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Parent variables related to home-based mathematics and early literacy activities in preschool: Evidence from a Saudi Arabian study

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Abstract Aims: This research aimed to determine the level of activities related to mathematics and literacy preparation skills carried out by parents at home during the preschool period and to determine the relationship between the level of support for children's mathematics skills at home and the support for literacy preparation skills at home. **Methods:** Four-hundred and fifty parents participated in the study, using random sampling method. Data analysis was carried out with the data of a total of ٤٠٠ participants due to missing data, data cleaning and data removal during examination of test assumptions. Two instruments were used to collect data: Early Math Questionnaire (EMQ; Missall et al., ٢٠١٥), and The "Child-Parent Co-Reading Activities " scale developed by Işıkoğlu Erdoğan (٢٠١٦). **Findings:** It seems that the mothers and fathers in this study do math and reading activities with their child very often. According to the results of this study, it was observed that the parents did activities to improve and support their mathematics skills very often. There are significant differences between the scores of mothers (females) and fathers (males) in early math questionnaire. There is no statistically significant difference according to parents' age. Concerning the "Child-Parent Co-Reading Activities, there is no significant difference is observed between the groups for any demographic variable except the score received by the parents (gender).

Keywords: Parent variables, home-based mathematics, early literacy activities ,preschool, Saudi Arabian study

Introduction

Preschool years are the building block of the educational adventure that begins with the birth of the child and continues throughout life. Its share in the later periods of an individual's life is considered important. During the preschool period, brain development occurs rapidly, and a foundation is formed for the cognitive, language, motor, social and emotional development areas of this period. The child, who begins to gain competence in these areas, also shows rapid cognitive development (Akar&

Aksoy, ٢٠٢١; Eissa, ٢٠١٨). Mathematics and literacy preparation skills are among the basic skills acquired during the child's preparation for school, and these skills are considered two important early indicators of the child's academic success in the future (Duncan et al., ٢٠٠٨).

Early academic skills—literacy and numeracy skills in particular—are important for the development of later skills and are predictive of long-term academic achievement. Despite the importance of these early skills, children enter the school setting with varying literacy and numeracy abilities (Napoli et al., ٢٠٢١). Early mathematics skills, which begin to develop before school age and provide the foundation for later mathematics skills; these include sub-skills such as the ability to know instantly without counting, knowledge of numbers, being able to keep numbers in mind, distinguishing size concepts such as large and small, matching, sorting, grouping, and performing simple operations (Krajewski & Schneider, ٢٠٠٩). There are also sources that group these skills as number concept and counting abilities, numerical relations and arithmetic operations (Jordan et al., ٢٠٠٦).

Within the scope of reading and writing preparation skills; competencies such as verbal language skills, alphabet recognition, phonological awareness, vocabulary, distinguishing spoken words from written words and writing (Eissa, ٢٠١٤; ٢٠١٥). Among these, understanding vocabulary, vocabulary and grammar rules are among the verbal language skills. Alphabet and letter knowledge refers to the child's acquisition of information such as the combination of letters to form words and the relationship of letters to the sounds they describe. Phonological awareness includes developing the ability to use language in different ways, such as sensitivity to sounds, being able to form words from sounds, and separating words into sounds (Eissa, ٢٠١٧).

The child, who begins to acquire early mathematics and literacy preparation skills in the first years of life, learns these skills through home and school experiences. Nokali et al. (٢٠١٠) emphasized that factors such as the school and family being in communication and the family being aware of the learning activities carried out by the teacher increase the frequency of support provided to the child at home. In this regard, the teacher's knowledge of the family is an important factor in supporting the child's learning.

According to Lynch et al. (٢٠٠٦), who argue that there are two different family structures that the teacher may encounter in the process of getting to know the family, the first family type is aware of its own share in the child's learning process and ensures that the skills acquired at school are reinforced and supported at home. The second type of family believes that the teacher is the only responsible person in the child's education process and does not take much responsibility, especially in teaching activities. During the quality pre-school education process, the teacher must get to know the family and provide support for the child's education.

