

“Is it a dairy product or food for breakfast?” Impact of preschool attendance on children’s categorical abilities

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Past research has shown that schooling has a significant impact on individuals’ categorical abilities; however, little is known about the effect of preschool attendance on these abilities. The purpose of this study was to explore the impact of preschool education on Turkish children’s categorical preferences and categorical achievement. In the study, in order to investigate the short and long-term effects of preschool attendance, primary school children were included in the sample as well as preschoolers. Thus, the sample consisted of 200 children from three different age groups (five-year-olds, first and third grade). Half of the children attended preschool (preschool group), half did not (non-preschool group). Data were collected through individual interviews. As data collection tools, conflict and non-conflict triads were used. Conflict triads were utilised to determine children’s categorical preferences, while non-conflict triads were used to evaluate children’s categorical achievement. Children were asked to indicate which option was in the same category with the target. Findings showed that there was a significant difference between preschool and non-preschool groups in categorical preferences. Preschool attendance also had a significant effect on children’s categorical achievement.

Introduction

The preschool years are a dynamic period of human development (Garzon, 2015). In this period, children develop rapidly in physical, cognitive and social terms, and learn a lot about the world around them. Therefore, it is a critical issue to provide quality education to children in this period (Aral, Baran, Bulut & Çimen, 2000). Preschool education is an educational level that serves children under school age (Johnson, 1996). It is the first level of formal education and provides a fundamental base for future lives of children (Heidari, 2014). However, the age group covered by the concept of preschool education differs from country to country. In Turkey, preschool education includes children aged 3-5 years (MEB, 2013). Therefore, in this study, the term of preschool education was used for the education of 3-5 years old children in kindergarten before starting primary school.

Over the past decades, a number of studies have been performed to assess the impacts of preschool attendance on individuals’ development. Some of these studies focused on short and long term impacts of the preschool attendance, while others examined its immediate effects. Three well-known longitudinal studies (the *Perry Preschool Project*, the *Carolina Abecedarian Project* and the *Chicago Child-Parent Centre Program*) have shown several short and long term benefits of preschool attendance that last through school ages and even in adulthood. The findings of these longitudinal studies indicated that participants in the intervention group had higher test scores in later school life; were more likely to graduate from four-year colleges; earned more money; needed less public assistance; were more likely to have their own homes and cars; were less involved in crime; tended to use less drugs and showed less antisocial behaviours compared to the non-involvement group

(Belfield, Nores, Barnett & Schweinhart, 2006; Conyers, Reynolds & Ou, 2003; Jensen, Holm & Bremberg, 2013; Ou & Reynolds, 2006; Ramey, Campbell, Burchinal, Skinner, Gardner & Ramey, 2000; Reynolds, Temple, Robertson & Mann, 2002; Schweinhart, 2003; Schweinhart, Montie, Xiang, Barnett, Belfield & Nores, 2005).

Consequently, longitudinal studies have shown that preschool attendance has short and long-term positive impacts on two main developmental domains: cognitive development (including cognitive functioning, maths and reading skills, school readiness, and academic success) and non-cognitive development (including socio-emotional attributes such as self-regulation, prosocial behaviours, and motivation) (Gong, Xu & Han, 2016; Sammons, Sylva, Melhuish, Siraj, Taggart, Smees & Toth, 2014). Cognitive development is a fundamental developmental area, defined as the construction of thought processes such as reasoning, categorisation, recall and problem solving, from early childhood to adulthood (McFadden, 2012). The cognitive development of children in the preschool period is very important because of the remarkable development of the brain (Raadt, 2010). Past studies have demonstrated that preschool attendance has a significant effect on children's cognitive development (e.g., Aguilar & Tansini, 2012; Bietenbeck et al., 2017; Camilli et al., 2010; Goodman & Sianesi, 2005; Loeb et al., 2007; Melhuish et al., 2015; Ramey et al., 2000; Santín & Sicilia, 2018). Reynolds, Temple & Ou (2010) stated that preschool attendance created a cognitive advantage that led to short and long term positive effects on the social and academic life of individuals.

