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Heredity and Creativity: Mother-Child Sample[1]

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Abstract

The aim of this study is to examine the creativity relationship between children aged 8-10 and their mothers. With this relationship between mother and child, it is aimed to provide information to the literature on creativity and transfer.290 children, 155 girls and 145 boys, and their mothers participated in the study.. Torrence Creativity Test Verbal and Formal Form was used to measure the creativity of children and mothers. Tests were administered to children and mothers separately. Data were evaluated by correlation and regression analysis. As a result of the evaluations, a significant correlation was found with the creativity total scores of the mothers and the creativity total score of the children, the abstractness of the titles and the originality sub-dimensions. It was determined that maternal creativity total score predicted child creativity total score, abstractness of child titles and child originality sub-dimensions positively and significantly. A significant correlation was found between mothers' figurative creativity, abstractness of titles sub-dimension scores and children's figural creativity originality sub-dimension scores. A positive and significant correlation was determined between the mothers' figural fluency sub-dimension scores and the abstractness of children's titles, child fluency, child originality and child figural creativity total scores. It was observed that the formal fluency sub-dimension scores of the mothers positively predicted the total scores of the children's formal creativity. No significant correlation was found between the verbal creativity total score and sub-dimension scores of the mothers and the verbal creativity total and sub-dimension scores of the children.

Keywords: *Creativity, Transfer, Mother-Child Creativity, Primary School Children.*

Öz

Bu çalışmanın amacı 8-10 yaş arası çocuklar ile çocukların anneleri arasındaki yaratıcılık ilişkisini incelemektir. Anne çocuk arasındaki bu ilişki ile yaratıcılık ve transfer konusunda literatüre bilgi verilmesi amaçlanmaktadır. Çalışmaya 155 kız ve 145 erkek olmak üzere 290 çocuk ve anneleri katılmıştır. Çocukların ve annelerin yaratıcılığını ölçen testler çocuklara ve annelere ayrı ayrı uygulanmıştır. Veriler korelasyon ve regresyon analizi ile değerlendirilmiştir. Yapılan değerlendirmeler sonucunda annelerin yaratıcılık toplam puanları ile çocukların yaratıcılık toplam puanları, başlıkların soyutluğu ve özgünlük alt boyutları arasında anlamlı bir ilişki bulunmuştur. Anne yaratıcılığı toplam puanının, çocuk yaratıcılığı toplam puanı, çocuk başlıkların soyutluğu ve çocuk orjinallik alt boyutlarını pozitif yönde ve anlamlı olarak yordadığı belirlenmiştir. Annelerin şekil yaratıcılık, başlıkların soyutluğu alt boyut puanları ile çocukların şekil yaratıcılık orjinallik alt boyut puanları arasında anlamlı bir ilişki bulunmuştur. Annelerin şekil akıcılık alt boyut puanları ile çocukların başlıkların soyutluğu, çocuk akıcılığı, çocuk orjinalliği ve çocuk şekil yaratıcılığı toplam puanları arasında pozitif yönlü ve anlamlı bir ilişki saptanmıştır. Annelerin sözel akıcılık alt boyut puanlarının çocukların sözel yaratıcılık toplam puanlarını pozitif yönde yordadığı görülmüştür. Annelerin sözel yaratıcılık toplam puan ve alt boyut puanları ile çocukların sözel yaratıcılık toplam ve alt boyut puanları arasında anlamlı bir ilişki bulunmamıştır.

Anahtar Kelimeler: *Yaratıcılık, Aktarım, Anne-Çocuk Yaratıcılığı, İlkokul Çocukları.*

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Introduction

Creative thinking is a broad process about the awareness and perception of information gaps and the defectives of the existing conditions regarding the problems faced and difficulties encountered; the process of creative thinking is the formation of appropriate hypotheses to the conditions perceived related to the problems and difficulties encountered and testing and evaluating these hypotheses and goes on with reconsidering the current condition announcing these to the environment (Torrance, 1993). Another definition assumes that creativity is related to creating new and viable businesses. That's why the same criteria are applied for the selection of a good researcher, best novelist, artist, entrepreneur, and even a CEO. Many CEO's are chosen not for their learning and memory skills; but for their creative vision that will carry a company much further than its current condition (Lubart, 1996). Guilford (1968) highlighted this by stating, "where there are problems, including interpersonal ones, there is the need for creative behavior".