While the child acquires his first life experiences in the family environment, he also learns to be self-confident, to establish social relationships and to have attitudes and behaviors appropriate to the society he lives in. In addition, children have the opportunity to acquire skills and equipment that will prepare them for school, which begin to develop in the family environment before moving on to formal education (Akar& Aksoy,٢٠٢١).

School preparation activities that families offer to children should include their social skills as well as their gains in different areas such as cognitive, emotional and motor development. In particular, family support is more important for the later academic lives of children in risk groups such as low socio-economic status. However, not every child may be supported at the same level in their home environment (Cunnigham & Zibulsky, ٢٠١١).

The main reasons for the individual differences seen among children in the first years of school include the support of the family and whether the child attends a pre-school institution or not. For this reason, school readiness is a concept that the family and the pre-school institution should address holistically (Snow, ٢٠٠٦).

Problem Statement

Many studies in the literature have revealed the contribution of the support provided by families to children at home to their early academic skills, including basic mathematics and literacy preparation skills (Akıncı & Tezel, ٢٠١٨; Akyüz and Doğan, ٢٠١٧; LeFevre et al., ٢٠٠٩; Purpura et al., ٢٠٢٠). In addition, when the existing research is examined, it is seen that studies on the literacy environment at home are predominant and the research focuses on issues such as the socio-economic level of parents, their views and opinions, and shared book reading (Altun, ٢٠١٦; Cunningham & Zibulsky, ٢٠١١; Veryeri & Küntay, ٢٠١٧).

Preschool children's exposure to books at an early age can also have an important place in their early academic skills. Book reading activities that parents carry out with their children at home contribute to the child's literacy education (Tepetaş et al.,٢٠٢١). These activities enable the child to make a transition from spoken language to written language by being aware of the existence of written language, thus increasing their level of readiness for school (Pamuk et al.,٢٠٢٣).

Polat (٢٠٠٦) suggested that children who are frequently read to by their parents and who have their own books at home have more advanced language development and can show higher levels of success in vocal studies compared to their peers who do not participate in book reading activities at home.

Duursma and Pan (٢٠١١) examined the book reading habits of families in their research with the children of ٨٠٠ mothers and fathers from lower socio-economic levels. Similarities and differences between families where only mothers frequently participate in book reading activities versus families where both parents frequently

read books were examined. It was observed that in more than half of the participating families, both mothers and fathers regularly participate in book reading activities. Among the results of the research are the fact that as the level of education increases, the frequency of reading activities at home increases and the economic levels of families where both parents read books at the same level are higher.

Revelle and Bowman (٢٠١٧) examined the reading activities of three-year-old children with their families using books in different formats (printed books and digital books). Researchers collected data by taking notes of conversations between parent and child during reading activities. Research findings have revealed that parents' conversations with their children about book content are much more limited during activities read online.

Shahaeian et al. (٢٠١٨) examined the relationship of shared book reading activities with their subsequent academic success in their study involving ٤,٧٦٨ children aged between two and three years. The study was conducted in a longitudinal design, observing the effects of children's early academic skills and families' socio-economic levels. Children's academic achievement levels were evaluated with standardized national test scores when they reached an average age of ٩ years. Research findings have shown that children's academic achievement scores are directly and indirectly related to early academic skills acquired through shared reading in early periods. In the study, the frequency of reading activities was seen as an important predictor of academic success.

The findings of Dulay et al.(٢٠١٨), in which they used the structural equation model, showed that the socio-economic status of the children and their home literacy environment were detrimental to children from low socio-economic families, and that there was a positive and significant relationship with the status of receiving pre-school education, the self-efficacy of the parents and the skills the children had. It has been observed that the home literacy environments of three- or four-year-old children receiving pre-school education have a positive effect on their grammar skills.

Even though the activities involving early mathematics and literacy preparation skills carried out by parents at home have been the subject of many studies independently of each other (O'Brien et al., ٢٠٢٠; Purpura et al., ٢٠٢٠), the number of domestic studies conducted with a relational design is quite limited.

In fact, supporting children's early mathematics and literacy preparation skills with various experiences at home is important in terms of contributing to their readiness for primary school in both areas and having positive effects on their future academic success. However, understanding the direction and strength of the relationship between these two areas can also affect the quality of support provided to children at home.

