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INVESTIGATION OF THE COGNITIVE FUNCTIONS OF CHILDREN AGED 48-60 MONTHS

48-60 AYLIK ÇOCUKLARIN BİLİŞSEL İŞLEVLERİNİN İNCELENMESİ

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ABSTRACT: Cognitive functions which are the main step of development and learning, are considered as a significant predictor of cognitive development in early childhood period. Cognitive functions are the pre-requisites needed for acquiring thinking, learning and behavioral functions. Inadequate cognitive functions mostly result in low cognitive performance. The current study aims to evaluate cognitive functions of children continuing to preschool educational institutions as well as identify the factors that may potentially affect. The study group consisted of 100 children aged 48-60 months and were studying at pre-schools. Children were randomly selected among the population that met the criteria from the randomly chosen pre-schools located in the central districts of Ankara, Turkey. "Application of Cognitive Functions Scale" was implemented to evaluate children's cognitive functions. Turkey validity and reliability was done by Yavuz and Zembat (2017). As the scale has a dynamic assessment structure, a pre-test and post-test score is gathered for each child. The results of the study showed a significant outcome in favor of the girls in terms of cognitive functions, the duration of preschool education has an impact on cognitive skills, and adult support makes a difference between children's pre-test and post-test scores.

Keywords: Cognitive function, Cognitive development, Early childhood, Learning.

ÖZET: Gelişim ve öğrenmenin temel basamağı olan bilişsel işlevler, erken çocukluk döneminde bilişsel gelişimin önemli bir yordayıcısı olarak kabul edilmektedir. Bilişsel işlevler, düşünme, öğrenme ve davranışsal işlevlerin kazanılması için gerekli olan ön koşullardır. Yetersiz bilişsel işlevler çoğunlukla düşük bilişsel performansla sonuçlanır. Bu çalışma, okul öncesi eğitim kurumlarına devam eden çocukların bilişsel işlevlerini değerlendirmenin yanı sıra etkileyebilecek faktörleri belirlemeyi amaçlamaktadır. Araştırmanın çalışma grubunu okul öncesi eğitim kurumlarına devam eden 48-60 aylık 100 çocuk oluşturmuştur. Çocuklar, Ankara ili merkez ilçelerindeki anaokullarında kriterleri karşılayanlar arasından rastgele seçilmiştir. Çocukların bilişsel işlevlerini değerlendirmek için "Bilişsel İşlevleri Uygulama Ölçeği" kullanılmıştır. Ölçeğin, Türkiye geçerlik ve güvenirliği Yavuz ve Zembat (2017) tarafından yapılmıştır. Ölçek dinamik bir değerlendirme yapısına sahip olduğundan her çocuk için ön test ve son test puanı toplanmaktadır. Araştırma sonuçları bilişsel işlevler açısından kız çocukların lehine anlamlı olduğunu, okul öncesi eğitim süresinin bilişsel beceriler üzerinde etkili olduğunu ve yetişkin desteğinin çocukların ön test ve son test puanları arasında fark yarattığını göstermiştir.

Anahtar Kelimeler: Bilişsel işlev, Bilişsel gelişim, Erken çocukluk, Öğrenme.

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GENİŞLETİLMİŞ ÖZET

Giriş:

Gelişim ve öğrenmenin temel basamağı olan bilişsel işlevler, erken çocukluk döneminde bilişsel gelişimin önemli bir yordayıcısı olarak kabul edilmektedir. Bilişsel işlevler, düşünme, öğrenme ve davranışsal işlevlerin kazanılması için gerekli olan ön koşullardır. Yetersiz bilişsel işlevler çoğunlukla düşük bilişsel performansla sonuçlanır. Yaşından beklenen beyin fonksiyonlarına sahip olmayan veya nörolojik anomaliler yaşayan çocuklarda bilişsel işlevlerin ve öğrenme becerilerinin yeterli gelişemediği görülmektedir (Oktay, 2002). Bu doğrultuda çocukların gelişim alanlarında yaşanabilecek olası gecikme ve sorunların erken dönemde belirlenebileceği, etki yaratabilecek etmenlerin ortaya konularak bilişsel işlevlerin yeterli düzeyde kazandırılmasına yönelik farkındalık oluşturulabileceği öngörülmektedir.

Yöntem

Bu çalışma, okul öncesi eğitim kurumlarına devam eden çocukların bilişsel işlevlerini değerlendirmenin yanı sıra etkileyebilecek faktörleri belirlemeyi amaçlamaktadır. Araştırmanın çalışma grubunu okul öncesi eğitim kurumlarında öğrenim gören 48-60 aylık 100 çocuk oluşturmuştur. Çalışma grubuna dâhil edilen çocukların engele yönelik tanılarının olmamasına ve tam aileye sahip olmasına dikkat edilmiştir. Ankara ili merkez ilçelerinden rastlantısal olarak seçilen altı anaokulunda, uygun kıstasları sağlayanlar arasından rastlantısal örnekleme ile çocuklar seçilmiştir. Çocukların bilişsel işlevlerini değerlendirmek için "Bilişsel İşlevleri Uygulama Ölçeği" kullanılmıştır. Ölçeğin, Türkiye geçerlik ve güvenirliği Yavuz ve Zembat (2017) tarafından yapılmıştır. Ölçek dinamik bir değerlendirme yapısına sahip olduğundan her çocuk için ön test ve son test puanı toplanmaktadır.

