotional regulation is a skill set required to control a negative and intense emotion experienced in a certain situation. It has been supported by many studies that there are strong relationships between these two variables and many problem behaviors. One of these types of problem behaviors may be behaviors caused by math anxiety. Therefore, mathematics anxiety may be high in students who do not have functional emotion regulation skills and high levels of psychological resilience. In this study, the relationship between mathematics anxiety, emotional regulation skills and psychological resilience was examined.

Related Literature

Psychological Resilience

Psychological resilience is defined as a person's ability to cope in the face of a significant change, difficulty or stress (Rutter (1985, 1999). The concept is explained as an interaction of protective and risk factors rather than having a single, simple structure.

Significant relationships have been found between psychological resilience and psychological difficulties such as anxiety, depression, and stress (Gao, Yuan, Pan & Wang, 2019; Morete, Solano, Boff, Filho & Ashmawi, 2019). For example, building psychological resilience can protect people from the harmful effects of stress (Hartley, 2011; Han et al., 2018). Additionally, it is emphasized that psychological resilience can reduce mental problems such as anxiety and depression among children and adolescents (Dray et. al., 2017; Fenwick-Smith, Dahlberg & Thompson, 2018).

Emotion Regulation

According to Thompson (1994), emotion regulation is an internal and external process in which the individual has the responsibility to evaluate and change emotional reactions by observing the time and intensity of their emotional reactions in order to achieve their own goals. In more concrete terms, emotion regulation determines the balance of an emotional response and is a process consisting of skills such as awareness, identification, naming and changing that a person needs in order to bring intense emotions to a manageable level.

While emotion regulation skills are often used to maintain and improve emotional arousal, they are especially used to reduce the feeling of negative emotions. Mathematics anxiety is an emotion, and failure to regulate this emotion can pose an obstacle to the student's learning mathematics.

Math Anxiety

Mathematics anxiety is defined as negative cognitive and emotional reactions to mathematics or numbers accompanied by a feeling of tension (Richardson & Suinn, 1972; Hembree, 1990). These negative emotions and cognitions can inhibit the ability to manipulate numbers and solve mathematical problems.

Carey et al. (2019) examined the possible causes of mathematics anxiety under three categories: environmental, personal and mental factors. Teacher and parent attitudes can be given as examples of environmental factors (Beilock et al., 2010; Tomasetto, Alparone, & Cadinu, 2011). Low self-esteem and learning style and attitudes towards mathematics (Abbasi, Samadzadeh, & Shahbazzadegan, 2013; Sloan, Daane, & Giesen, 2002; Hembree, 1990) are some of the personal factors. Finally, learning disabilities can also be given as an example of mental factors (Passolunghi, 2011; Rubinsten & Tannock, 2010). These factors can constitute protective and risk factors that constitute psychological resilience.

In the relevant literature, no research has been found examining the relationship between secondary school students' emotion regulation skills and psychological resilience levels and mathematics anxiety. On this basis, this study can make significant contributions to the process of developing methods and techniques that can be used to intervene in mathematics anxiety.

Method

Sample

The participants of this study are secondary school students in 6th, 7th and 8th grades. School psychological counselors working in secondary schools "5. 5th grade students were not included in the research due to their evaluation that "the grade level is a continuation of primary school". The data was collected from students who continued their education in 15 secondary schools in Bayraklı district of Izmir province in 2022-2023.

After obtaining the necessary official permissions from the Bayraklı District Directorate of National Education, school psychological counselors working in these schools were informed about the research and data collection tools. Data collection tools were transferred to the online environment and the access link required to participate in the research was developed and shared with school psychological counselors. Therefore, the data was collected online. Table 1 [1]contains demographic information about the participants.

		N	%
Cinsiyet	Kız	517	55,2
	Erkek	420	44,8
	Toplam	937	100
Sınıf Düzeyi	6	389	41,5
	7	444	47,4
	8	104	11,1
	Total	937	100

Table 1: *Distribution of Participants by Gender and Grade Level*

Table 1 shows that 517 (55.2%) of the participants were female; It shows that 420 (44.8%) of them were male. 389 of the participants (41.5%) were in the 6th grade; 444 people (47.4%) are 7th grade students and 104 people (11.1%) are 8th grade students. The total number of participants is 937.