Research objectives and questions

From this point of view, this research aims to determine the level of activities related to mathematics and literacy preparation skills carried out by parents at home during the preschool period and to determine the relationship between the level of support for children's mathematics skills at home and the support for literacy preparation skills at home.

The following questions are posed:

١. To what degree do parents include activities related to mathematics and literacy preparation skills at home during the preschool period?

٢. Is there a statistically significant relationship between the level of parents' involvement in mathematics skills and literacy preparation skills in the preschool period?

٣. Does the support provided at home for mathematics and literacy preparation skills differ significantly according to socio-demographic characteristics(parent's relationship with the child, child's age, attendance at pre-school education, parents' age and education level, number of adults and children at home, monthly income of the family)?

Research hypotheses

١. Parents include activities related to mathematics and literacy preparation skills at home during the preschool period with high degree.

٢. There is a statistically significant relationship between the level of parents' involvement in mathematics skills and literacy preparation skills in the preschool period.

٣. The support provided at home for mathematics and literacy preparation skills differ significantly according to socio-demographic characteristics (parent's relationship with the child, child's age, attendance at pre-school education, parents' age and education level, number of adults and children at home, monthly income of the family).

Method

Participants

Four-hundred and fifty parents participated in the study, using random sampling method. Data analysis was carried out with the data of a total of ٤٠٠ participants due to missing data, data cleaning and data removal during examination of test assumptions. The researchers recruited parents through meeting with parents in-person at publicly funded pre-kindergarten programs when parents were dropping off or picking up their children, word-of-mouth referrals, and sharing information with

parents at public play yards within the vicinity of the pre-kindergarten institutions. The distribution of the parents constituting the study group according to socio-demographic variables is presented in Table ١.

Table ١. *Distribution of participants by Demographic Variables*

Variables	Group	Number	%
Gender	Female	٢٩٠	٧٢,٥٪
	Male	١١٠	٢٧,٥٪
	Total	٤٠٠	١٠٠
Age	٢٠-٢٥	٢٠٠	٥٠٪
	٢٦-٣٠	١٦٠	٤٠٪
	٣١ and older	٤٠	١٠٪
Education Level	Primary/Middle School	٤٠	١٠٪
	High School	١٧٠	٤٢,٥٪
	University Degree	١٩٠	٤٧,٥٪
Number of children	One	٢٥	٦,٢٪
	Two	٧٥	١٨,٧٪
	Three and above	٣٠٠	٧٥٪
Income	Low Income	١٦	٤٪
	Middle Income	٢٩٠	٧٢,٥٪
	High Income	٩٤	٢٣,٥٪

Data Collection Tools

Personal Information Form: This form, filled out by the parents, was used to determine the demographic characteristics of the parents and their children participating in the study. The form included questions such as the parent's relationship with the child, the child's age, attendance at pre-school education, the parents' age and education level, the number of adults and children in the house, and the family's total monthly income.

Early Math Questionnaire (EMQ; Missall et al., ٢٠١٥): The third section of the EMQ includes ١٣ questions that focus on mathematics-related beliefs, and asks parents/guardians to rate “how you think and feel about mathematics.” Questions address values and beliefs, personal experiences, and self-efficacy. Items are rated on a ٤-point Likert scale (١ = strongly disagree, ٢ = disagree, ٣ = agree, and ٤ = strongly agree) (Missall et al., ٢٠١٥). Scores for this measure were obtained by averaging responses to all ١٣ questions. In this study, Cronbach’s α = ٠,٩١

The "Child-Parent Co-Reading Activities " scale developed by Işıkoğlu Erdoğan (٢٠١٦) was used to determine parents' book reading activities to their children. This scale, whose validity and reliability studies have been published, consists of ١٣ multiple-choice questions that measure reading habits and ٣٨ items rated on a ٤-point Likert scale that measure reading activities together. Child-Parent Co-Reading Activities has ٥ dimensions: "interactive reading together", "views on reading

together", "modeling literacy", "importance of literacy" and "literacy teaching". The total (α) coefficient of the tool was found to be .٨١ (Işıkoğlu Erdoğan, ٢٠١٦). In this study, Cronbach's α = ٠,٨٦.

