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AN INVESTIGATION OF THE RELATIONSHIP AMONG 60-72-MONTH-OLD CHILDREN'S ATTENTION ABILITIES AND THEIR GEOMETRY AND PHONOLOGICAL AWARENESS SKILLS

Research article

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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN 60-72-MONTH-OLD CHILDREN'S ATTENTION ABILITIES AND THEIR GEOMETRY AND PHONOLOGICAL AWARENESS SKILLS

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Abstract

The aim of this study was to investigate the relationship between attention abilities, geometry, and phonological awareness skills of 60-72 months old children. The accessible population of the research in the relational scanning model consisted of 60-72 months old children attending to kindergartens and nursery classes of elementary schools in a province of Turkey in the 2018-2019 academic year. The sample of the study included 347 children aged 60-72 months, who were randomly selected to attend high, middle, and lower socio-economic level schools and volunteered to participate in the research. In the research, "General Information Form" to collect data about children and their parents, "Frankfurter Test Für Funjahrige Konzentration –FTF-K" (Attention Gathering Test of Five-Year-old Children) developed to determine children's attention levels and adapted, "Early Geometry Skills Test" developed to assess children's geometry skills and "Early Literacy Skills Assessment Tool" consisting of five subtests developed to measure the phonological awareness skills of children were used as data collection tools. Simple Linear Regression and Pearson Correlation tests, which are parametric tests, were used to analyze the data. As a result of the findings, it was found out that the children's attention ability was high, and their geometry and phonological awareness skills were low. Children's attention ability significantly predicted their geometry and phonological awareness skills. It was concluded that there were significant relationships between gender, parental education level variables, and children's geometry skills and phonological awareness skills.

Keywords: Attention ability, geometry skill, phonological awareness skill, 60-72-month-old children, preschool education

1. Introduction

Cognition and cognitive come from Latin words cogito and cognoscere which mean thinking, knowing, and grasping (Cohen, 2017; Oakley, 2004). Cognitive development, on the other hand, is the sum of mental processes that examine how the processes of acquiring, processing, and organizing information develop in individuals (Oakley, 2004). Attention, which is one of the cognitive developmental processes, is a mental process in which people selectively direct their awareness to some stimuli and ignore others (Papadopoulos et al., 2002). In line with the topic of this study, some relevant terms are explained as follows:

Attention

Attention, among the behaviorally irrelevant stimuli, is the ability to select behaviorally relevant stimuli, responses, memories, or thoughts (Corbetta, 1998). Controlling and maintaining attention in the pre-school period is important for school success. School readiness largely depends on the development of the children's ability to regulate their emotions and control their attention (Blair, 2002). Thanks to attention, the organism

perceives and selects objects and events in the environment (MEB, 2015). Attention, which is necessary for learning and perception (Ruff & Rothbart, 2001), develops by concentrating on something and the performance of attention focusing on an object, situation or event increases (Akçınlı Yurdakul et al., 2012). Ettrich (1998) stated that special attention should be given to the development of attention skills starting from the pre-school period and added that developing attention skills by giving importance at an early age had an impact on the reduction of problems that may arise in later years.

Attention ability affects many skills in learning. With the increase in the attention span of children, it becomes easier to acquire skills such as generalization, reversibility, and flexible thinking in mathematics. In the pre-school period, it is a prerequisite for children to increase their attention span in order to acquire geometric skills such as learning shapes and location in space, especially in the field of geometry. Increased attention facilitates the acquisition and comparison of properties of geometric shapes. Studies have shown that children's attention skills affect academic achievement in mathematics and geometry (Rabiner et al., 2016; Peterson et al., 2017). DuPaul et al. (2015), Erbay (2013), Gözalan and Koçak (2014), İnal Kızıltepe et al. (2017), Zevenbergen and Ryan (2009), and Saez et al. (2012) concluded that attention affected academic achievement.

Geometry

Geometry is present in everything that children relate to, and it is a skill that should be emphasized in preschool (Aktaş Arnas & Aslan, 2005). At an early age, children discover that everything around them has a shape and has similar or different characteristics (Kesicioğlu et al., 2011). According to Clements (1998), geometry is grasping the field. This area is the area where children should better learn, explore, and conquer the place in which they live, breathe, and move (Cited by Pound, 2008). Clements and Battista (1992) defined geometry as "the study of spatial properties, relations and transformations of objects in space". If geometry skills are supported by various experiences in kindergartens, a strong geometric and spatial thinking foundation is formed in children (Clements & Sarama, 2004). Pre-school children's ability to copy geometric shapes may affect their reading and math achievement in primary school (Benson & Haith, 2009). In addition, tangram experiences, which help children develop positive attitudes towards geometry, recognize shapes and develop classification skills, help children understand basic geometric concepts and relationships. Early experiences with tangrams help children develop their geometry vocabulary, their ability to identify shapes, classify, and explore relationships between the seven parts. Such early experiences are particularly important for recognizing and applying geometry in children's natural worlds (Bohning & Althouse, 1997). In order to develop geometry skills in the early period, children should be provided with concrete geometric shapes and materials to create various geometric shapes by combining, folding, or following lines (Clements, 1998). When teaching geometric shapes to children, they should be shown in geometric shapes of different sizes, which are not typical, have different positions, distortions, flatness, and children should be brought to life with different activities. In order for children to gain spatial awareness, words indicating place and location should be used during the day and activities should be organized. In the studies conducted by Hasler and Akshoomoff (2017), Taşkın and Tuğrul (2014), Zippert, Clayback, and Rittle-Johnson (2019), it was concluded that mathematics and geometry skills affected academic achievement.