Preschool education in Turkey

The history of preschool education in Turkey dates back to the Ottoman Empire, the beginning of the 20th century. The first preschool institutions were opened in the early 1900s (Acer, 2015). Although several attempts were made to develop preschool education in these last years of the Ottoman Empire, they were not effective due to the situation of the country (Oktay, 2000). The Republic of Turkey was founded after the fall of the Ottoman Empire. However, for many years it had not been possible to disseminate preschool education, due to Turkey's economic problems (Deretarla-Gül, 2008). In parallel with the increase in the number of working women since the 1960s, the number of preschool education institutions has started to increase. Since then, a number of official and civil initiatives have been launched to promote preschool education (Tüfekci-Akcan, 2008).

Today, preschool education is optional and covers three to five years of age in Turkey. It is offered by both the public and private sectors. According to Turkish National Education Statistics, as of 2018-2019, the preschool attendance rate of three to five-year old children was 45% in Turkey. The statistics show that most children do not access preschool education (SGB, 2020), and the proportion of children not attending preschool is higher in rural areas (Yağan-Güder, 2019).

All of the public preschool institutions in Turkey apply a national program known as the *Turkish National Preschool Education Program* (MEB, 2013). This is a framework and developmental program, and preschool teachers prepare monthly and daily schedules

according to their students' developmental levels, individual characteristics, interests, needs and environmental facilities, based on this framework. The aim of the program is to support each child's cognitive, socio-emotional, motor and language development and to improve self-care skills in the child. The program has many objectives in each developmental area and concepts that can be taught to children. Each teacher prepares educational activities such as games, maths, science, language, art, music, drama, movement and field trips for each child to reach these objectives. The program allows the teachers to decide what objectives are handled in each monthly and daily program, what kinds of activities are performed, what types of materials are utilised, and how to assess this process (MEB, 2013). When examining the Turkish National Preschool Program, it can be seen that there are several objectives that include observing, comparing, one to one correspondence, and grouping entities and concepts such as animate-inanimate, old-new, scented-scentless, hard-soft, hairy-hairless, bright-matte, dessert, salty, hot and sour that can support children's categorisation abilities.

Categorisation

Categorisation is a fundamental cognitive ability which refers to the process of dividing the world into meaningful units by bringing together entities that have common characteristics (Large et al., 2007). A category includes in a group items that are equivalent for some purpose (Murphy, 2010). Categories are the fundamental cognitive structure for understanding, identifying and organising things we encounter in our daily lives (Ware, 2017). Using categories mediates our interplay with the world; they design and refine our perception and cognition (Gee et al., 2012). Children begin to classify objects around them from a very early age (Deng & Sloutsky, 2013) and use categories to construct their thinking about real life. Categorisation also lets them understand that items can be classified in different ways (Large et al., 2007).

There are several ways children can categorise items (Nguyen & Murphy, 2003). One of them is *taxonomic categorisation*. The term of "taxonomy" is derived from *taxis* (division or arrangement) and *nomos* (law), which are ancient Greek words (Large et al., 2007). Warner (2004) described taxonomy as a system of labels that constructs a hierarchical navigation scheme (cited in Large et al., 2007). Taxonomic categories are formed according to joint features of objects and organise concepts into a hierarchical structure (Nguyen & Murphy, 2003). All members of a taxonomic category share some specific properties. Most of the categories collected by common names such as cars, vegetables, mushrooms, predators or books are taxonomic (Nguyen, 2008).

Thematic categories group objects that often have a spatial or temporal contiguity (e.g., a horse and a saddle form a thematic category because a saddle is used to ride a horse). Thematic categories contain spatial (e.g., the money is placed in the wallet), functional (e.g., a bottle opener is used to open a bottle cap) or temporal relations (e.g., menus generally come before meals). Sometimes objects may have more than one kind of common thematic relation (Lin, 1996). For instance, a bottle opener and a bottle cap have both spatial and functional relations. Contrary to taxonomic category, members of the

same thematic category do not have to share the same perceptual attributes. Thematic category members functionally complement one another (Sachs et al., 2007).

Script categories comprise items that have a same function in an event or a daily activity, such as materials needed for painting. Unlike a taxonomic category, members of a script category do not always have the same common features. The role of items in the same event or routine activity brings them together (Nguyen & Murphy, 2003). For instance, a piece of cake and birthday decorations do not have the same attributes, but they have the same role in a current situation (e.g., necessary things for a birthday party). Therefore, they are members of the same category. Script categories are also dissimilar to thematic categories. Items that occur in the same time and place and perform an integral role are grouped in same thematic category. On the other hand, members of a script category do not always occur in the same time and place and have an integral role (Nguyen, 2007, 2008; Nguyen & Murphy, 2003).