Torrance (1965) defines that family and the social milieu are among the most important factors affecting creativity. The impact of parents and families on the creativity of children has been the subject of research in various ways. These issues include family size (Dewing & Taft, 1973; Aldous 1973), parental age (Cantey, 1974), sibling status (Cicirelli, 1967), parental attitudes (Weisberg & Springer, 1961; Fearon et al., 2013; Yıldız Çiçekler & Aral, 2021), parental abilities and interests (Domino, 1969; Dewing & Taft, 1973), parents' allowance for the child's independence (Drevdahl, 1964). Ellinger (1966) examined the common features of studies on home environment and creativity. As a result, children's participation in family activities, families' satisfaction with the child's school, opportunities and resources that provide the child's participation in the intellectual environment, involvement in the decision-making process, factors affecting the emotional world such as corporal punishment, parents' expectation levels for their children's academic success, the role model chosen to meet the need have been determined as the familiar conditions. When these situations are examined, it is seen that all these factors that affect creativity in the family are the factors that could be described as environmental factors. Considering the family, another type of factor is heredity.

Traits that can be thought to have hereditary effects are predispositions that develop differently according to different environmental conditions. That is, they emerge through experiences, their effect is not fixed, it is in a range of responses. Nature and bringing up are complementary elements. Genes also control or change environmental conditions. It is like an intelligent child shaping his environment by choosing books and other intellectual activities (Vernon, 1989).

The formation of abilities with the social environment is a complex process of different interactions. This process cannot be separated from genetic influences. Understanding the process requires recognizing the interaction of social and genetic influences. The social factor is a fundamental condition for the emergence of genetically determined signs of creativity. Hereditary markers can only emerge through social factors. A certain talent does not come into existence out of nothing under any social condition (Khudoikulovna, 2021). Many people who are generally regarded as geniuses are so different from the normal ones enabling their talents and creativity not to be explained with environmental conditions. Mozart alone is the most important evidence that genetic differences exist in creativity. At the age of 6, he is perfecting both music and composition. Mozart grew up in an environment of constant music, under the extreme pressure of his father, and had far superior skills compared to other musicians in an equally stimulating environment (Vernon, 1989).

Some artistic differences also indicate that creativity has a genetic or racial basis. Just as the North American Eskimo inherited genes for three-dimensional spatial ability that helped them produce their unique stone carvings in the Arctic environment (Vernon, 1989). In addition, applied arts skills are passed from one generation to the other. The art of Lutfulla Fozilov from Kokand and Madraim Otajonov from Khiva exemplifies generational transmission. The Jurakuls have been successfully continuing the art of their ancestors, pottery, for 300 years, and Toir Tukhtakhodjaev

from Tashkent carpentry inherited suggesting heredity in creativity (Khudoikulovna, 2021). The studies made by Cropley (2000), Pavill (2011), Scott, Leritz, and Mumford (2004) determined that education improves creativity. Although these studies seem to be indicating the opposite of heredity on creativity, they cannot explain the long-lasting effect of education and why the educational impact varies between individuals. These questions still remain unclear. However, it is thought that genetic-based tendencies affect the effectiveness and permanence of the education received. The answers to these questions have been tried to be explained by twin/adoption studies (Velázquez et al., 2015).