Phonological Awareness

One of the three literacy areas that has an important role in the acquisition of literacy is phonological awareness. (Pullen & Justice, 2003). Phonological awareness is the

understanding that sound streams in words can be separated into separate sounds and that language contains phonemes smaller than words (Browne, 2001). Phonological awareness, the ability to join and use phonemes in speech (syllables, beginnings, and sounds and phonemes) independently of meaning, includes matching, synthesizing (e.g., mixing, adding) and analysis (e.g., counting, dividing, deleting) spoken sounds (Yopp & Yopp, 2009). Phonological awareness is the ability to hear, identify and use individual sounds in spoken language words (Strickland & Riley-Ayers, 2007). Before children start learning words, they distinguish sounds and their importance, and then learn to produce them and decode the sound system of the ambient language (Herschensohn, 2007). Children's phonological development follows a clear pattern from awareness of syllables to awareness of rhythms and individual sounds or phonemes within syllables (Treiman & Zukowski, 1996). Without well-divided representations of syllables and words, young children cannot develop skills in phonological awareness tasks such as blending sounds into words or analyzing words into their phonemic components (Ambrose et al., 2012). From birth, children's phonological awareness begins to develop, and between 3-5 years of age, children's phonological awareness increases and what they articulate improves greatly (Berk, 2013).

Children who have received pre-school education start primary education with early literacy skills. Children have learned the basics of oral and written language, have achieved success in alphabet knowledge and phonological awareness skills, and start primary education by getting ready for literacy skills (Uyanık & Kandır, 2010). Children reach a phonological awareness gradually increasing from the simple to the complex, from the larger units to the smaller units. The development of phonological awareness starts with word awareness and is completed as syllable awareness, rhyme awareness, phoneme awareness and finally phoneme manipulation (phoneme throwing, separation, merging) (Turan, 2017). Rhymes and alliterations (repetition of the same sound), phoneme combining and separation activities that reflect the basic levels of phonological awareness should be done for phonological awareness education in the preschool period (Turan, 2017). As the pre-school teachers interact with the children, in a way they conduct phonological awareness activities. Singing songs with children, using rhymes, and rhyming words, and producing words that begin with the same sound help children develop their phonological awareness skills (Beauchat et al., 2010). In the studies conducted by Child, Cirino, Fletcher, Willcutt and Fuchs (2019), Cornwall (1992), Demirtaş and Ergül (2020), Uyanık (2013), it was concluded that literacy, language, and phonological awareness skills affected academic achievement.

Relevant Literature

According to the research, it is much more difficult for children who have low cognitive abilities, mathematics, and literacy skills, which are called academic skills, to compensate for these deficiencies in the future, and in this case, they may negatively affect their future learning experiences (Mağden & Şahin, 2002; Turan & Akoğlu Gul, 2008). Gözüm's (2017) study on the effect of the attention skill development program in the pre-school period on the children's attention ability and reasoning skills, the process of acquiring attention ability and its effect on executive skills was examined. As a result of the research, it was concluded that the Attention Ability Development Program in Pre-school Period was effective on children's attention-gathering ability (Gözüm, 2017). In the study "Examination of the Effects of Game-Based Attention Training Program on the Vocabulary Knowledge Levels of Five-six-Year-Old Children" by Gözalan and Koçak (2014), the “Game-Based Attention Training Program” prepared by the researcher was applied to the children in the experimental group for 10 weeks. Although the post-test scores of both groups increased to a certain extent compared to the pre-test scores, it was observed that this increase was higher in the experimental group (Gözalan & Koçak, 2014). Hawes, Moss, Caswell, Naqvi, and MacKinnon (2017), in their