Data Collection Tools

In this research, three scales (Mathematics Anxiety Scale, Emotion Regulation Scale for Adolescents, Psychological Resilience Scale) and a Personal Information Form including variables such as gender and grade level were used as data collection tools.

The Mathematics Anxiety Scale was developed by Bindak (2005) and consists of 10 items. Reliability-validity analyzes were conducted with data collected from 6th, 7th and 8th grade secondary school students. The scale consists of a single factor and the explained variance rate was calculated as 51.7%. The Cronbach's alpha internal consistency reliability coefficient of the scale was found to be 0.84.

The Emotion Regulation Scale for Adolescents was developed by Phillips and Power (2007, cited in Duy and Yıldız, 2014). The internal consistency coefficients of the scale adapted to Turkish culture by Duy and Yıldız (2014) are between .57-.76. Subdimensions of the scale; internal functional emotion regulation (ICDD), internal dysfunctional emotion regulation

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[1] Kiz- Female; Erkek = Male; Toplam = Total

(IADD), external functional emotion regulation (DIDD), external dysfunctional emotion regulation (DIODD). A total score of 4 is created by summing the items in each sub-dimension of the scale. Accordingly, the sub-dimension with the highest score represents the emotion regulation strategy that the adolescent frequently uses.

The Child and Youth Psychological Resilience Scale was developed by Liebenberg, Ungar and LeBlanc (2013) and adapted to Turkish culture by Arslan (2015). There are 12 items in the scale and the items have a 5-point Likert type rating. Exploratory and confirmatory factor analysis results showed that the scale consisted of a single factor explaining 51.28% of the total variance. To examine criterion validity, its relationship with self-efficacy and positive and negative emotions was tested. There was a positive correlation between self-efficacy and positive emotions with the Child and Youth Psychological Resilience Scale; It was found that there was a significant negative relationship with negative emotions. The internal consistency coefficient of the scale was calculated as .91 using the Cronbach alpha method. These results can be shown as evidence that the scale is a valid and reliable tool that can be used to measure the psychological resilience levels of children and young people. The lowest score that can be obtained from the scale is 12 and the highest score is 60. A high score indicates that the person has high psychological resilience.

Statistical Analysis

In order to test the hypothesis of the study, the data obtained were analyzed using the SPSS 23 statistical package program. On this basis, multiple regression analysis technique was used to examine the relationship between emotion regulation and psychological resilience level and mathematics anxiety. Additionally, Pearson Correlation coefficient was used to determine the relationships of each of the emotion regulation sub-dimensions and psychological resilience variables with mathematics anxiety.

Results

In this study, the relationship between emotion regulation skills and psychological resilience level and mathematics anxiety was examined using multiple regression analysis. Before the results, the mean and standard deviation scores for the three data collection tools are shown in Table 2.

Betimleyici İstatistikler	M	SD	N
ÇGPSÖ	45,3	8,7	937
İçsel İşl. DD	14,5	3,2	937
İçsel İşl. Ol DD	13,6	4,8	937
Dışsal İşl. DD	11,5	3,3	937
Dışsal İşl.Ol DD	9,4	3,9	937
MKÖ	24,9	8,6	937

Table 2: *Mean and Standard Deviation Scores of CGPSS, EDDS and MK Scales*

Multiple Regression Analysis method was used to test the model in which the predictive variables were psychological resilience and emotion regulation skills and the outcome variable was mathematics anxiety. Table 3 shows the results of multiple regression analysis.

Model	Değişkenler	B	SH	β	t	p	R²
	(Sabit)	21.46	1.820		11.7	.000	
	Psik. Sağl.	.018	.048	.011	.381	.70	
1	İçsel işl.	-.604	.083	-.222	-.7.312	.000	.25
	İç. İş. Ol	.636	.058	.354	10.940	.000	
	Dışsal İşl.	.098	.077	.038	1.272	.204	
	Dışsal İşl. Ol.	.230	.074	.104	3.122	.002	

Table 3: *Multiple Regression Analysis Results for the Relationship Between Emotion Regulation Skills and Psychological Resilience Level and Mathematics Anxiety*

Table 3 shows that the variables of internal functional emotion regulation, internal dysfunctional emotion regulation, external functional emotion regulation and external dysfunctional emotion regulation, which are the sub-dimensions of psychological resilience and emotion regulation, can explain 25% of the variance in mathematics anxiety.