Another category type used by children is *evaluative category*. In an evaluative category, items are evaluated according to their positive or negative attributes. For example, healthy/unhealthy foods or useful/harmful stimulus are evaluative categories. Evaluative categories help us to distinguish between useful and harmful stimulus and to give appropriate responses to them (Nguyen & Murphy, 2003).

Development of categorisation abilities in childhood

There are many studies about the factors that can affect children's categorical abilities. The most researched factor is age. In research on conceptual development, there are several perspectives on when categories emerge and how they develop in children. According to the traditional view of categorisation, a developmental shift occurs in children's categorical preferences during the primary school years (Greenfield & Scott, 1986; Jahandarie, 1986; Nelson & Nelson, 1990; Ralli & Niasti, 2018; Smiley & Brown, 1979). The traditional view states that while children primarily use thematic, script or evaluative categories, they prefer to use taxonomic categories after starting primary school. Parallel to the traditional categorisation approach, several researchers have determined that young children mostly classify objects according to thematic / script relations, while school age children generally group objects according to taxonomic relations. For example, in a recent study, Ralli and Niasti (2018) found that younger participants (3 and 6-years-olds) tended to create groups of items according to thematic relations, while older participants (9, 13 and 20-years-olds) created groups of items on a taxonomic associations.

In these studies, conflict triads that comprised a target and two alternatives categorically related to the target were used. Children were asked to choose the alternative that was in the same category with the target. In conflict triads, both alternatives are correct, and children have to choose one of them. Nguyen and Murphy (2003) stated that conflict triads reflect children's categorical preferences, do not present their categorical achievement, and children's choice of the thematic alternative in a conflict triad does not imply that they do not know taxonomic categories. Therefore, they used non-conflict triads to investigate children's categorical achievement. In contrast to the conflict triad, in

a non-conflict triad, there is only one correct alternative (in a non-conflict triad, there is a target, an alternative that is categorically related to the target and another alternative that does not have any categorical relationship with the target) and these triads are used to measure children's categorical success rather than their categorical preferences. Nguyen and Murphy (2003), in their research using non-conflict triads, found that children can use different types of categories simultaneous from the early years, and their categorisation performance increases with age. Follow-up studies (Aslan, 2010, 2011; Nguyen, 2007, 2008) that used non-conflict triads produced similar results.

Socioeconomic status may also affect children's categorical abilities. Mpofu and Vijver (2000) determined that preschoolers who come from high income families generated more taxonomic categories than their peers come from lower SES families. Similarly, Aslan (2013a) found that middle-income children had better performance in categorisation than their low-income peers. Miyamoto and Ji (2011) stated that socioeconomic status effects individuals' categorical choice and high socioeconomic status (SES) predict taxonomic categorisation. They found that the participants with a higher socioeconomic status categorised more taxonomically than those who had a lower socioeconomic status.

Lastly, education is another factor that may affect children's categorical abilities. A number of studies have shown that formal education has a significant impact on individuals' categorical preferences (e.g., Brown, McDonald & Roman, 2014; Greenfield et al., 1966; Luria, 1976; Scribner, 1974; Wassman & Dasen, 1994). Brown et al. (2014), for instance, found that low-educated adults living in a rural setting mostly grouped items in a functional, self-referent way and made less use of taxonomic categories than highly educated adults living in urban settings. A similar trend was observed in children. Greenfield et al. (1966) found that there was an impact of schooling on categorical preferences and educated children tended to grouping objects taxonomically. Moreover, the content of education programs offered to children also may effect their categorical abilities (Kaefer & Neuman, 2013; Neuman & Dwyer, 2011; Sung, Chang & Lee, 2008). Aslan (2013b) found that 6-year-old children who joined a project-based program developed to support categorical abilities, performed better on non-conflict triads than their peers who joined the regular school program. In another study, Sung et al. (2011) determined that multimedia games designed to develop taxonomic concepts helped young children understand the difference between thematic and taxonomic categories, and improved concepts about hierarchical taxonomic.