Procedure

Parents were contacted by the school personnel ,and they were asked to sign Informed parental consent. The personal information form, parental participation in mathematics activities scale and child parent reading activities measurement tools were to be filled in by parents. Teachers working in pre-school education institutions were contacted and informed about the study, and help in collecting data . For this purpose, preschool teachers were asked to provide information about the study to parents with children aged ٣-٦.

Findings

Descriptive statistics

Descriptive statistics regarding the participants' scores from Early Math Questionnaire and The "Child-Parent Co-Reading Activities " scale are presented in Table ٢. As shown in table ٢, it seems that the mothers and fathers in this study do math and reading activities with their child very often.

Table ٢. *Mean and Standard Deviation of the Early Math Questionnaire and The "Child-Parent Co-Reading Activities " scales*

Scale	Number	Mean	SD
Early Math Questionnaire	٤٠٠	٤.٦٧	.٨٩
Child-Parent Co-Reading Activities	٤٠٠	٣.٨٨	.٨٢

One-way ANOVA analyzes

Table ٣ *One-way ANOVA analyzes for early math questionnaire according to demographic variables*

Demographic Variable	N	M	SD	t	*F*	*p*	Levene Statistic (p value)
Gender	٤٠٠			٢,٢٤		.٠٤	< .٠٠١
Femal	٢٩٠	٤,٢٢	.٦٧				
Male	١١٠	٤,٠٥	.٧٢				
Age					٢,١١	.٠٩	.٠٤٣
٢٠-٢٥	٢٠٠	٤,٥٦					
٢٦-٣٠	١٦٠	٤,٢١					
٣١ and older	٤٠	٤,٠٠					
Education Level					٣,٤٤	.٠٠٥	.٢٩
Primary/Middle	٤٠	٤,٠١	.٦٩				

School							
High School	١٧٠	٤,١٣	.٧٦				
University Degree	١٩٠	٤,٢٣	.٨٧				
Income					٤,١١	.٠٠٤	.٤٢
Low Income	١٦	٤,١٠	.٧٦				
Middle Income	٢٩٠	٤,٥٠	.٨٧				
High Income	٩٤	٤,٢٢	.٧٨				
Number of children					٤,٠٢	.٠٠٤	.٣٩
One	٢٥	٤,٠٣	.٨٧				
Two	٧٥	٤,٢١	.٧٨				
Three and above	٣٠٠	٤,٥٠	.٨٧				

Table ٤ *One-way ANOVA analyzes for The "Child-Parent Co-Reading Activities (ÇEBOE)according to demographic variables*

Demographic Variable	N	M	SD	t	*F*	*p*	Levene Statistic (p value)
Gender	٤٠٠			٦,٣٣		< .٠٠١	.٤٣
Femal	٢٩٠	٣,٧٧	.٧١				
Male	١١٠	٣,٣٤	.٧٩				
Age					٢,٨٨	.١٢	.٢١
٢٠-٢٥	٢٠٠	٣,٦٦					
٢٦-٣٠	١٦٠	٣,٤١					
٣١ and older	٤٠	٣,٠٥					
Education Level					٢,١٣	.١٩	.٣٠
Primary/Middle School	٤٠	٣,٠٠	.٦٤				
High School	١٧٠	٣,١٩	.٧٣				
University Degree	١٩٠	٣,٢٧	.٨٠				
Income					١,٢٢	.١٦	.٣٧
Low Income	١٦	٣,١٩	.٧٥				
Middle Income	٢٩٠	٣,٨٠	.٨٠				
High Income	٩٤	٣,٣٤	.٧٩				
Number of children					١,٤١	.٢٠	.٣٤
One	٢٥	٣,١٠	.٨٣				
Two	٧٥	٣,٢٣	.٧٤				
Three and above	٣٠٠	٣,٨٨	.٨١				