Richmond (1966) determined a significant correlation between the creativity subtest scores among twins in a study with twins. Zarea et al. (2016) in their study with groups consisting of maternal, fraternal twins, and siblings determined that although heredity plays a role in creativity, the environment plays a larger role than genetics in the emergence of creativity. Barron and Parisi (1976) reported in their study of young adult twins that genetics influence perceptual and aesthetic abilities, not aesthetic preferences. Considering that twin studies are generally limited to small age groups, Velázquez et al. (2015) conducted a study focusing on drawing on a study group of maternal, fraternal, and separated twins between the ages of 18-77. While the genetic effect was determined for identical twins, this effect could not be mentioned for fraternal twins. Nichols (1978) reviewed 10 studies of twins and summarized the correlations as an average of .61 for identical twins and .50 for fraternal twins, and concluded that there is heritability in creativity. Twin studies are considered to have limitations as they share the same gene pool they also share the same environment. This limitation can only be overcome by studies with twins raised separately.

This study will try to explain the effect of the mother's creativity on the child's creativity by working on the mother and the child, taking into account the limits of twin behaviors. In studies on mothers, mothers of creative children are talented (Domino, 1969), were able to think more abstractly Bishop and Chace (1971), and had different interests Dewing and Taft (1973). However, this study aims to compare the creativity levels of the child and the mother by applying the same assessment material, namely the Torrance Creative Thinking Scale, to both the child and his/her mother. In this way, it is thought to contribute to the literature about the effect of mother's creativity on child's creativity. Since young children cannot control environmental effects, they cannot allow heredity based tendencies (Velázquez et al., 2015). Considering this condition, it is assumed that working with children aged 7-11 in this study will yield healthier results.

Method

This study was designed in relational survey model, which is one of the general screening methods. Simple random sampling method was used to determine the study sample. The study group, data collection and analysis and information are given below.

Participant

The study was carried out with children (n=290) and their mothers (n=290) living in Konya, who volunteered to participate in the study. Children aged 8-10 years were included in the study. The gender distribution of the children participating in the study was 155 girls and 145 boys. The average age of the children was found to be 9.45. The average age of the mothers was determined as 45. In addition, children do not have any developmental delays related to different developmental areas that are not related to intelligence.

Data Collection & Materials

Torrance Tests of Creative Thinking was used to measure the creativity of children and mothers in the present study. Torrance Tests of Creative Thinking is a scale that can be used from kindergarten to adulthood (Aslan, 2001). It was found appropriate to use this test in order to obtain

more accurate data in determining the creativity of the mother and child.

Torrance Test of Creative Thinking was administered to groups of 10 children and mothers. Necessary explanations were made to the children and mothers before the tests applied in the school.

Torrance Test of Creative Thinking: Torrance Test of Creative Thinking was first developed by Torrance (1966) improved 1974 (Torrance), and revised in the later years 1984 (Torrance & Ball), 1998 (Torrance). The tests consist of two parts, verbal and figurative. There are seven activities in the verbal section and three activities in the figurative. The duration of the test that can be administered on individual or group basis is 75-80 minutes. In the present study, form B of the test was employed.

The Cronbach Alpha value of the validity study for the original test was found to be .72 and lower. (Ferrando et al., 2007; Torrance, 1998). The factorial structure of the verbal section has been analyzed by Dixon (1979), Hocevar (1979), Krumm and Lemos (2010), Krumm et al. (2014) and the figurative section by Almeida et al. (2008), Aranguren (2014), Heausler and Thompson (1988), Kim (2006), Kim et al. (2006), Krumm et al. (2014) unable to come to a common conclusion neither in the verbal nor in the figurative section. It seems that latent variables of the models proposed are used as explicit variables. Considering all these information, revealing the factor structure of the present study would be of no benefit in the practice.

The Turkish validity and reliability study of the Torrance Test of Creativity was conducted by Aslan in 2001. The Cronbach Alpha reliability coefficient was found to be between .50 and .56.

The Cronbach Alpha reliability coefficient for this study was found to be .62 for the Mothers' Shape Creativity Test, .90 for the verbal creativity test, .88 for the children's verbal creativity test, and .67 for the shape creativity test.