The present study

Previous studies have shown that formal education effect individuals' categorical abilities (e.g., Brown et al., 2014; Greenfield et al., 1966). Whilst these studies focused mostly on elementary or later education levels, numerous other studies have reported that preschool education has significant impacts on children's cognitive abilities (e.g., Anderson et al., 2003; Camilli et al., 2010; Kartal, 2007; Malmberg et al., 2011). Categorisation is a main cognitive ability for humans and its development should be supported from an early age. Therefore, it is important to know how preschool education affects children's categorical

abilities. Considering the available findings about the factors affecting children's categorical abilities, the current study sought answers to the questions:

1. How does preschool attendance affect children's categorical preferences?
2. How does preschool attendance affect children's categorical achievement?

Methods

Research design

In this study a quantitative approach was employed with a cross-sectional design to examine the effects of preschool attendance on children's categorical preferences and categorical achievement. A causal-comparative research design was selected, being a design suitable for specifying the reasons for an event or a situation, and the variables that impact these reasons (Büyükoztürk, Çakmak, Akgün, Karadeniz & Demirel, 2012). The advantage of causal-comparative research design is that it enables study of cause and effect relationships under conditions where it is difficult or impossible to manipulate experimentally (Gay, Mills & Airasian, 2006).

Participants

The sample comprised 100 children attending preschool and 100 not attending. In order to examine the short and long term effects of preschool education on children's categorical skills, primary school students as well as preschoolers were included in the study. Thus, the study included five, seven (first grade) and nine (third grade) year old children. For sampling, the researcher contacted local authorities to find five year old children not attending preschool, in four district of Adana, Turkey. From this list of children, 50 were selected using random numbers. Secondly, five-year-old children attending preschool were selected using random numbers, from three preschools in the same four districts. They were attending the National Preschool Education Program (MEB, 2013). Lastly, because elementary education in Turkey is compulsory, seven and eight year old children were selected from first and third classes of an elementary school in the same district, using random numbers. Half of them went to preschool and half did not.

There were 76 girls and 74 boys in the preschool group, and 74 girls and 76 boys in the non-preschool group. Most of the children in both groups had conventional two-parent families. The children also came from low or middle-income families. The parents had similar education levels in both groups. The mothers were mostly elementary or secondary school graduates, whereas most fathers were secondary or high school graduates. The professions of parents in both groups were also similar. Most of the mothers were housewives, whilst the majority of fathers were fabric workers or artisans.

Instruments

As data collection tools, conflict and non-conflict triads prepared by the researcher were used in the present study. Conflict triads were utilised to determine children's categorical

preferences, and non-conflict triads were used to assess children's categorical achievement. Each triad had three pictures (one target and two choices). Each picture was 2 x 3 inches, printed horizontally on A4 paper.

Conflict triads

Conflict triads consisted of a target (e.g., coke) and two choices that have a categorical relationship to the target (e.g., tea [taxonomic choice: coke and tea are beverages] and cake [script choice: coke and cake are eaten at the same time; for example, at a birthday party]). There were 18 conflict triads in total. Conflict triads were used to determine a child's preference when faced with two categories at the same time. In conflict triads, taxonomic, script and evaluative alternatives were randomly presented to the children. In a conflict triad, for example, a script choice was given as the first alternative, whereas in the next conflict triad, an evaluative choice was presented as a first choice.

Non-conflict triads

Non-conflict triads consisted of a target (e.g., a steak), an option that has a categorical relationship to the target (e.g., a sausage [taxonomically related]) and another option that has not any categorical relationship to the target (e.g., a cherry). There were 28 non-conflict triads in total. Taxonomic non-conflict triads comprised a target (e.g., a banana), an option that has a taxonomic relationship to the target (e.g., an apple [fruit]) and another option that has not any categorical relationship to the target (e.g., soup). In a script non-conflict triads, there was a target (e.g., cheese), an option that has a script relationship to the target (e.g., an egg [cheese and an egg are eaten at the breakfast]) and another option that has not any categorical relationship to the target (e.g., radish). Finally, evaluative non-conflict triads were composed of a target (e.g., celery), an option that has an evaluative relationship to the target (e.g., grapes [celery and grapes are healthy]) and another option that has not any categorical relationship to the target (e.g., candy).