study named "Strengthening Children's Spatial and Numerical Skills with a Dynamic Spatial Approach to Early Geometry Teaching: 32-Week Intervention", children with spatial intervention showed improvement in spatial language, visuospatial, two-dimensional mental rotation and symbolic number comparison compared to an active control group. In the study of "Examination of Preschool Children's Recognition Levels of Geometric Shapes" by Kesicioğlu, Alisinanoğlu and Tuncer (2011) it was seen that their children made mistakes in recognizing triangle, square, rectangle, circle shapes and their distractors (Kesicioğlu et al., 2011). In the study of "Phonological Awareness Education in Preschool Period" by Turan and Akoğlu (2011), it was found that phonological awareness skills were effective in reading preparation and reading skills (Turan and Akoğlu, 2011). Based on the results of this research, attention ability, geometry and phonological awareness skills have a high potential to be the focus of attention in the relevant literature. Attention skills, geometry and phonological awareness skills developed at an early age can facilitate the future academic life of children. At the same time, the development of children in these areas can be supported by determining the differences and relations between attention ability, geometry, and phonological awareness skills according to variables such as gender, parental age, and parental education level, which have been mostly discussed in studies. Early precautions can be taken by ensuring that children develop in these areas with attention, geometry, and phonological awareness activities at school and at home. Taking these precautions at an early age is important for the child to develop these skills and to develop them by getting support when necessary.

Justification of the research

In the literature, studies on attention ability, geometry, and phonological awareness revealed that attention ability affected mathematical skills, literacy, and academic achievement (Gözalan & Koçak, 2014; Peterson et al., 2017; Porta, Carrada, & Ison, 2016; Erbay, 2013; Child, Cirino, Fletcher, Willcutt, & Fuchs, 2019; Rabiner, Godwin, & Dodge, 2016). However, no research has been found that examines the relationship between the attention ability of pre-school children and their geometry and phonological awareness skills together. At the same time, when we examined the studies, it was determined that these studies were mainly conducted with English speaking children. However, language is affected by the culture in which it emerged. In this study, the relationships between attention, geometry and phonological awareness skills of Turkish-speaking children were investigated. In this context, it was thought that evaluating children's attention abilities, geometry and phonological awareness skills in different cultures would contribute significantly to the literature. From this point of view, it was thought that this research, which was conducted to determine the variables that pre-school children's attention ability and geometry and phonological awareness skills were related to, would provide information to parents and educators in this regard. Moreover, the findings of this study can be used to support the development of children in these areas in future research on attention abilities, geometry skills and phonological awareness.

Research Problems

In this context, the problem statement of the research was "Is there a significant relationship between attention abilities of 60-72-month-old children and their geometry and phonological awareness skills?" and answers were sought for the following sub-problems;

1. At what level are the attention abilities of 60-72-month-old children?
2. At what level are early geometry skills of 60-72-month-old children?
3. At what level are phonological awareness skills of 60-72-month-old children?

4. How well does attention ability predict early geometry skills and phonological awareness skills of 60-72-month-old children?

5. What is the relationship between 60-72-month-old children's early geometry skills and phonological awareness skills?

6. Between 60-72-month-old children's geometry skills and phonological awareness skills;

a) What kind of relationship is there according to the gender variable?

b) What kind of a relationship is there according to the mother's education level variable?

c) What kind of a relationship is there according to the father's education level variable?

2. Method

2.1. Model of the Research

In this relational study, we aimed to determine the relationship between the attention abilities of 60-72 month old pre-school children and their geometry and phonological awareness skills. Relational screening models are research models that aim to determine the existence or degree of change between two or more variables (Sönmez & Alacapınar, 2013).

2.2. Population and Sampling

The accessible population of this study consisted of children aged 60-72 months who were attending to the kindergartens and nursery classes affiliated to the Turkish Ministry of National Education in a city center of Turkey in the 2018-2019 academic year. According to the data obtained from the Provincial Directorate of National Education, the accessible population of the research consisted of approximately 4000 children aged 60-72 months, attending to the kindergartens and nursery classes. Eventually, the sample of the study included randomly selected 347 children by using the appropriate sample sizes table for different deviation amounts. The confidence rate of the sample to represent the population was 95% (Büyüköztürk et al., 2017). From the list of kindergartens and nursery classes obtained from the Provincial Directorate of National Education, the schools with low, middle and high socio-economical levels were randomly selected from the list at each level to represent all three levels (Baştürk & Taştepe, 2013). Of the children included in the sample, 50.7% were boys and 49.3% were girls. The educational status of the mothers of the children participating in the study were, respectively; secondary school and below (43.8%), university (32.9%), high school (20.5%), post-graduate (2.9%). The educational status of the fathers of the children participating in the study were, respectively; university (37.2%), secondary school (28.3%), high school (27.7%), post-graduate (6.9%).