One-way ANOVA analyzes were used to examine possible differences between participants in the demographic variables. The findings of each measurement tool are presented below. The results of the scores obtained from the Early Math Questionnaire according to demographic variables are presented in Table ٣. As shown in table ٣, there are significant differences between the scores of mothers (females) and fathers (males) in early math questionnaire, t= ٢,٢٤, p = .٠٤, Levene's statistical

p< .٠٠١. There is no statistically significant difference according to parents' age. As for education level , it is noted that there is a significant difference between at least two groups, F (٣, ٤٠٠) = ٣,٤٤, p = .٠٠٥, Levene's Statistics p = .٢٩. According to the post hoc analysis using the Tukey test, the differences observed between groups according to educational level are observed only between those who got primary /middle school and those who obtained a university degree (Mean Difference = .٣٤; p = .٠١). Results show that there is a significant difference according to income (F (٢, ٤٠٠) = ٤,١١, p = .٠٠٤, Levene's Statistics p = .٤٢). According to the subsequent post hoc analysis, the average scores received by families with low income and those with middle income (Mean Difference = .٢٨; p = .٠٢) , low income and high income(Mean Difference =.٣٢; p = .٠٠٥). as detetcted, there are statistically significant differences of parents according to the number of children they have, in at least two groups, F (٢, ٤٠٠) = ٤,٠٢, p = .٠٠٤, Levene's Statistics p = .٣٩. Parents with one child are higher than parents with two children (Mean Difference = .٢١; p = .٠٤٣) and parents with three or more children (Mean Difference = .٣٦; p = .٠٠٥). Concerning The "Child-Parent Co-Reading Activities, there is no significant difference is observed between the groups for any demographic variable except the score received by the parents (gender). According to the independent groups t-test analysis, mothers (M = ٣,٧٧; SD = .٧١) received significantly higher scores than fathers (M = ٣,٣٤; SD = .٧٩), t(٤٠٠) = ٦,٣٣, p < .٠٠١, Levene Statistic p= .٤٣.

Discussion

Families have an important role in the academic development of preschool children and their preparation for primary school. In this context, families' support for the cognitive, affective, social and psycho-motor development of their children has a critical impact on both their readiness for school and their academic success in the future (Lee,٢٠٢٣). Early mathematics skills and literacy activities are considered important in supporting children's academic success in the future (Alptekin& Sönmez, ٢٠٢٢).

This research aimed to determine the level of activities related to mathematics and literacy preparation skills carried out by parents at home during the preschool period and to determine the relationship between the level of support for children's mathematics skills at home and the support for literacy preparation skills at home.

Parents support to their mathematics skills

According to the results of this study, it was observed that the parents did activities to improve and support their mathematics skills very often. Based on these findings, it can be said that parents mostly include mathematical activities in games and daily activities in the mathematical activities they carry out with their children, rather than activities related to skills such as addition and subtraction and solving simple problems. This finding can be explained by parents' lack of experience or knowledge about which activities to support their children's operation skills such as

addition and subtraction. In addition, parents may not feel adequate about how they can support these activities through games, depending on their children's ages and interests.

The relationship between demographic characteristics of the child and the parents

The relationship between some demographic characteristics of the child and the parents in the preschool period and the availability of activities supporting early literacy and mathematics skills provided by their parents at home was examined. It was observed that the scores of parents who are university graduates are higher than those who obtained only primary and high school degree. There are research findings among parents showing that the education level of the mother, in particular, has an impact on the mathematics skills of the children (Güleç, ٢٠١٥).

Although there are studies in the literature that suggest that the education level of the parents is a predictor of the home mathematics environment (Purpura et al., ٢٠٢٠), on the contrary, there are other studies in which the parent's education level is not seen as any predictor of the home mathematics environment (Ergel & Aydoğan, ٢٠٢١). Based on these findings, it can be thought that the education level of the parents may be important, but informative training on this subject can help parents provide home-based support to their children, and thus the differences that may arise depending on the differences between the educational level of the parents can fade away.

The finding that the quality of the support provided to the child at home during the preschool period differs according to the family's income level is similar to the findings of other studies in the literature (Ergül et al., ٢٠١٧; İvrendi & Wakefield, ٢٠٠٩; Starkey et al., ٢٠٠٤).

