Araştırma Makalesi ● *Research Article*

The Relationship of Family Functioning with Math Success in Middle School Students

İlköğretim İkinci Kademe Öğrencilerinde Aile İşlevselliğinin Matematik Başarısıyla İlişkisi

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Abstract: The aim of this study is to determine whether there is a relationship between students' family functionality levels and their math achievement. The research was carried out with 167 students studying in the 7th and 8th grades in the 2019-2020 academic year. The data were collected with "Introductory Characteristics Form", "Family Assessment Scale" and "Mathematics Achievement Test". Mann-Whitney U, Anova, Kruskal Wallis and Spearman correlation tests were conducted at identifying descriptive statistics in the analysis. For the research, the approval of the Ethics Committee (04/03/2019-E.3273) and permission from the relevant institutions were obtained. The dimension with the highest non-functionality was found to be "showing due consideration" in the 'Family Assessment Scale'. The median math score of the students is 52 (min-max:1.76-96). The math achievement score of the children whose fathers are officer is higher (p<0.05). A significant negative correlation was determined between the mathematics achievement score and all sub-dimensions of the family evaluation scale in moderate difficulty (p<0.05). Educational programs should be rescheduled in a way that will positively affect students' family perceptions. With the activities to be applied, the skills of individuals should be developed in skills such as intra-familial relationship management, empathy and overcoming the stress.

Keywords: Child, Family, Funtional Family, Math Achievement

Öz: Araştırmanın amacı öğrencinin içinde bulunduğu ailenin işlevselliği ile matematik başarısı arasındaki ilişkinin belirlenmesidir. Araştırma, 2019-2020 eğitim-öğretim dönemi içerisinde 7. ve 8. sınıfta okuyan 167 öğrenci ile gerçekleştirilmiştir. Veriler "Tanıtıcı Özellikler Formu", "Aile Değerlendirme Ölçeği" ve 'Matematik Başarı Testi' ile toplanmıştır. Analizde tanımlayıcı istatistikler, Mann-Whitney U, Anova, Kruskal Wallis ile Spearman korelasyon testleri uygulanmıştır. Veri analizinde SPSS 20.0 programı kullanılmıştır. Araştırma için Etik Kurul onayı (04/03/2019-E.3273) ve ilgili kurumlardan izin alınmıştır. 'Aile Değerlendirme Ölçeği'nde işlevsizliğin en fazla olduğu boyut "gereken ilgiyi gösterme" olarak bulunmuştur. Öğrencilerin ortanca matematik puanı 52'dir (min-max:1.76-96). Babası memur olan çocukların matematik başarı puanı daha yüksek olduğu bulunmuştur (p<0,05). Matematik başarı puanı ile Aile Değerlendirme Ölçeği'nin tüm alt boyutları arasında negatif yönlü orta güçlükte anlamlı korelasyon belirlenmiştir (p<0,05). Eğitim programları öğrencilerin aile algılarını olumlu etkileyecek şekilde yeniden planlanmalıdır. Uygulanacak etkinlikler ile aile içi ilişki yönetimi, empati ve stres ile başa çıkma gibi konularda bireylerin becerileri geliştirilmelidir.

Anahtar Kelimeler: Çocuk, Aile, Fonksiyonel Aile, Matematik Başarısı

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Giriş

The importance of family is great in the upbringing of the individual and his adaptation to society (Kalyencioğlu and Kutlu, 2010). Family has been the concept experienced the most profound change in the modernizing and globalising world (Miller et al., 2000; Ağacık, 2007). Family environment gives the individual a new social identity by developing the qualities of loving/being loved, making decisions, taking responsibility, creativity and being healthy (Abalı et al., 2006; Kalyencioğlu and Kutlu, 2010).

The tools investigating family structure and its functions are increasingly gaining importance in assessing family functionality (Abalı et al., 2006). The adaptation process of the individual is effective in fulfilling the functions of family (Kalyencioğlu and Kutlu, 2010). In the family functionality model, intra-family interaction affects the health of individuals, and the behavior of one of the family members affects the whole family, as well as the functionality of family affects the family members (Miller et al., 2000; Abalı et al., 2006; Satir, 2016). Intra-familial relationships are essential criterion for whether the functionality is healthy or not, and can be determined according to the sub-dimensions of family functionality (Bulut, 1993; Tree, 2007). According to these sub-dimensions, families are being evaluated whether they are healthy or not (Ebstein et al., 1983).