2.3. Data Collection Tools

As data collection tools, “Frankfurter Test Für Funjahrige Konzentration –FTF-K”, “Early Geometry Skills Test” and Phonological Awareness subtest from “Early Literacy Skills Assessment Tool” was used.

a) Frankfurter Test Für Funjahrige Konzentration –FTF-K” (Attention Gathering Test of Five-Year-old Children): It was developed by Raatz and Möhling in 1971 to determine the attention skills of 60-72 months old children and adapted in Turkey by Gözüm (2017). Of the apples and pears mixed in the scale, children are asked to find and mark the pears within 90 seconds. It takes eight minutes to explain the test and the instructions to the children. The marking time of the test is 90 seconds and there are 42 pear symbols that can be marked on the scale. In this scale, the raw score consists of pears marked by the child in 90 seconds. In order to eliminate the effect of gender and age variable, corrected scores of children were

used instead of raw scores. In order to calculate the corrected score of the child, the calendar age on the day of the test is found and the test is evaluated by adding the corresponding score from the corrected score table to the raw score. The test is divided into 3 levels. Those who score between 0-22 are rated below the average, those who score between 23-32 are rated as average, and those who score between 33-43 are rated above the average. While forming the study group for validity and reliability studies, four schools whose socio-economic levels were grouped as low, middle, and high by the Turkish Statistical Institute (TUIK) were selected according to the school list obtained from the Kars-Turkey Provincial Directorate of National Education. 173 children, 49.7% girls (n=86), 50.3% boys (n=87), were selected by random sampling method among 60-72 months old children, constituted the study group for reliability procedures. The test-retest method was used for the reliability study of the test. In the test-retest reliability method used in the study, in which the effect of the attention ability development program in the pre-school period on children's attention ability and reasoning skills was examined, the level of the relationship between the first application and the second application was found to be .743 ($p < .001$). According to these results, the “Frankfurter Test Für Funjahrige Konzentration –FTF-K” (Attention Gathering Test of Five-Year-old Children) was accepted as a reliable data collection tool for Turkish children aged 60-72 months (Gözüm, 2017).

b) Early Geometry Skills Test: The "Early Geometry Skills Test", developed by Sezer (2015), was used to determine the early geometry skills of 60-72 months old children. In the administration of the test, which has a total of 46 questions; children are asked to find the same shapes as given in the example, to show the geometric shapes such as triangle, rectangle, square, circle/circle, cylinder, rectangular prism, cube, cone among mixed shapes, to find the shapes that will follow the patterns, to find the geometric shapes, edges, to draw the corners, to create the same pictures on the cards shown from the blocks in the form of cubes and rectangular prisms, to find the surfaces of geometric shapes from the given options, to create a geometric shape using the given wooden sticks, to show the appropriate part to fill the space inside the shapes, to find the geometric shape that is not used in the example. For correct answers given, 1, 2, 3, 4, 5, 6 and 7 points are given in some questions, while 1 point is given for correct answers in other questions. For wrong answers given, -1, -2, -3, -4, -5, -6 and -7 points are deducted from the score for some questions. If the child gets a negative point in the questions given a negative score, this score is written as "0" in the total score. In other questions, 0 points are given for incorrect answers. The highest score that can be obtained from the test is 71. The content validity index of the Early Geometry Skills Test was .65, the total reliability coefficient Cronbach alpha value was .855 and the KR-20 coefficient was .853. The criterion for the intragroup correlation coefficient of the test was .124, the Pearson correlation coefficient between the two halves was .697, the Spearman-Brown coefficient was .821 and the Guttman Split-Half coefficient was .767. According to the Guttman Lambda (Li) method, the reliability coefficients varied between .760 and .883. Finally, the Pearson correlation coefficient for the test-retest reliability of the test was calculated as .898, the KendallTau_b coefficient as .738 and the Spearman rho coefficient as .885. As a result of these findings, a valid and reliable test consisting of 42 items was obtained (Sezer, 2015). In this study, the Cronbach alpha value of the total reliability coefficient of the early geometry skill test was found to be .785. The correlation between the forms of the test was .673, Spearman-Brown coefficient .804 and Guttman Split-Half coefficient .673.

c) Early Literacy Skills Assessment Tool: Early Literacy Skills Assessment Tool, consisting of five subtests and a total of 96 items, was developed by Karaman and Güngör Aytar (2016). As a subtest of the Early Literacy Skills Assessment Tool, the Phonological

Awareness Skills Assessment has five sections. While matching words starting with the same sound and matching rhymed words are done using picture cards, noticing the beginning sounds of words, discarding syllables and sounds and combining sounds are practiced by talking to children. The items in the assessment tool were evaluated with a score of "1" for correct answers and "0" for incorrect answers. The KMO value was calculated, and the Bartlett sphericity test was performed in order to understand whether the Phonological Awareness Skills Assessment Subtest was suitable for factor analysis. In this context, it was seen that the KMO value was .50 and above, and the result of the Bartlett sphericity test was statistically significant. The average of the difficulty indices of the 53 items in the test is p=.40, and the average of the discrimination indices is p=.56. While applying this subtest, visuals were used in the items "matching words starting with the same sound and matching rhyming words" (Karaman & Güngör Aytar, 2016). In this study, the Cronbach alpha value of the total reliability coefficient of the phonological awareness test was found to be .746. In order to understand whether the test was suitable for factor analysis, the KMO value was calculated, and the Bartlett sphericity test was performed. In this context, it was seen that the KMO value was .834 and the result of the Bartlett sphericity test was statistically significant.

