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INVESTIGATION OF NUMBER AND OPERATIONS SKILLS OF CHILDREN ATTENDING PRESCHOOL EDUCATION

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Abstract
The aim of this research is to investigate number and operation skills by 4-5-year old children enrolled at a preschool. The sample of the study consists of 4-5 years old preschool children (n=112 girls, n=105 boys) from kindergartens. Data was collected through "Number and Concept test for the children between 48-86 months" which were developed by Aktaş-Arnas, Gül ve Sığırtmaç (2003). The results of the study showed that age, education level of mother and father cause meaningful difference in the success on the number and operation skills. On teh other hand, the gender did not cause any meaningful difference on number and operation skills.

Key Words: Number and Operation Skills, Preschool Education, 4-5 Years Old Children, Mathematics in Preschool.

INTRODUCTION

Mathematics education in preschool consists of skills and notions such as number, shape, time, measuring, data analysis and problem solving (Dinçer and Ulutaş, 1999). Also, the basic elements of mathematics education are associating skills and information, problem solving, learning the numeric system, and associating mathematics with the concept of number (Akman, 2002). Since mathematics has the main role in the construction of science, children must understand (grasp) counting numbers (Dere, 2000). According to Sophian (1995), specializing in counting is essential for children to understand mathematics. Children they will open their eyes to a new world when they understand the characteristics of numbers; and as soon as they start using symbols, they obtain important pre-conditions and possibilities for their mathematics education (Zhou and Wang, 2004). In addition, aside from solving problems in application and in practicality, skills in expressing a number as an object of thought and disassembling a number form the basic knowledge of

arithmetics (Hunting, 2003). Children will become aware of addition when they mix a group of objects with another group of objects, and they will recognize substraction when they remove one or several objects from a group of objects (Butterworth, 2005). Educators can help children to grasp the meaning of operations such as addition and substraction by presenting them various problems (Ktoridou, Eteokleous and Gregoriou, 2005).
Children require experiences to develop mathematical concepts and skills; and in order to understand abstract mathematical concepts that they will encounter in the future, they must do studies on concepts and skills like one-to-one matching, classification, addition, substraction, multiplication, division, data analysis and measuring as prerequisites (Charlesworth and Lind, 2003; Charlesworth, 2005). Studies on children's learning in the first six years of their lives emphasize that their success in mathematics in the following learning steps is closely related to their education in early childhood period (Barth et. al., 2005; Güven and Balat, 2006; Wolfgang et. al., 2003).

Experiences that children live and knowledges that they obtain on mathematics during their preschool education form important foundations for their experiences of primary education. For this reason, children need learning environments in which they are active, and methods-techniques for the development of mathematical concepts and skills that they can use in the future (Erdoğan, 2006; Yıldız, 1999). It is very important to lay the foundations of concepts of number and operation in mathematics education given in preschool period for children to understand numerical relations in following years. In order to support children's development on the notion of operations, various studies that will support the development of the concept of number must be made, proper methods and techniques must be used, exploration and problem solving opportunities must be presented by supporting children to learn by structuring new knowledge and skills on top of their inherent knowledge and skills that they obtained from first-hand experiences (Johansson, 2005). In this context, identification of number and operation skills of children attending the preschool education and the variables affecting these skills will allow teachers to identify and correctly use the most proper methods and techniques to support children's number and operation skills. The goal of this study is to analyze the number and operation skills of children in 4-5 year old group and attending the preschool education by variables of children's age, gender, mother's level of education and father's level of education.

METHOD

Screening model is used in this study.

Participants

A total of 217 children – 113 four year olds, 104 five year olds – attending 10 different state preschools in Istanbul's Kadıköy district. 112 of these children are girls and 105 of them are boys. 51 of the children's mothers are primary school graduates, 83 of the children's mothers are secondary school graduates, 36 of the children's mothers are associate degree graduates and 47 of the children's mothers have bachelor's degree. Also, 34 of the children's fathers are primary school graduates, 70 of the children's fathers are secondary school graduates, 42 of the children's fathers are associate degree graduates and 71 of the children's fathers have bachelor's degree.