Families in which there is an emotional bond between individuals, where each individual fulfills his role, where behaviors are controlled, and problems are solved together, where there is a natural and direct communication between individuals are defined as healthy or functional families (Epstein et al., 1983; Bulut, 1990). In a healthy family, individuals meet at a common point and have a common purpose (Taneli, 1988). The functionality of the family has an important place in the healthy growth and development of the child. Families that cannot perform their functions due to problematic intra-family interaction are defined as dysfunctional families (Ağacık, 2007).

There are many factors that are important for a child to succeed or fail in math class. The conducted researches show that functional families are a very influential factor in this regard (Berberoğlu et al., 2003; Dursun and Dede, 2004; Keskin and Sezgin, 2009). The family environment (distribution of roles within the family, the value that members place on each other, communication, parental attitude, etc.) is thought to affect the academic success of the child. In the literature, the studies analyzing the relationship between family characteristics and math achievement have often been limited to income status or demographic characteristics (Dursun and Dede, 2004; Duman, 2006; Keskin and Sezgin, 2009). And the studies investigating the relationship between family functionality and students' mathematics achievement seem to be inadequate (Erbay, 2013; Karaağaç and Erbay, 2015).

Insufficiency of health, education and socio-cultural facilities, family environments and social problems with many children, etc., in the Eastern Anatolia Region in general, directly affect the healthy growth and development of the child and therefore the education life (Sönmez, 2010). Considering the literature on the subject of family functionality and math achievement of the child, there are no previous studies in the current province.

The aim of this study, which is planned in this point, is to determine the relationship between the functionality of the student's family and math achievement.

Method

Research Design

The study has a descriptive type. The research was conducted in a public school in the Mus city center in the 2019-2020 academic year. The participants consisted of students in the 7th and 8th grades.

Research Group

In this single-centered study, it was aimed to reach 195 students in 7th and 8th grades within a week; however, it was conducted with 167 children who came to the school during the study. The level of participation in the research is 85.6%. The reason for using this age group in the study is that the data collection scales are suitable for use for this age group. Children aged 12 and above can perceive these questions more easily. The reason why the school was chosen by researchers is that it can save money

in terms of transportation, cost and time, and the research is sustainable. In the study, without selecting the sample 7th and 8th grades.

Selection of Research Criteria

Students who did not have any neuro-developmental delays or any disabilities and who did not have difficulty in reading and understanding the questions participated in the study.

Selection of Exclusion Criteria

Those who completed the questions in the data form incompletely and left completely blank were excluded from the research.

Data Collection Tools

"Introductory Information Form", "Math Achievement Test" and "Family Assessment Scale" were used in collecting data.

Introductory Information Form

In the information form prepared by the researchers in line with the literature, the student was asked about the age, gender, class of study, place of residence, parents' education status, working status, income status, and family type (Bulut, 1990; Ağacık, 2007; Karaağaç and Erbay, 2013; Karaağaç and Erbay, 2015).

Math Achievement Test

The validity and reliability of the "Math Achievement Test (MAT)" prepared by Çanakçı (2008) in line with international studies were calculated. Cronbach α value of the test was calculated as 0,813. 25 multiple choice questions in "MAT" are distributed according to various fields of mathematics (numbers, geometry, measurement, probability and statistics, algebra). Accordingly, test questions are evenly distributed among learning areas.

Family Assessment Scale

The Turkish adaptation of the "Family Assessment Scale (FAS)" was made by Bulut (1990). In FAS, there are 60 questions and seven sub-scales. These subscales are; Problem Solving, Communication, Roles, Emotional Response, Due Consideration, Behavior Control, and General Functions (Karaağaç and Erbay, 2015). According to the 7th sub-scale 'General Functions' dimension, whether the family is healthy or not is generally evaluated (Ağacık, 2007). There are two types of expressions in the scale articles as 'healthiness' and 'unhealthiness'. In some items, the option "strongly agree " indicates healthy family functions, while the option "strongly disagree" is an indicator of unhealthy family function. When the scale is applied to all family members over the age of 12 and the average score is taken, it gives the family functionality score of the family (Ağacık, 2007). The highest 4 points can be obtained from each sub-dimension. This score refers to the "impaired familial function". For each sub-dimension of FAS, below 2 points was classified as "unhealthy (non-functional)" and above as "healthy (functional)".