2.4. Data Collection

Data collection tools were applied between October and February in the 2018-2019 academic year. Before applying the data collection tools, an application was made to the ethics committee of a university in Turkey and necessary permissions were obtained from the Provincial Directorate of National Education. The permission to use the tests was obtained also from the people who developed and adapted them. The research was carried out with children aged 60-72 months attending the kindergartens and nursery classes of elementary schools, who volunteered to participate in the research. In the 2018-2019 academic year, the school principal, teachers, and parents were interviewed at the schools included in the sample group, and information was given about the research, and the research was conducted with the children of the parents who agreed to participate in the research. Parents and teachers were told about the general information form, which included the variables of children's gender, age, number of siblings, duration of attendance at preschool, education status of parents, age and profession, and necessary permission was obtained from the parents to use this information in the general information form. The tests were administered to the children individually by the researchers on different days in order to maintain the validity and reliability of the tests, as they could tire the children and cause erroneous answers to the tests. The tests were administered in a quiet and comfortable environment in the schools where the children attended, paying attention to the rules of application of the tests. In order to gain expertise in applying the measurement tools, the scale application manuals sent by the developers were read in detail before the research and necessary preparations were made. The materials required for the scales were determined and provided by the researchers. Only felt-tip pens and scales were used as materials for the attention test. Square, triangle, and rectangular wooden blocks were taken for the geometry test and square, triangle, rectangle and circle shapes were made from cardboard by the researchers in two dimensions. For the phonological awareness test, cards consisting of pictures of various words were prepared by the researcher. Using these materials, measurement tools were administered to the children. The data were collected by the researchers.

2.5. Analysis of Data

After the application of the scales, the data were transferred to the computer environment and the analysis of the data was made using appropriate tests with the help of SPSS. In the study, it was decided whether the data were normally distributed or not by looking at the

skewness and kurtosis coefficients for all variables. According to George and Mallery (2010), if the skewness and kurtosis coefficients take values between -2 and +2, the distribution is considered normal. It was observed that the skewness and kurtosis coefficients of all the variables in the study were in this range, and the parametric Simple Linear Regression and Pearson Correlation tests were used.

3. Findings

The findings of the research are listed according to the sub-problems.

1. At what level are the attention abilities of 60-72-month-old children?

Table 1. *Frequency and Percentage Distributions Regarding the "Frankfurter Test Für Funjahrige Konzentration –FTF-K" (Attention Gathering Test of Five-Year-old Children)*

	Attention Levels	f	%
FTF-K	Below Average	15	4.3
	Average	130	37.5
	Above Average	202	58.2
	Total	347	100

According to table 1, 58.2% of 60-72-month-old children had an attention level above the average, while 37.5% have an average attention level. It was seen that only 4.3% of children have below-average attention levels. According to these results, as the sum of average and above-average attention level of children was 95.7%, it can be said that most of the 60-72-month-old children had high attention levels.

2. At what level are early geometry skills of 60-72-month-old children?

Table 2. *Mean, standard deviation distributions and mode and median values of Early Geometry Skill Test*

Early Geometry Test	$\bar{x}$	sd	Mode	Median
	29.57	10.37354	27	29

According to table 2, it was seen that the average score of 60-72-month-old children from the geometry test was 29.57. The mode of the scores of the children from the geometry test was 27. Accordingly, it was found out that the scores of the children in the geometry test were low.

3. At what level are phonological awareness skills of 60-72-month-old children?

Table 3. *Mean and standard deviation distributions and mode and median values of Phonological Awareness Sub-test*

	$\bar{x}$	sd	Mode	Median
Phonological Awareness Sub-test	15.20	8.6829	6	14

Table 3 shows that the mean score of 60-72-month-old children was 15.20 for the phonological awareness sub-test. The mode of the scores of the children for the phonological awareness test was 6. Therefore, it was found out that the scores of the children in the phonological awareness test were low.

4. How well does attention ability predict early geometry skills and phonological awareness skills of 60-72-month-old children?

Table 4. *The predictive power of attention ability of 60-72-month-old children on early geometry and phonological awareness skills*

	B	Standard Error	*β*	t	p
Constant	1.975	.086		22.921	.000
Early Geometry	.010	.004	.170	2.594	.010
Phonological Awareness	.019	.004	.279	4.246	.000

*p<.05, R= .412, R^2= .169, F=35.062, n=347

Table 4 shows that attention ability of 60-72-month-old children significantly predicted early geometry and phonological awareness skills (p<.05). It explained children's attention ability, early geometry, and phonological awareness skills by 16%. According to the standardized regression coefficient (β), the relative order of importance of the predictor variables on attention ability was as follows: phonological (β=.279) and geometry (β=.170).