Data Collection Tool

"Number and Operation Concepts Test For 48-86 Month Old Children" is used as the data collection tool in this study. This test is prepared by Aktaş-Arnas, Gül and Sığırtmaç (2003) to measure the number and operation knowledge of children between 48-86 months. Its concepts of number and operation oriented items consist of rhythmic counting, writing figures, recognizing figures, matching figures, number conservation, ordinal numbers, cardinal numbers, and addition and substraction operations.
The internal consistency coefficient is calculated for test reliability and the KR-20 value for whole test is found 0,98. Also, the internal consistency for age groups is calculated and the KR-20 values showed a variability between 0,97 and 0,98. In another study made for test reliability, Pearson Product-Moment Correlation Coefficient is calculated as 0,97.

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Data Analysis

Data entry of information obtained by data collection tools is realized in this study. Proper packages are used for data analysis and statistics.

FINDINGS

Findings obtained in accordance with the main goal of this study are included in this section. Sub-goals of the study are respectively discussed in the presentation of the findings.

Table 1: T-Test Results of Number and Operation Concepts Test Scores By The Age Variable

Age	N	X	S	df	t	*p*
Four Year Old	113	35,05	12,61	215	4,197	,000
Five Year Old	104	42,55	13,72			

When table 1 is studied, a significant difference is found ($p < .05$) for "The Number and Operation Concept Test" scores by children's age.

Table 2: T-Test Results of Number and Operation Concepts Test Scores By The Gender Variable

Gender	N	X	S	df	t	*p*
Girl	112	39,46	13,52	215	,907	,365
Boy	105	37,78	13,80			

When table 2 is studied, no significant difference is found ($p >.05$) for "The Number and Operation Concept Test" scores by children's gender.

Table 3: ANOVA Results of Number and Operation Concepts Test Scores by Mother's Education Level Variable

Source of the Variance	Sum of Squares	df	Mean Square	F	*p*
Between Groups	5203,807	3	1734,602		
Within Groups	35075,575	213	164,674	10,534	,000
Total	40279,382	216			

When table 3 is studied, a significant difference is found ($F=10,534$, $p <.05$) for The Number and Operation Concept Test scores by the mother's education level.
Groups are compared with each other to determine which groups have this difference. Since the variances are homogeneous, Tukey test is perfomed and the results are given in Table 4.

Table 4: Tukey Table of Number and Operation Concepts Test Score by Mother's Education Level Variable.

Mother's Education Level	**N**	**Mother's Education**	**Mean Difference**	***P***
Primary Education	51	Secondary Education	-,05618	1,000
		Associate Degree	-11,23333*	,001
		Graduate Degree	-9,57447*	,002
Secondary Education	83	Primary Education	,05618	1,000
		Associate Degree	-11,17715*	,000
		Graduate Degree	-9,51829*	,000

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Associate Degree	36	Primary Education	11,23333*	,001
		Secondary Education	11,17715*	,000
		Graduate Degree	1,65887	,946
Graduate Degree	47	Primary Education	9,57447*	,002
		Secondary Education	9,51829*	,000
		Associate Degree	-1,65887	,946

When table 4 is studied, a significant difference in favor of children of mothers with associate degree is found between children of mothers with primary education degree (X=35,00) and children of mothers with associate degree; and a significant difference in favor of children of mothers with graduate degree is found between children of mothers with primary education degree (X= 35,00) and children of mothers with graduate degree (X= 44,57). Also a significant difference in favor of children of mothers with associate degree is found between children of mothers with secondary education degree (X= 35,05) and children of mothers with associate degree (X=46,23); and a significant difference is found in favor of children of mothers with graduate degree between children of mothers with secondary education degree (X=35,05) and children of mothers with graduate degree (X=44,57).

Table 5: ANOVA Results of Number and Operation Concepts Test Scores By Father's Education Level Variable

Source of the Variance	Sum of Squares	df	Mean Square	F	*p*
Between Groups	3208,970	3	1069,657		
Within Groups	37070,413	213	174,039	6,146	,001
Total	40279,382	216			

When table 5 is studied, a significant difference is found (F=6,146, p <.05) for The Number and Operation Concept Test scores by the father's education level.
Groups are compared with each other to determine which groups have this difference. Since the variances are homogeneous, Tukey test is perfomed and the results are given in Table 6.