Based on similar past research (Nguyen & Murphy, 2003), in order to decide on the items to be included in the data collection tools, they were presented to 10 university students who were asked to assess whether each option represent a target category. For example, "Is an egg appropriate for breakfast food?" (script category) or "Is pudding appropriate for a dairy product?" (taxonomic category). They used a five-point Likert scale to assess the suitability of each item. As a result of this assessment, items averaging below four were changed and the triads were formed with the remaining items. To assess the validity of the conflict and non-conflict triads, expert opinions were considered and the final versions of the triads were designed accordingly. KR-20 reliability coefficients were computed to test reliability, finding .75 for the non-conflict triads.

Procedure

For data collection, school administrations, teachers and families were informed about the aims and procedures of the research, and their permissions to conduct the research were obtained. Data were obtained through individual interviews with the children administered by the researcher in a quiet room of their school. Individual interviews with the five-year-old children not attending preschool were conducted in a silent room in their houses. The

interviews were held at the end of the training year. When a non-conflict triad was presented, the child was asked the names of foods in the triad, and then s/he was asked to find the alternative which was in the same group with the target. Subsequently, the child was shown the conflict triads. The same procedure as the non-conflict triads was applied in conflict triads.

Data analysis

The percentage and frequency of children's choices were calculated in conflict triads to determine children's categorical preferences. The mean scores of children in non-conflict triads were analysed based on descriptive statistics and normality test results. A Shapiro-Wilk test revealed that children's scores on non-conflict triads demonstrated normal distribution. Thus, children's scores on non-conflict triads were analysed with parametric tests. A two-way ANOVA with a Tukey's post-hoc analysis was performed to examine the separate and common effects of preschool education and age on children's scores on non-conflict triads. Lastly, a regression analysis was used in order to determine how independent variables predict the categorisation scores of children on the non-conflict triads.

Results

Children's categorical preferences

Figure 1 shows the distribution of the categorical preferences of the children in the preschool group according to age.

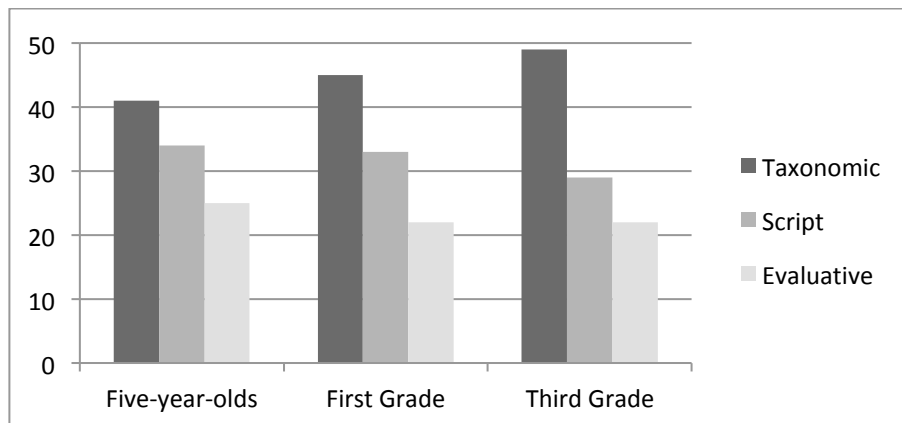


Figure 1: Distribution of the categorical preferences of children in the preschool group according to age.

Five-year-old children in the preschool group mostly chose taxonomic alternatives. Script categories were in second place and evaluative categories were third place in preferred order. There was an increase in preferences for taxonomic categories with age, whereas there was a decrease in preference for script categories; 41% of the 5-year-olds'

preferences were taxonomic, whereas 34% were script and 25% were evaluative. There was a similar distribution in first-grade students' preferences; 45% of their choices were taxonomic, 33% were script and 22% were evaluative categories. The gap in children's categorical preferences between taxonomic categories and other categories widened in third grade; 49% of the third-graders' preferences were taxonomic, whereas 29% were script and 22% were evaluative.