Data Analysis

Simple correlation (Pearson) was used by using SPSS 21 package program to determine the relationship between the data collected in the study and mothers and their children. In the data analysis regarding the predictive status of the total score and sub-dimensions, which are in a significant relationship according to the correlation results, simple linear regression analysis was performed since the analysis would be made with a single predictor and more than one predicted variable. The scoring conducted by two different specialists, blind to the scores given by each, revealed a correlation of .89 during the evaluation of the Torrance Test of Creativity. Evaluations were converted to standard scores and analyzed.

Results

The data of the Torrence Creativity Test obtained from the mother and child were analyzed and the results were tried to be explained in the tables below.

Table 1. Correlation results of the Children and Mothers obtained from Torrance Test of Creativity Figurative Section

SUBDIMENSIONS OF TORRANCE TEST OF CREATIVITY FIGURATIVE SECTION ADMINISTERED TO CHILDREN							
		Abstractness of Titles	Enrichment	Resistance to Early Closure	Fluency	Originality	Total
SUBDIMENSIONS OF TORRANCE TEST OF CREATIVITY FIGURATIVE SECTION ADMINISTERED TO MOTHERS	**Abstractness**	.08	-.02	-.02	.06	.13*	.09
	of Titles	.23	.67	.69	.30	.04	.16
		290	290	290	290	290	290
	Enrichment	.10	-.00	.01	-.01	-.00	.02
		.10	.97	.78	.78	.91	.71
		290	290	290	290	290	290
	Resistance	.06	-.04	.01	.07	.12	.09
	to Early	.30	.48	.86	.26	.06	.14
	Closure	290	290	290	290	290	290
	Fluency	.16*	.00	.04	.16*	.15*	.18**
		.01	.91	.46	.01	.02	.00
		290	290	290	290	290	290
	Originality	.13*	.02	.09	-.02	.14*	.11
		.04	.67	.17	.76	.03	.10
		290	290	290	290	290	290
		.17**	-.00	.04	.10	.19**	.18**
	Total	.01	.93	.46	.11	.00	.00
		290	290	290	290	290	290

*$p<.05$ ** $p<.01$

According to Table 1, when the correlation between the sub-dimension and total scores obtained from the Torrance Test of Creativity Figurative Section administered to children are compared with the results obtained from Torrance Test of Creativity Figurative Section administered to the mothers are examined, it can be seen that there is a correlation between the abstractness of titles sub-dimension scores of the mothers and the originality scores of the children (r=.13; p<.05); mothers' fluency scores and children's abstractness of titles (r=.16; p<.05), fluency (r=.16; p<.05), originality (r=.15; p<.05) sub-dimension scores and children's creativity figurative form total scores (r=.18; p<.01); a positive and statistically significant relationship could be determined between the between mothers' originality scores and children's abstractness of titles (r=.13; p<.05) and originality (r=.14; p<.05); mothers' creativity figural form total scores, children's abstractness of titles (r=.17; p<.01), originality (r=.19; p<.01) and children's creativity figural form total scores (r=.18; p <.01).

Table 2. Simple Linear Regression Analysis comparison values for maternal creativity total score predictive modeling: Child creativity total score, child originality sub-dimension, child titles abstraction sub-dimension

Predicted Variables	B	Std. Error	β	t	p	R	R^2	Durbin-Watson
Constant	27.82	2.11		13.16	.00			
Total of Children Creativity	.14	.05	.18	2.70	.00**	.18	.03	1.78
Constant	7.38	.82		8.94	.00			
Originality of Children	.06	.02	.19	2.93	.00**	.19	.03	1.91
Constant	2.58	.60		4.29	.00			
Abstractness of Children	.03	.01	.17	2.60	.01*	.17	.03	1.95

**p<.05 **p<.01*
Predictor: Total Maternal Creativity Score
Predicted: Creativity total score of children, originality, abstractness of titles