The relationship of each predictor variable with mathematics anxiety was examined with the Pearson Correlation Coefficient, and Table 4 presents the results of the correlation coefficients.

Değişken	N	r	p
Matematik Kaygısı			
Psik. Sağl.	937	-0.13	.34
İçsel işl.	937	-.268	.000
İç. İş. Ol	937	.424	.000
Dışsal İşl.	937	.010	.37
Dışsal İşl. Ol	937	.327	.000

Table 4: *Pearson Correlation Coefficient Results for the Relationship Between Predictor Variables and Mathematics Anxiety*

When Table 4 is examined, it is seen that there is no significant relationship between psychological resilience and mathematics anxiety (r = -0.13 and p>.05). A significant negative relationship was found between internal functional emotion regulation and mathematics anxiety (r = -.268 and p <.05). A positive significant relationship was found between internal dysfunctional emotion regulation and mathematics anxiety (r = .424 and p <.05). No significant relationship was found between external functional emotion regulation and mathematics anxiety (r = .010 and p>.05). Finally, a positive significant relationship was found between external dysfunctional emotion regulation and math anxiety (r = .327 and p <.05).

Discussion

In this study, it was determined that emotional regulation skills and psychological resilience level significantly predicted mathematics anxiety. However, no significant relationship was found between psychological resilience alone and mathematics anxiety. A possible reason for this may be that psychological resilience is not a variable with a simple structure, but a result variable constructed by the interaction of many factors. For example, Yorgun (2022) found that psychological resilience is a mediating variable between childhood traumas and mathematics anxiety. Similarly, Afifi and Macmillan (2011) stated that psychological resilience should be built to cope with traumatic experiences and for this, protective factors should be taken into account.

Emotion regulation skills are examined in four categories when a matrix consisting of internal-external and functional-non-functional categories is used. Internal functional emotion regulation means that a person regulates an intense emotion through internal processes such as developing realistic thoughts. Therefore, within the scope of the research, participants who have internal functional emotion regulation skills are expected to have low math anxiety levels. The results confirm this hypothesis. Likewise, a positive relationship was found between both internal and external dysfunctional emotion regulation and mathematics anxiety. In other words, students who use internal-external dysfunctional emotion regulation skills also have high math anxiety levels.

An unexpected result of the research was that no significant relationship was found between external functional emotion regulation skills and mathematics anxiety. External functional emotion regulation skills involve getting help from another source regarding the emotion one is experiencing. Getting psychological support in general and help with math anxiety in particular may be a method that students do not often resort to. Particularly when developmental characteristics are taken into account, sharing their psychological experiences with others and being aware of their emotional experiences may not be a common way of seeking help among secondary school students.

In their study examining the psychological counseling and guidance needs of secondary school and high school students, Yıldız et al. (2018) found that the need for personal guidance was lower than the needs for educational and vocational guidance. Getting help in dealing with anxiety is a service that is considered within the scope of personal guidance and even psychological counseling. As a matter of fact, the finding that participants had difficulty expressing their needs on private issues related to themselves was also supported by other studies (Vrij, Nunkoosing, Paterson, Oosterwegel, & Soukara, 2002).

Suggestions

Emotion regulation skills are an important skill set that every person must have in order to be an effective individual. Regulating and tolerating emotions such as stress and anxiety, especially those that arise in the face of difficulties, and preventing these emotions from getting in the way of healthy and realistic thinking can be an important step in solving problems. For this reason, programs to teach emotion regulation skills can be implemented in schools. Additionally, activities aimed at emotional regulation skills can be used specifically to reduce or eliminate math anxiety.

As stated before, the psychological resilience variable is a structure that emerges from the interaction of many variables. Therefore, instead of psychological resilience, the relationship between math anxiety and more specific variables such as self-esteem, social support, and thinking style can be examined.

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