Figure 2 shows the distribution of the preferences of children in the non-preschool group according to age. Five-year-old children in the non-preschool group mostly chose script categories. However, there was a decrease in preferences for script categories with age. Third graders in the non-preschool group preferred taxonomic categories more than script categories; 43% of the 5-year-olds' preferences were script, whereas 31% were taxonomic and 26% were evaluative. First-graders chose taxonomic and script categories equally (38% taxonomic and 38% script), and 24% of the first-graders' preferences were evaluative. Lastly, third-graders in the non-preschool group chose taxonomic categories more than script and evaluative categories; 45% of the third-graders' preferences were taxonomic, whereas 34% were script and 21% were evaluative.

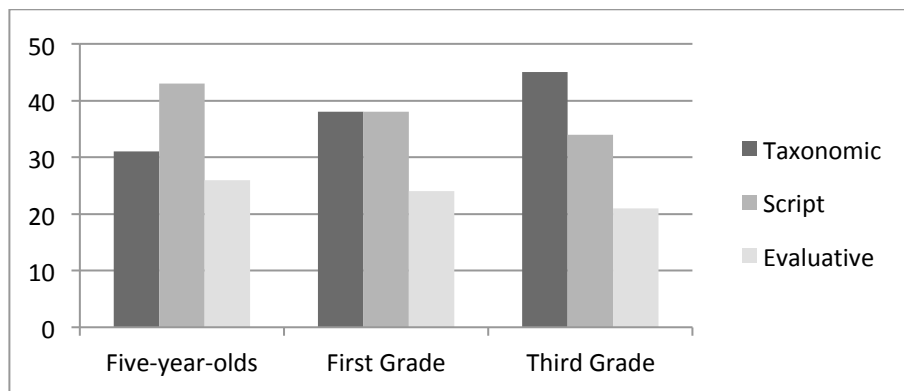


Figure 2: Distribution of the categorical preferences of children in the non-preschool group according to age.

Children's categorical success

Tables 1 and 2 presents results for children's scores according to preschool attendance and age.

Table 1: Means and standard deviations for children's scores according to preschool attendance and age

Groups	Attended preschool			Do not attend preschool			Total		
	n	Mean	SD	n	Mean	SD	N	Mean	SD
Five-year-olds	50	24.12	2.86	50	20.00	2.65	100	22.06	3.44
First grade	25	26.68	1.31	25	26.08	2.29	50	26.38	1.87
Third grade	25	26.40	3.10	25	25.96	2.28	50	26.18	2.70
Total	100	25.33	2.88	100	23.01	3.89	200	24.17	3.61

Table 2: Two-way ANOVA results for children's scores according to preschool attendance and age

Source of variance	Sum of squares	df	Mean square	F	P	η^2
Corrected model	1322.700	5	264.540	40.489	.001	.511
Intercept	111362.888	1	111362.888	17044.62	.001	.989
Preschool education	133.128	1	133.128	20.376	.001	.095
Age	891.420	2	445.710	68.218	.001	.413
Preschool education*Age	162.160	2	81.080	12.410	.001	.113
Error	1267.520	194	6,534			
Total	119428.000	200				
Corrected total	2590.220	199				

The results of two-way ANOVA revealed that there was a significant impact of preschool education on children's categorisation scores, but the effect size was small [$F(2,194)=20.376$, $p<.01$, $\eta^2=.095$]. The mean score of children in the preschool group was 25.33, whereas the mean scores of children in the non-preschool group was 23.01 (Table 1). Age also had a significant effect on children's categorisation scores and the effect size for this measure was medium [$F(2,194)=68.218$, $p<.01$, $\eta^2=.413$]. Tukey's post hoc analysis revealed that there was a statistically significant difference among the five-year-old children, first and third graders, against the five-year-old children. Lastly, It was found that the common effect of the factors whether or not to attend preschool and age on children's categorisation scores was significant but the effect size was small [$F(2,194)=12.41$, $p<.01$, $\eta^2=.113$].

Table 3 indicates the results of the regression analysis on the rate of how preschool attendance, gender, age, and parents' education as independent variables predict the categorisation scores of children on the non-conflict triads. When the binary and partial correlation between dependent variable and independent variables were examined, it was seen preschool education significantly accounts for 22% of the variance in children's categorisation success ($\Delta R^2=.22$). Moreover, preschool education and age significantly explained together 44% of the variance in categorical achievement of children ($\Delta R^2=.44$). The regression analysis also revealed that the most predictive variable of children's categorical achievement was age and preschool education followed it.