When Table 2. was examined, it was determined that the predictor of the total score of maternal creativity, which was significantly correlated with the scores of the child creativity total score (p<.01), child originality (p<.01) and child titles abstraction (p<.05) sub-dimensions scores, was statistically significant. The explanatory rate of the models was 3% (R^2=.03) for the child's total score, 3% (R^2=.03) for the child's originality score, and 3% (R^2=.03) for the children's titles' abstractness score. The predictors of maternal creativity total score were child originality sub-dimension (β=.19; p<.01) child titles abstraction sub-dimension (β=.17; p<.05) and child creativity total score (β=.18; p<.01), predicted positively and significantly. According to the findings, it was seen that the high scores of the mothers in the creativity test predicted the increase in the children's total creativity score, the originality sub-dimension, and the high scores they got in the abstractness of the titles sub-dimensions.

Table. 3. Simple linear regression comparison values for predictive modeling of maternal fluency sub-dimension: Child creativity total score

Predicted Variables	B	Std. Error	β	t	p	R	R^2	Durbin-Watson
Constant	38.51	2.57	-	14.95	.00	-	-	-
Total of Children Creativity	.32	.04	-.14	2.13	.00*	.18	.03	1.83

**p<.01*
Predictor: Maternal fluency sub-dimension
Predicted: Child creativity total score

When Table 3 was examined, it was determined that the model created for the predictor of the mother fluency sub-dimension score, which was found to be significantly correlated with the child creativity total score, was statistically significant (t= 2.13; p<.01). The explanatory rate of the model was found to be 3% (R^2=.03). Maternal fluency sub-dimension score predicts the child creativity total score (β=-.14; p<.01) positively and significantly. According to the findings, it was seen that the high scores of the mothers in the fluency sub-dimension predicted the increase in the total scores of the children in the creativity test.

Table 4. Correlation results of Torrance Creativity Test Verbal Test Scores obtained from children and mothers

		SUBDIMENSIONS OF TORRANCE TEST OF CREATIVITY VERBAL TEST ADMINSTERED TO CHILDREN			
		Fluency	Flexibility	Originality	Total
SUBDIMENSIONS OF TORRANCE TEST OF CREATIVITY VERBAL TEST ADMINSTERED TO MOTHERS	**Fluency**	.03	.05	.04	.04
		.59	.44	.53	.49
		290	290	290	290
	Flexibility	.05	.09	.05	.07
		.44	.19	.41	.31
		290	290	290	290
	Originality	.00	.01	.06	.03
		.91	.79	.38	.67
		290	290	290	290
	Total	.03	.05	.05	.05
		.62	.43	.43	.47
		290	290	290	290

p<.05

According to Table 4, no significant correlation was found between the verbal form total score and sub-dimension scores obtained by the mothers from the Torrance Test of Creativity and the verbal form total and sub-dimension scores obtained by the children from the Torrance Test of Creativity. However, it is seen that the correlation values between them are very close.

Discussion

A significant correlation was found between the maternal creativity total scores of and children's total creativity scores, abstractness of the titles and the originality sub-dimension scores. It was determined that maternal creativity total score predicted child creativity total score, abstractness of titles and originality sub-dimensions of children positively and with statistical significance. Considering that the abstractness of titles is defined as the ability the essence of an issue and catching it in an abstract title (Cho et al., 2010), the study conducted by Bishop and Chace's (1971) supports the outcomes of the present study. In their study conducted with 3-4 year olds and their parents, Bishop and Chace (1971) have analyzed the games they were playing and their home environments. As a result of the study, it was revealed that the mothers of creative children were able to think more abstractly in terms of concepts compared to the mothers of children with less creativity. It has been seen that the games and activities offered by the mothers of creative children include more complex and abstract concepts. In addition, Bishop and Chace used Harvey Cards as study materials. The aim of Harvey cards is helping individuals to get rid of the pressure of consciousness and judgment and to come up with creative and original ideas (Onur & Zorlu, 2017). This information suggests that creative mothers may also affect the originality dimensions of their children. Onur and Zorlu (2017) also found a significant correlation between Harvey cards scores and creativity in their study. Another outcome of the present study is the statistically significant correlation between mothers' figurative creativity abstractness of title sub-dimension scores and children's figural creativity and originality sub-dimension scores, suggesting that there is a strong correlation between abstractness of titles and originality. Dewing and Taft (1973) had determined that mothers of creative girls are more "complex", have more unusual, unconventional interests, and girls who are less creative have a greater number of interests compared to their mothers. Whereas the study of Dewing and Taft supports that mothers' creativity significantly predicts children's originality dimensions, it also supports significant correlations between mothers' originality scores and children's originality and abstractness of titles sub-scores.