5. What is the relationship between 60-72-month-old children's early geometry skills and phonological awareness skills?

Table 5. *Pearson correlation test results for the relationship between early geometry skills and phonological awareness skills of 60-72-month-old children*

		Early Geometry Skills
Phonological Awareness Skills	R	0.663
	P	0.0001
	N	347

*p<.05

According to Table 5, it was found out that there was a statistically significant relationship between phonological awareness skills and early geometry skills of 60-72-month-old children. This relationship was positive and moderately significant (r=.663, p=.0001). According to this result, it is possible to say that as phonological awareness skills of 60-72-month-old children increased, their geometry skills also increased.

6.a. Is there a significant relationship between early geometry and phonological awareness of 60-72-month-old children according to gender variable?

Table 6. *Pearson correlation test results for the relationships between early geometry and phonological awareness skills of 60-72-month-old children according to gender variable*

	Gender		Phonological Awareness Skills
Early Geometry Skills	Girls	r	0.624
		p	0
		n	171
Early Geometry Skills	Boys	r	0.704
		p	0
		n	176

p<.05

Table 6 shows the correlation results between geometry skills and phonological awareness skills of 60-72-month-old girls and boys. It was found out that there was a positive and moderately significant relationship between girls' early geometry skills and phonological awareness skills (r=.624). It was seen that there is a positive and highly significant relationship between boys' early geometry skills and phonological awareness skills (r=.704). Thus, it can be said that the relationship between early geometry skills and phonological awareness skills of boys was higher than that of girls.

6.b. Is there a significant relationship between the geometry skills and phonological awareness skills of 60-72-month-old children according to the mother's education level variable?

Table 7. *Pearson correlation test results for the relationships between geometry skills and phonological awareness skills of 60-72-month-old children according to the mother's education level variable*

	Mother's education level		Phonological awareness skill
Early Geometry Skills	Secondary or below	r	0.457
		p	0
		n	152
Early Geometry Skills	High school	r	0.522
		p	0
		n	71
Early Geometry Skills	University	r	0.661
		p	0
		n	114
Early Geometry Skills	Post-graduate	r	0.75
		p	0.013
		n	10

p<.05

The relationship between geometry skills and phonological awareness skills of 60-72-month-old children according to mother's education level are given in Table 7. It was seen that there was a positive and moderately significant relationship between early geometry skills and phonological awareness skills of those whose mother's education level is secondary school or below (r=.457), high school (r=.522) and university (r=.661). It was found out that there was a positive and high-level relationship between early geometry skills and phonological awareness skills of the group whose mother's education level is post-graduate (r=0.75). Therefore, it can be said that the relationship between early geometry skills and phonological awareness skills was higher in children with a post-graduate mother's education level compared to other children. Mothers with high education levels might have higher awareness of geometry skills and phonological awareness skills than mothers with low education levels. Mothers with a high level of education might be more likely than other mothers to provide their children with resources related to early geometry skills and phonological awareness.

6.c. Is there a significant relationship between the geometry skills and phonological awareness skills of 60-72-month-old children according to the father's education level variable?

Table 8. *Pearson correlation test results for the relationships between early geometry skills and phonological awareness skills of 60-72-month-old children according to the father's education level variable*

	Father's education level		Phonological awareness skill
Early Geometry Skills	Secondary or below	r	0.349
		p	0
		n	98
Early Geometry Skills	High school	r	0.60
		p	0
		n	96
Early Geometry Skills	University	r	0.635
		p	0
		n	129
Early Geometry Skills	Post-graduate	r	0.808
		p	0
		n	24

p<.05

The relationships between early geometry skills and phonological awareness skills of 60-72-month-old children according to father's education level are given in Table 8. It was found out that there was a positive and moderately significant relationship between early geometry skills and phonological awareness skills of those whose father's education level is secondary school or below (r=.349), high school (r=.60) and university (r=.635). It was found out that there was a positive and high-level relationship between early geometry skills and phonological awareness skills of the group whose father's education level was postgraduate (r=0.808). In this case, it can be said that the relationship between early geometry skills and phonological awareness skills of children of fathers with a post-graduate degree was higher than other children. Fathers with a high level of education might have been more aware of early geometry skills and phonological awareness skills than fathers with a low level of education. Fathers with a high level of education might be more likely than other fathers to provide their children with resources related to geometry skills and phonological awareness.

4. Discussion and Conclusion

This study was conducted to investigate the relationship between attention ability, early geometry, and phonological awareness skills of 60-72-month-old children. As a result of the research, it was seen that children's attention skills were high, and their early geometry and phonological awareness skills were low. It was found out that there was a positive and significant relationship between children's early geometry skills and phonological awareness skills. It was concluded that there were positive and significant relationships between children's early geometry skills and phonological awareness skills in terms of gender and parental education level variables.