Table 3: Predictors of categorisation achievement

Variable	Categorical achievement		
	Model 1: B	Model 2: B	95% CI
Constant	18.49*	21.84*	[20.34, 23.37]
Preschool education	3.49*	2.53*	[1.73, 3.33]
Age		3.58*	[4.36, 2.81]
R ²	.22	.45	
F	56.12*	81.4*	
ΔR^2		.44	
ΔF		.23*	

Notes: N=200; * $p<.01$

Discussion

The current study was conducted to examine the effects of preschool attendance on children's categorical preferences and categorical achievement. Categorical preferences showed some differences according to whether they went to preschool or not. Five-year-old children in the preschool group mostly preferred taxonomic categories. Taxonomic preferences in the preschool group continued to increase in first and third grade. On the other hand, five-year-old children in the non-preschool group, in contrast with their peers in the preschool group, mostly preferred script categories. Script preferences in the non-preschool group decreased in primary school. Third graders in the non-preschool group mostly chose taxonomic categories, just like their peers in the preschool group, while first graders in the non-preschool group preferred taxonomic and script categories equally. Lastly, children in both the preschool group and the non-preschool group preferred evaluative categories the least in each age group. Moreover there was a decrease in selecting evaluative categories with increase in age. Consequently, preschool education makes a difference in five-year-old children's categorical preferences.

The differences in categorical preferences of five-year-old children may be due to preschool education supporting taxonomic thinking. Objectives such as comparing and grouping entities according to the material from which they are made, issues and concepts such as foods, animals, plants, and animate-inanimate in the Turkish National Preschool Program may have directed children towards taxonomic thinking. Taverna and Peralta (2013), in parallel with the findings of the current research, stated that children make important gains in the understanding of taxonomies during preschool. Vygotsky (1999) held that knowledge about taxonomic categories can be developed to a great extent by education (cited in Li et al., 2011). Similarly, Murphy (2004) stated that a preference for taxonomic categories is a result of Western education. He claimed that the tendency to choose items that share a certain type of semantic relationship is due to the analytical thinking taught in schools. In parallel with Murphy's claim, Estes, Golonka and Jones (2011) specified that formal education is associated with a decreased likelihood of thematic / script thinking that encourages us to categorise items taxonomically. Brown et al. (2014) pointed out that formal schooling appears to enable abstract or hierarchical thinking, implementing rules based on logic rather than on individual experience. In other words, schooling facilitates using taxonomic categories, because of its clear stress on theoretical rather than everyday competencies (Mpofu & van de Vijver, 2000).

Additionally, the finding that third graders preferred mostly taxonomic categories, whereas the five-year-olds chose mostly script categories in the non-preschool group also supports the Vygotsky (cited in Li et al., 2011) and Murphy (2004) explanations. Children not attending preschool turn towards taxonomic categories after they start formal education in elementary school. Past studies (e.g., Brown et al., 2014; Luria, 1976; Scribner, 1974; Smiley & Brown, 1979) also are consistent with the findings on the effect of formal education on categorical preferences. They showed that formal education affected categorical preferences of individuals, and individuals who received education tended to prefer taxonomic categories. However, past studies were carried out with older children or

adults, mostly some years ago. The current study extends the findings on the effect of education on categorical preferences by adding preschool education in a contemporary context.

The current study shows that age also has a significant effect on children's categorical preferences. There was an increase in preferences for taxonomic categories with age, whereas there was a decrease in preference for script and evaluative categories.

Past research, consistent with these findings, has shown that the preferences for taxonomic categories increase with age, while preferences for other categories decrease. In a study with 4-5 years old children, Nanjappa, Sebastian and Deepa (2013), for instance, found evidence to support the phenomenon of "thematic to taxonomic shift" occurring at the end of preschool years. Smiley and Brown (1979) stated that there is a non-monotonic age trend in categorical preferences. According to this non-monotonic age trend, there is a strong tendency for thematic / script categories in early ages, while a strong preference for taxonomic categories in later childhood. Finally, preference for thematic / script categories becomes strong again in middle and late adulthood (Estes et al., 2011).