A positive and statistically significant correlation was also determined between mothers' figurative fluency sub-dimension scores and children's abstractness of titles, originality, and figurative creativity. It has been determined in the present study, that the figurative creativity fluency sub-dimension scores could predict positively and significantly the figurative creativity total scores of children. Creativity is attributed generally to two skills. Fluency is one of these skills and is defined as the ability to create many ideas. Moreover, it is a common feature in all creativity related tests (Cho et al., 2010). Clark & Mirels (1970) have

suggested that wherever correlations are found between high creativity indices, it is because of the fluency dimension that affects all scores. However, studies on the fluency hypothesis could not support this hypothesis. Snyder et al. (2004) have made a similar claim stating that an individual's creativity is based on ones' intellectual fluency. The only proven manifestation of creativity is creation itself and this is enabled through mental fluency. The claims of Cho et al. and Snyder et al. are that fluency scores highly affect the overall score of creativity. It is thought that these claims support the result obtained in the present study that mothers' fluency scores significantly predict children's creativity scores. Richmond's (1966) results determining a very high correlation between the fluency and originality scores of twin pairs (R=.86) is likewise a result supporting the results of the present study.

No statistically significant correlation could be determined between maternal verbal creativity total score and sub-dimension scores and the verbal creativity total and sub-dimension scores of the children. Whereas the maternal figurative creativity significantly predicted children's figural creativity, the lack of a significant correlation between mothers' verbal creativity skills and children's verbal creativity skills suggests that the effects of environment and heredity on creativity are complex. Velázquez et al. (2015) used "draw a human test" in their study on 122 twins and as a result they found that the creativity of the twins was close to each other. Nichols (1978) analyzed 10 studies with twins and concluded that heredity has an effect on creativity. The three-dimensional spatial ability genes of the North American Eskimo that enable them to produce their unique stone carvings (Vernon, 1989), from Kodand' to Lutfulla Fozilov and from Hiva' to Madraim Otajonov, handing down the art from generation to generation, Jurakul's family pottery for 300 years, the continuing successful carpentry of Toir Tukhtakhodjaevs from Tashkent of their ancestors (Khudoikulovna, 2021), and the perfect performance of Mozart who happens to have a musician father, both in music and composition perfectly at the age of 6 (Vernon, 1989) are among the examples considered to be an evidence of transfer in creativity. However, when these examples and studies that prove the hereditary part of creativity are examined, it is seen that they are generally confined with applied arts and constitute formal creativity splendid examples. The use of drawings in the study of Velázquez et al. (2015) also refers to formal creativity.

This information explains the results obtained in this study explaining that mothers' figurative creativity scores significantly predict children's figurative creativity. The lack of a relationship between mothers' verbal creativity and children's verbal creativity suggests that verbal creativity may not be transfer and may be more open to environmental effects. Alptekin et al. (2021) concluded in their study that children's social problem-solving skills significantly predicted their verbal creativity. Likewise, the present study also supports the conclusion that the environmental factors and social milieu are more effective than transfer in the development of verbal creativity.

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