Considering the distribution of attention ability of children, 4.3% of children were with low attention, 37.5% of children were with average attention and 58.2% of children were with high attention. 95.7 of the children participating in the study had a high and average attention ability. The high attention span of children might be due to their curiosity about their environment at a time when there were many stimuli around them. In this sense, children are aware of which objects, events, or situations around them they should focus on, and children do not have a problem focusing when directing their attention to this object,

event or situation. Verkerk, Jeukens-Visser, Houtzager, van Wassenaer-Leemhuis, Koldewijn, Nollet, and Kok (2016) conducted a study to compare the attention ability of very low birth weight children with normal birth weight children, according to which the mean scores of very low birth weight children on five of six measures were significantly lower. Costelloe, Davis, Cavenagh, and Doneva (2019) conducted a study of "Attention levels in young children who stutter" to find out whether children who stutter and children who do not stutter differed in terms of attention ability, and they concluded that children who stutter had lower attention skills scores (Costelloe et al., 2019).

As a finding of the study, it was found out that the children's early geometry skills were at a low level. As a result of the low level of geometry of children, it was observed that children had difficulties in recognizing geometric shapes. It has been observed that children who can recognize typical geometric shapes have difficulty in recognizing non-typical shapes. The reason for this is that children often encounter typical shapes in their environment and do not encounter non-typical shapes. Aktaş Arnas and Aslan (2010) has revealed that while young children are successful in recognizing typical geometric shapes, they are not successful enough in recognizing atypical geometric shapes.

Another significant finding was that children's phonological awareness skills were found to be low. As a result of the low phonological awareness skills of the children, it was observed that the children had difficulties in combining syllables and sounds with the given sounds. Children's difficulties in this regard may be due to the fact that syllables and sounds and combining the given sounds activities are less applied in classes compared to other phonological awareness skills activities. Although children's phonological awareness skills were low, it was observed that they made it easier to show and say rhyming pictures. In the study "Early Literacy Skills Profile of Kindergarten Children: Ankara Sample" conducted by Kargın, Güldenoğlu and Ergül (2017), 69.8% of the children scored below the average in the total scores of the sub-tests for assessing phonological awareness skills.

According to the findings, the high attention skills of 60-72-month-old children also positively affected their early geometry and phonological awareness skills. As the attention level of children increases, their focus on the object, event or situation increases at the same rate. It is possible that children with high attention levels focus more on geometry and phonological awareness skills than children with low attention levels, thereby increasing their geometry and phonological awareness skills. In the study "Cognitive Prediction of Reading, Mathematics, and Attention: Shared and Unique Effects" by Peterson et al. (2017), it has been concluded that oral comprehension contributes to the relationship between reading and mathematics. A total of 58 preschool children in the experimental and control groups participated in the study "The Effect of Cognitive Skills Support Program on Creative Thinking, Academic and Language Skills of 61-72 Months-Old Children" conducted by İnal Kızıltepe et al. According to the results of their study, it was determined that the cognitive skills support program was effective in supporting children's language skills.

Pearson correlation analysis was applied to understand whether there was a significant relationship between early geometry skills and phonological awareness skills of 60-72-month-old children. According to the results, it was seen that there was a positive and significant relationship between early geometry skills and phonological awareness skills. According to the results, it is possible to say that as phonological awareness skills of 60-72-month-old children increase, their geometry skills also increase. High phonological awareness skills also affect other skills. Phonological awareness skills help children understand what they are reading, be aware of visual shapes, and distinguish between letters and numbers. Children with a high level of phonological awareness skills also have a high

level of geometry skills. In the study of Uyanık and Kandır (2014) "Adaptation of Kaufman Survey of Early Academic and Language Skills to 61-72-month-old Turkish children", according to the internal correlation results of the survey, relationship between vocabulary, numbers, letters & words, articulation survey sub-tests and the scales corresponding to the sub-tests which are as follows: expressive language skills, receptive language skills, number skills, letter & word skills scales, and early academic and language skills composite of the tests was found to be significant. 70 children between the ages of five and six participated in the study "Examination of the Relationship Between Language and Mathematics Skills of Pre-school Children According to Various Variables" by Taşkın and Tuğrul (2014). The findings of their study revealed that there was a positive and significant relationship between children's language skills and mathematical skills. They observed that as the scores of the children in the sub-tests of the Bracken Basic Concept Scale-Revised Form test aiming to measure the knowledge of mathematical concepts increased, the scores they got from the Peabody Picture-Vocabulary Test also increased. In the study "Cognitive Prediction of Reading, Mathematics, and Attention: Shared and Unique Effects" by Peterson et al. (2017), it was concluded that oral comprehension contributed to the relationship between reading and mathematics.