Preschool education effects also categorical success of children. The children in the preschool group performed better on non-conflict triads compared to their peers in the non-preschool group. In the conceptual development literature, there are some findings that several kinds of interventions increase the categorical success of preschool children (e.g., Kaefer & Neuman, 2013; Neuman & Dwyer, 2011; Sung et al., 2008). Aslan (2013b) found that 6-year-old children who joined a project-based preschool program involving various activities such as science, maths, field trips, drama and art have better performance on the categorisation test than their peers who did not join that program. Kaefer and Neuman (2013) investigated the effect of a word learning program on 4-year-old's categorical achievement. They determined that children in the training program were more successful in categorisation than children in the control condition.

A similar effect of education exists for adults. Brucki and Rocha (2004), for instance, found that formal education had a significant impact on adults' categorical achievement. They determined that there was a positive correlation between categorical performances and duration of education. Similarly, Brown et al. (2014) found that education predicts categorical achievement of adults, and stated that education is an important predictor of various cognitive abilities. Schooling allows us to learn different learning techniques as well as diverse knowledge. Kolinsky et al. (2014) stated that formal education presents available cues for producing category exemplars and therefore facilitated access to categories. As formal education offers many opportunities for children to learn categories, it is an expected result that children attending preschool had better performance in categorisation compared with their peers not attending preschool. Preschool education provides opportunities for children to learn and develop many different categories in various activities, such as grouping entities according to their various properties in maths activities, observing entities in different environments and comparing their similar and different properties on field trips, making collections containing different objects in science activities, and listening to stories about various beings.

Lastly, the findings of present study revealed that age made a significant difference to the categorical performance of children. First and third graders performed significantly better on non-conflict triads than five-year-old children. Furthermore, it was determined that age was the most important variable predicting children's categorical success. Although there are various studies on the effect of age on the categorical preferences of children, there are very few studies about the effect of age on their categorical success. Existing studies show that categorical success of children increases with age. Nguyen and Murphy (2003), for instance, found that children's categorical successes increased from four to seven years of age. Similarly, Nguyen (2007) determined that performance by children between three to six years of age on categorisation tasks improved with age. In another study, Jin (2012) examined cognitive skills of American and Mexican preschool children between the ages of 3-6. She found that older preschoolers had better performance than younger preschoolers in categorisation tasks in both countries. The developmental literature contains numerous studies on the effects of age on children's cognitive skills. A similar trend can be expected for categorical skills, which are important parts of cognitive development. As children grow up, both their cognitive maturity and education levels increase (Bee & Boyd, 2011; Berk, 2012). This can lead them to become even more skilled in organising, namely in categorising, the objects they see around them.

Conclusion

The findings of this study showed that preschool attendance impacts the categorical preferences of children. In five-year-old group, children in the preschool group tended to choose taxonomic categories, whereas children in non-preschool group mostly preferred script categories. In contrast, first and third-graders in the preschool group and those in the non-preschool group mostly chose taxonomic categories. Thus preschool education creates a short-term difference in children's categorical preferences, and this difference disappears in first year of primary school when children who did not attend preschool start formal education.

Preschool education also had a significant impact on children's categorical success. Children in the preschool group had better performance on non-conflict triads than children in the non-preschool group. Likewise, age had a significant effect on categorical achievement. First and third grade students had higher categorisation scores on non-conflict triads than five-year-old children. Moreover, the common effect of preschool education and age on children's categorical achievement also was significant. Lastly, preschool education and age predicted children's categorical achievement significantly.

As a conclusion, preschool attendance leads to some differences in the children's categorical preferences and improves their categorical achievement.

Recommendations

Categorisation is a fundamental attribute of human cognition and should be developed from early ages. The findings of current study show that preschool education, just like age, has a significant effect on children's categorical abilities. Therefore, to support children's

cognitive development, as well as other development areas, preschool education should be made available for all children. Since primary education is compulsory in Turkey, there were no children not attending primary school in the sample. In the future studies in different countries, categorical abilities of primary school children who went to preschool could be compared with their peers who had neither preschool nor primary school attendance. In this study, a cross-sectional method was used as a research method. Longitudinal studies could be used to examine the long-term effects of preschool education on children's categorical preferences and categorical achievement. Furthermore, in the current study, children's categorical abilities were tested by using items in food area, so in the future studies other items familiar to children, such as animals, tools and clothes also could be used in testing children's categorical abilities.

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