Data Collection

"Math Achievement Test" and "Family Assessment Scale" were applied to the students during the course hours on different days in the same week in the school where the research was conducted. Students were asked to fill out both MAT and FAS forms for approximately one course hour. Before the application, the students were informed about the forms to be applied and verbal consent was obtained from the participants. The data were collected face-to-face by researchers.

Variables of the Research

The dependent variable of the research is "MAT" and "FAS" scores. Independent variables, on the other hand, are age, gender, class of study, place of residence, parents' education and work status, family type, income status.

Statistical Analysis

In the study, convenience for normal distribution was examined by Kolmogorov Smirnov and Shapiro-Wilk tests. Descriptive statistical methods (number, percentage, median, minimum, maximum), and from univariate analyses Mann-Whitney U, Anova and Kruskal Wallis tests were used. The Spearman correlation test was applied to determine the relationship between the scales. The SPSS 20.0 program was used in the data analysis.

Ethical Approval and Cost

For the research, the approval of the Ethics Committee (04/03/2019-E.3273) and permission from the relevant institutions were obtained. Data are kept confidential. The researchers bore all cost of the study

Results

47.3% of the children participating in the study are male gender and 75.4% are 8th grade. 27.5% of the students have a large family structure and 29.9% live in districts and villages. Families with lower income than expenses account for 13.8%. Those whose education level is a primary school and below constitute 62.8% of mothers and 27.0% of fathers. Mothers of 95.2% of the children and fathers of 64.0% of the children do not work in any job (Table 1).

Table 1. Distribution of MAT Scores According to Some Socio-Demographical Variables

Characteristics	N	Percentage (%*)	MAT Score		
			Median (Min-Max) İnterquartile range	Statistic Test	p
Age					
12-13 years	94	56.3	33.0	3229.0 [a]	0.51
14-15 years	73	43.7	24.0		
Gender					
Female	79	47.3	24.0	3128.0 [a]	0.26
Male	88	52.7	36.0		
Class					
7th class	41	24.6	36.0	2485.5 [a]	0.72
8th class	126	75.4	28.0		
Place of residence					
Villages and district	50	29.9	28.0	2423.5 [a]	0.08
City center	117	70.1	32.0		
Mother's employment status					
Employed	8	4.8	39.0	574.5 [a]	0.64
Unemployed	159	95.2	28.0		
Father's occupation					
Officer**	34	20.4	33.0	6.078 [c]	0.04
Worker	26	15.6	17.0		
Unemployed	107	64.0	32.0		
Family type					
Nuclear	121	72.5	32.0	2662.0 [a]	0.66
Extended	46	27.5	29.0		
Total	167	100			

*Column percentage; **Group forming the difference; [a] Mann-Whitney U; [c] Kruskal Wallis test

The mathematics achievement score of the children, of the officer fathers were found to be higher than the children of other fathers (p<0.05). The effect of other socio-demographic variables on the math achievement score could not be shown (p>0.05). (Table 2).

Table 2. Distribution of MAT Scores According to Some Socio-Demographical Variances

| Characteristics | N | Percentage (%*) | MAT Score | | |
			Mean±Standard Deviation	Statistic Test	p
Mother's education					
Illiterate	49	29.3	54.8±16.4	0.516ᶜ	0.72
Primary school graduate	56	33.5	51.9±20.7		
Secondary school	31	18.6	48.3±21.2		
High school	26	15.6	59.8±18.8		
College and over	5	3.0	56.8±31.7		
Father's education					
Illiterate	8	4.8	47.5±20.3	1.247ᶜ	0.29
Primary school graduate	37	22.2	52.0±18.1		
Secondary school	37	22.2	54.1±18.3		
High school	55	32.9	52.8±20.1		
College and over	30	18.0	57.2±23.3		
Income type					
Income less than the expense	23	13.8	52.2±21.8	4.04ᶜ	0.13
Income equal to the expense	49	29.3	48.9±19.2		
Income more than the expense	95	56.9	56.1±19.3		
Total	167	100			

*Column percentage; ᶜOne-Way ANOVA test

When the sub-dimensions within the scope of FAS were examined, it was determined that the students who participated in the study received the lowest average score from the "general functions" sub-dimension (1.69±0.65) and the highest score from the "showing due consideration" dimension (2.29±0.56). The median math score of the students is 52, with a minimum of 1.76 and a maximum of 96.