Table 6: Tukey Table of Number and Operation Concepts Test Score by Father's Education Level Variable.

Father's Education Level	**N**	**Father's Education**	**Mean Difference**	***P***
Primary Education	34	Secondary Education	2,47619	,653
		Associate Degree	5,28571	,058
		Graduate Degree	-4,37037*	,002
Secondary Education	70	Primary Education	-2,47619	,653
		Associate Degree	2,80952	,869
		Graduate Degree	-6,84656*	,009
Associate Degree	42	Primary Education	-5,28571	,058
		Secondary Education	-2,80952	,869
		Graduate Degree	-9,65608*	,000
Graduate Degree	71	Primary Education	4,37037*	,002
		Secondary Education	6,84656*	,009
		Associate Degree	9,65608*	,000

When table 6 is studied, a significant difference in favor of children of fathers with graduate degree is found between children of fathers with primary education degree (X= 36,00) and children of fathers with graduate degree (X= 43,37); a significant difference in favor of children of fathers with graduate degree is found between children of fathers with secondary education degree (X= 36,52) and children of fathers with graduate degree (X= 43,37); and a significant difference in favor of children of fathers with graduate degree is found between childrenn of fathers with associate degree (X= 35,71) and children of fathers with graduate degree (X= 43,37).

CONCLUSION AND DISCUSSION

When results obtained in light of the findings are studied, it is firstly observed that children's number and operation skills change according to age groups. Similarly to this result, when the litterature is studied it is determined that the number skills show differences by age groups, that there is a decrease in errors as the age grows, and an increase in errors as the number of objects increases (Aunio et. al., 2004; Bruce and Threlfall, 2004; Camos, Barrouillet and Fayol, 2001; Freeman, Antonucci and Lewis, 2000; Ömercikoğlu, 2006; Patel and Canobi, 2010). Additionally, when the operation skills of children are also studied in light of the litterature, it can be observed that, parallel to the result of the study, children's operation skills show differences by age groups (Patel and Canobi, 2010). It can be said that this differentiation in children's number and operation skills, which appears depending on the age group, is caused by children's general developmental characteristics.

When the second result obtained from the study is studied, it is observed that children's number and operation skills don't vary according to gender. When studies analyzing the effect of the gender variable on the mathematics skills of children in preschool period are examined, it is seen that, while it is possible to see many studies in parallel with the finding of this research (Aunio et. al., 2004; Bengino and Ellis, 2004; Erdoğan, 2006; Sezer, 2008; Yıldız, 1998), there are also findings in the litterature that, contrarily, show the existence of gender's effect on children's mathematics skills (Howell and Kemp, 2010; Jordan et. al. 2006).

As a result of the research, it can be said that, determining that gender has no effect on children's number and operation skills is caused by the children attending preschool education and by the preschool education which gives equal opportunity to both genders.

When the third result obtained from the study is studied, it is observed that the parents' education level is effective on children's number and operation skills, and children's number and operation skills positively improve as the parents' education level increases. In litterature, Bengino and Ellis (2004) state that children with family and sibling support are more successful with their mathematics skills, Jordan et. al. (2006) state that the progress in mathematics skills of children from low-income families is slower than the progress of children from mid-income families. Besides these, studies showing no similarity with the findings and indicating that parents' education level doesn't affect children's mathematic skills are also seen (Erdoğan, 2006). The reason behind the occurence of this result may be caused by families with high education levels being more successful in creating rich and stimulating environment opportunities than other families.

In light of the findings, it can be proposed that families spend quality and effective time with their children, provide stimulating-rich environment opportunities when supporting their children's mathematics skills, and provide opportunities for their children to have proper experiences. Also, it can be proposed that teachers observe differences caused by children's socio-economic levels and take necessary precautions, and realize studies to inform families on this subject.

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