This may be due to that families with low socio-economic levels cannot provide their children with sufficient stimulating environmental opportunities. In addition, families working in low-income may have to work longer hours, and the time the family can spare for the child's academic development may decrease. As for the effect of the number of children a family has on parents' participation in mathematics activities, it is seen that the average scores of families with one or two children are higher than those of families with three or more children. The reason for this may be that as the number of children increases, the time the family can spend per child may decrease. Similarly, İvrendi and Wakefield (٢٠٠٩) revealed in their study that the mathematics support that families give to their children at home is related to education level, income level, occupation and age factors.

Regarding the book reading activities that parents do with their children are examined by parental gender. It was observed that mothers participate in these activities more than fathers. Duursma and Pan (٢٠١١) stated that mothers read more books than fathers in book reading activities. This finding may make sense considering that in many families, mothers spend more time with children than

fathers. In addition, there was no statistically significant difference between variables such as the parent's age, education level, income level and the total scores obtained from The "Child-Parent Co-Reading Activities. The difference in the frequency of implementation of literacy preparation skills by parents according to mother and father variables is similar to that of book reading activities. In other words, mothers' participation in home literacy activities with their children is more than fathers.

Conclusion

The study extends our understanding of the home learning environment of Saudi kindergarten children. Understanding factors that are related to the home literacy and numeracy environments may be an important step in identifying how to best encourage parents to engage their children in these practices at home. As a result of this finding, it was suggested to increase parents' capability on early literacy with the help of presenting sample structured and unstructured activities, seminars, and workshops.

Limitations

These research findings show that fathers are less likely to participate in home activities related to academic skills than mothers. However, the number of fathers participating in this study was significantly less than the number of mothers. For this reason, similar studies can be conducted with greater participation of fathers. In this study, data was not collected from children, but data was collected only from parents. Data can be collected and examined from children regarding the skills included in early academic skills, and there may be an opportunity to evaluate them more holistically. A different study could examine the relationship between support given to academic skills and children's competencies in these areas.

Data can also be collected from teachers by examining factors such as the teacher's attitude, the teaching methods applied, the alternative education system adopted by the preschool institution, and the cooperation with the family, which may affect the quality of the home literacy and mathematics environment.

Informed Consent Statement: Parents agreed to informed consent before filling out the questionnaires.

Data Availability Statement: The data of the present study is not openly available, as the participants in this study did not agree to their data being shared publicly during the data collection phase of the study.

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Conflicts of Interest: The author declares no conflict of interest.

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متغيرات الوالدين المتعلقة بأنشطة الرياضيات والقراءة والكتابة المبكرة في المنزل في مرحلة ما قبل المدرسة: دليل من دراسة سعودية

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الملخص: هدف هذا البحث إلى تحديد مستوى الأنشطة المتعلقة بمهارات الإعداد للرياضيات وأنشطة القراءة والكتابة المبكرة التي يقوم بها الوالدان في المنزل خلال مرحلة ما قبل المدرسة وتحديد العلاقة بين مستوى دعم مهارات الرياضيات لدى الأطفال في المنزل ودعم مهارات الإعداد لأنشطة القراءة والكتابة المبكرة فى البيت. شارك في الدراسة أربعمائة من الآباء والأمهات باستخدام طريقة أخذ العينات العشوائية. وتم استخدام الاستبيانات لجمع وتحليل البيانات. يبدو أن الأمهات والآباء في هذه الدراسة يقومون بأنشطة الرياضيات والقراءة مع أطفالهم في كثير من الأحيان. ووفقا لنتائج هذه الدراسة، لوحظ أن الآباء والأمهات قاموا بأنشطة لتحسين ودعم مهاراتهم في الرياضيات في كثير من الأحيان. توجد فروق ذات دلالة إحصائية بين درجات الأمهات والآباء في استبيان الرياضيات المبكر. لا يوجد فرق ذو دلالة إحصائية حسب عمر الوالدين. وفيما يتعلق بأنشطة القراءة المشتركة بين الطفل والآباء والأمهات ، لم يلاحظ وجود فروق ذات دلالة إحصائية بين المجموعات لأي متغير ديموغرافي باستثناء الدرجة التي حصل عليها الوالدان (على حسب النوع:الجنس).

الكلمات المفتاحية: متغيرات الوالدين، الرياضيات المنزلية، أنشطة القراءة المبكرة، مرحلة ما قبل المدرسة، دراسة في المملكة العربية السعودية