In our study, the relationship between early geometry skills and phonological awareness skills was also examined in terms of gender variable. Separate analyzes were performed for boys and girls. It was observed that there was a positive and moderate relationship between geometry skills and phonological awareness skills in girls, and a positive and high-level significant relationship in boys. The fact that the relationship between the early geometry and phonological awareness skills of girls was lower than that of boys might be because they did not prefer each center equally in learning centers. The fact that girls prefer the dramatic play center more than boys may cause them to stay in this center longer and spend less time in math, literacy, and book centers (Uyanık Aktulun et al., 2018). Zevenbergen and Ryan (2009) investigated the relationship between attention problems in pre-school children and expressive language and academic preparation skills in the study named "Gender differences in the relationship between attention problems in preschool children and expression language and emerging academic skills". They concluded that attention problems were associated with less developed expressive language skills for boys and poor performance on the academic skill measure for girls.

In this study, the relationship between early geometry skills and phonological awareness skills was also investigated in terms of mother’s education level variable. It was observed that there was a positive and moderate significant relationship between early geometry skills and phonological awareness skills of those whose mother's education level was secondary school or below, high school and university. It was observed that there was a positive and high significant relationship between early geometry skills and phonological awareness skills of the group whose mother had a post-graduate education level. As the mother's education level increased, the relationship between children's geometry skills and phonological awareness increased. The fact that the relationship between early geometry skills and phonological awareness skills of children with high maternal education level was higher than that of children with low maternal education level showed that children's maternal education level was effective in early geometry and phonological awareness skills. Thus, children can increase their geometry skills and phonological awareness skills with the awareness of their mothers. In the study "Examination of Cognitive Functions and Symbolic Play Skills in 48-60-month-old Children" conducted by Güney (2020) who used Application of Cognitive Functions Scale, it was concluded that as the education level of the mother increased, the scores of the children from the tests also increased in the classification subtest in which

children are asked to classify geometric shapes according to their color, shape and size, and in the pattern subtest in which they are asked to form the pieces from simple to difficult in a certain order. In the study of "Piaget's logical operations, phonological awareness and letter knowledge in preschool education" by Ferraz, Viana, and Pocinho (2018), it was determined that the phonological awareness performance of children whose parents had higher education levels was better than other children.

Moreover, in our study, we also investigated the relationship between early geometry skills and phonological awareness skills in terms of father education level variable. As a result, it was observed that there was a positive and moderately significant relationship between early geometry skills and phonological awareness skills of those whose fathers' education levels were at secondary school and below, high school and university. It was observed that there was a positive and highly significant relationship between early geometry skills and phonological awareness of the group whose father had a post-graduate education level. As the father's education level increased, the relationship between children's geometry skills and phonological awareness skills increased. The fact that the relationship between early geometry skills and phonological awareness skills of children with high father education level was higher than children with low father education level showed that children's father education level was effective in early geometry and phonological awareness skills. It can be said that children can increase their geometry skills and phonological awareness skills with the awareness of their fathers. In the aforementioned study by Güney (2020), it was also reported that children's early geometry skills increased as the level of father's education increased. In addition, in the study of "Development and Psychometric Characteristics of the Early Childhood Phonological Sensitivity Scale" conducted by Sarı and Aktan Acar (2013), it was observed that as the education level of the father increased, the scores of the children in the test also increased.

With reference to these findings, various suggestions have been developed regarding the relationship between attention abilities, early geometry and phonological awareness skills of 60-72-month-old children. Since it was determined that children with high attention abilities had higher early geometry and phonological awareness skills than children with low attention abilities, teachers should be informed that they should include more activities that increase attention ability. Teachers should organize activities that will contribute to the development of early geometry skills and phonological awareness skills for children whose attention skills are high but whose early geometry and phonological awareness skills are low. Since it was concluded that the education level of parents affected the early geometry and phonological awareness skills of children, parents should be informed that these skills will affect academic success in the future, and parents should be encouraged to participate in activities, seminars and conferences related to early geometry and phonological awareness. For future research, it can be investigated how children use materials related to attention, early geometry, and phonological awareness in classes. Information and awareness activities can be carried out for parents by developing projects on how to support their preschool children's attention, early geometry, and phonological skills at home. Research should be conducted on how to organize learning environments that will improve the early geometry and phonological awareness skills of pre-school children. Pre-school teachers' opinions should be sought, and if there is a problem in the classroom regarding attention, early geometry and phonological awareness, action research can be conducted to solve it.

5. Limitations

This research is limited to the Frankfurter Test Für Funjahrige Konzentration –FTF-K" (Attention Gathering Test of Five-Year-old Children) for attention ability, the "Early Geometry Skills Test" for early geometry skills, and the Phonological Awareness sub-test from the "Early Literacy Skills Assessment Tool" for phonological awareness skills. The limitations of the study can be stated as the absence of different variables that might have affected the results such as number of children's siblings, teachers' and parents' knowledge and attitudes towards attention, early geometry skills and phonological awareness skills, the frequency of activities related to attention, geometry skills and phonological awareness skills in classes. Meanwhile the study was also limited to 347 children attending to a pre-school center.

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