The relationship between each sub-dimension of FAS and math achievement was examined. Problem solving (r=-0.269, p<.01), communication (r=-0.393, p<.01), roles (r=-0.298, p<.01), being able to show emotional response (r=-0.343, p<.01), showing due consideration (r=-0.262, p<.01), behavior control (r=-0.293, p<.01) and general functions (r=-0.384, p<.01) sub-dimensions of the families were calculated (Table 3).

Table 3. The Correlation Between MAT and FES Scores of The Participants

| FES Scores | MAT Scores | | |
	N	r***	p
Problem-solving	167	-0,269	<0.01
Communication	167	-0,393	<0.01
Roles	167	-0,298	<0.01
Emotional response	167	-0,343	<0.01
Showing due consideration	167	-0,262	<0.01
Behavior control	167	-0,293	<0.01
General functions	167	-0,384	<0.01

***Spearman Correlation Test

This study shown that a negative-directed medium-strength significant correlation was found between perception of family as healthy or unhealthy and mathematics achievement scores in terms of each sub-dimension of FAS (p<0.01) (Table 3). As a result, in terms of FAS sub-dimensions, the mathematics achievement scores of the children whose functioned, healthily, that is, who perceived their families as healthy, were found to be higher.

Discussion

The research was carried out in one of the least developed provinces of Turkey according to national and international development levels. In this study, the most non-functionality in FAS was found to be in the dimension of 'showing due consideration'. There are many studies on this field that support the research results. Similarly, in the studies by Özeren (2021), Dinçer-Set and Özbesler (2020), and Kamişli (2018), the most non-functionality/unhealthiness was perceived in the dimension of "showing due consideration", and in the studies by Dil and Bulantekin (2011) in the sub-dimensions of showing due consideration and behavior control. The reasons why families often have problems in this dimension; The fact that there are too many individuals living in the house and therefore the members do not allocate enough time to each other, working conditions and spending too much time at work, the way leisure time is evaluated, friend environments, spending a significant part of the day at school, frequent use of social media tools can be shown (Alacahan, 2010).

In the research, while the mother's profession could not be found to affect the child's math success, children whose father was a officers were found to be more successful in mathematics. Educated parents are more aware of helping their children with math lessons and giving their children a positive perspective of the lesson. Thus, children are more successful at school with the support they receive from their families (Vural, 2004; Yenilmez and Özbey, 2006; Yenilmez and Duman, 2008; Şahin; 2011; İpek, 2011). Officer status is closely related to higher education level (Aslanargun et al., 2016). In a conducted study, a close relationship was found between the academic achievements of the students and the father's profession. Children whose fathers are officers were found to be very successful academically (İpek, 2011; Aslanargun et al., 2016). It is important for the child to identify with a successful father model in order to acquire characteristics such as success, self-confidence, discipline, etc. in the development process (Erdoğan, 2004).

According to the research, children who perceived their families as unfunctional had lower math achievements. In other words, students who perceived their families as functional had higher math achievements. Many studies support this result (Duman, 2006; Dil ve Bulantekin, 2011; Karaağaç and Erbay, 2015). Furthermore, in Lefebvre et al. (2008), it was found that the family factor had a significant effect on math achievement of students aging between 7-15 years. Diaz (1988) stated that students with low academic achievement were not sufficiently supported and cared for by their families. In the study, a significant relationship was found between mathematics achievement score and all sub-dimensions of family functionality. In another study, only the sub-dimensions of problem solving, roles, emotional response and general functions had a positive effect on math achievement. (Karaağaç and Erbay, 2015).

According to the 'problem solving' sub-dimension, which is defined as the performance of the family to produce effective solutions to existing or future problems, children with healthy functioning families were found to be more successful in mathematics lessons. The person's perception of problem-solving and the effect of the environment on it work on every area of life (Yiğit and Parlar, 2018). Struggling together for the solution to a common problem strengthens the sense of unity in the family. The inability to overcome difficulties weakens the integrity of the family (Miller et al., 2000; Özabacı and Körük, 2021). In the studies carried out, the successful students in mathematics class perceive their families as good problem solvers and struggling individuals (Bulut, 1990; Karaağaç and Erbay, 2015).

Children who perceived their families as healthy in terms of communication sub-dimension had higher math achievement scores. Positive intra-family communication increases the self-esteem of children, according to the study by Oman, Vesely, and Aspy (2005). Feeling valuable, being respected, and being accepted are important for the future school success and behaviors of a child. Positive ego development, which has a significant place in school success, applies only to functional families (Erbek et al., 2005). Communication is a learned phenomenon (Ağacık, 2007). According to Steinberg (2007), children who are raised in a hostile or conflicting environment cannot learn to establish healthy communication. This situation will affect the school, therefore the math achievement. It was determined in the study that roles were healthily distributed in the families of children who are successful in math. This result conforms to many studies which were conducted (Bulut, 1990; Karaağaç and Erbay, 2015).

In healthy families, there are patterns which are identified in terms of power and status. In addition, within the family, while parents take on the roles of high status, children do the ones that they can fulfill more easily (Bulut, 1990). If there is a problem in terms of role distribution in the family, the child will not gain a sense of responsibility. The child with a low sense of responsibility will not be able to set goals for himself and will not be able to show the desired success (Bulut Ateş and Aktaş, 2012).

Children growing up in an environment where family members easily express their feelings and received sufficient attention and intimacy from their families were found to be more successful in mathematics. Even though excessive or insufficient attention indicates the unhealthy family function, the optimum level of it indicates the healthy family function (Evirgen, 2010). While apathy isolates individuals in the family, excessive attention makes them "dependent" on each other (Alacahan, 2010). Children who grow up in a family environment with trust and love, who express their feelings and thoughts comfortably, cope easily with high self-esteem and different problems (Steinberg, 2007). Families who are immoderately interested in their children are not able to provide these qualities to their children (Bulut, 1990; Ağacık, 2007; Bulut Ateş and Aktaş, 2012). The literature has shown that students with low academic achievement are lack of parental support and attention (Karaağaç and Erbay, 2015; Diaz, 1988; Özabacı and Körük, 2021).

According to the sub-dimension of behavior control, children with healthy functioning were considered successful in mathematics. Unhealthy parental attitudes and behaviors lead to risky behaviors in children (Stevens et al., 2006; Edens et al., 2008). Facing the excessive attitudes from their families, students with low math achievement may first cause themselves to feel lonely and then to move away from the academy. Being healthy in this dimension is generally due to the Turkish Family social structure. In addition to the family, relations with the immediate environment are also important in providing behavioral control (Alacahan, 2010). In a study that shows the opposite of this finding, the relationship between the "behavior control" sub-dimension and math achievement could not be detected (Karaağaç and Erbay, 2015).

In the research, it was found that the healthiest level was in the general functions dimension. 'General functions', which is an important component of the family functionality, summarizes all sub-dimensions (Byles et al., 1988; Bulut, 1990). In this sub-dimension, it was found that children who perceive their families as healthy are more successful in mathematics. In a study, it was found that the math achievement scores of children who perceive family functions as generally unhealthy in terms of the "general functions" sub-dimension were low (Karaağaç and Erbay, 2015). Bahçivan-Saydam and Gençöz (2005) stated that children and adolescents who have problems with the general functions of the family have a tendency to risky behaviors. These behaviors will affect academic success.

In summary, this paper argued that the relationship between the general functions sub-dimension and family functionality and therefore the mathematical achievement can be found out. This relationship defines a functional family. On this basis, we conclude that students with functional family perception are more successful in mathematics (Erbek et al., 2005).

Conclusions and Suggestions

A linear and reverse relation was found between family functionality and math achievement in the study. There is a cyclical relation between functional families and child's math achievement. Therefore, the elements positively affecting the family perceptions of students should be included while planning educational programs in schools. Activities, in which skills such as management of intra-familial or interpersonal conflicts, empathy and coping with stress, etc. should be included. Thus, the academic achievements aimed at children and therefore their math achievements will show a significant increase.

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Beyan ve Açıklamalar (Disclosure Statements)