Bulgular ve Tartışma

Araştırma sonuçlarında; bilişsel işlevler puanlarının cinsiyete göre farklılık gösterip göstermediğine yönelik yapılan istatistiksel analizlerde işitsel bellek ve örüntü haricinde tüm bilişsel işlev puanlarında kız çocukları lehine anlamlı bir farklılık görülmektedir. Bununla birlikte çalışma kapsamında 48-60 aylık çocukların bilişsel işlev becerileri üzerinde okul öncesi eğitime devam etme süresinin etkisine bakılmış ve sınıflandırma, örüntü, toplam bilişsel işlevler puanında iki yıldan uzun süredir okul öncesi eğitim gören çocukların puan ortalamasının 0-1 yıldır devam edenlerden daha yüksek olduğu görülmüştür. Bilişsel işlevlerin tüm alt boyutları ve toplam puanda görüldüğü gibi son test puanı ön test puanlarından anlamlı bir şekilde farklılaşmaktadır. Bu da yetişkin desteği ile çocukların mevcut bilişsel işlevlerinin daha da gelişebileceğini göstermektedir.

INTRODUCTION

The increase of the neuron links among existing neurons through stimuli such texture, taste, sound at the first period of life and the cognitive change seen in babies later on establishes a foundation for more complex skills (Akdağ, 2015). In parallel to the improvement in cognitive development, an improvement is also observed in the cognitive function skills that guide the cognitive processes at the core of learning. Cognitive functions are the prerequisites for gaining thinking, learning and behavioral functions. In other words, insufficient cognitive functions mostly result in low cognitive performance (Feuerstein et al., 1980; 1994). The sub-stages of cognitive functions in majority of the studies are generally listed as classification, memory, sequencing and planning (Lidz, 2005). Memory, the most significant part of cognitive functions is associated with the storage of information and is discussed within two components as visual and verbal (Baddeley, 1992). In addition to having a larger capacity, visual memory is also more open to interaction. It is highlighted that verbal memory has a similar capacity as visual memory (O'Regan et al., 1999; Pashler, 1988). Children, during pre-school period, start to distinguish between the simple features of objects through comparisons and contrasts. This results in classification which is another cognitive functions. At these ages, although classification skills according to multiple features is insufficient, the foundation of flexible cognitive thinking are laid (Brewer, 2007). Verbal planning which consists of preparation, copying and avoiding unnecessary verbal clues stages give way to differences in cognitive functions (Macwhinney & Osser, 1977). The period between 4-6 years of age, names as intuitive period by Piaget, is seen as critical for gaining such skills as the prerequisite of rational thinking and it is suggested that in case of deficiencies problem situations such as cognitive weakness may arise in later years (Altıparmak & Öziş, 2005; DeHart et al., 2004). Basic cognitive functions are gained through direct exposure of children to environmental stimuli or via mediating learning experiences. Feuerstein sees this process as mandatory for children's cognitive development (Haywood et al., 1992).

Not being able to explain the individual differences in the test scores regarding intelligence have caused more concentration on cognitive functions and process at the foundation of intelligence and cognitive development (Sternberg, 1982). Scales that focus on learning potential, unlike intelligence tests, do not measure pre-existing knowledge but also the skills towards learning (Guthke, 1977). This requires adaptation to new situations by benefitting from past experiences. Program based on critical periods and environmental enrichment are aimed at increasing cognitive functions, metacognitive processes, problem-solving skills and thinking strategies (Justicia et al., 2000).

Cognitive functions are considered as a process resulting from the combination of innate ability, study habits, behavioral attitudes, learning background and strategies. While cognitive functions are described as mandatory by Feuerstein et al. (2006) are distinguished under three inter-related stages as input, elaboration and output; they are divided into stages of classification, memory, sequencing and planning by Lidz (2005). It is seen that the studies on easing the transition to concrete processes by pre-process period children prioritize skills such as numbering, protection, classification and comparison in order to improve basic cognitive functions (Yeow, 2011). Cognitive functions form the basis for intellectual and behavioral functions (Arbitman Smith et al., 1984). It is reported that at early ages, basic cognitive functions are determinants in identifying individual differences and that children who gain these functions at early ages have more functional skills in future years (Burns, 1980). Cognitive functions such as memory, judgment and language may show variances in each child due to individual differences (Scheuner et al., 2004). Firstly, a relational network coming from past experiences is established during the formation of the cognitive function structures. The relational network is formed firstly by the semantic network involving logical concept and associations, then, by the semantic network made up of abstract reasoning skills, respectively (Macizo et al., 2000).

Reasoning skill, as one of the main concepts of cognitive functions, represents the case of analyzing the current situation and reaching to the most accurate conclusion (Umay, 2003). This cognitive skills which involves judging a problem situation and reaching to conclusions through assumptions, includes subscales such as classification, sequencing (Piaget, 2006). Lohman and Hagen (2003), on the other hand, base this process with numerical, verbal and visual spatial skills. It is suggested that with the gaining of skills that define reasoning such as classification, comparison, contrasting a positive difference is formed in the cognitive and academic development of the child (Klauer & Phye, 2008). Working memory controls skills of short-term storage and use of information; and has different dimensions like verbal, visual and spatial. Short-term auditory memory, as one of such dimensions, covers short-term retention of information received as auditory. It is known that children with weak cognitive functions have difficulty at the point of retaining the words which they are told (Montgomery et al., 2010; Vugs et al., 2014). As another function of the working memory, short-term visual memory is found to be directly associated with the number of objects to be retained more than the examined features. It is reported that four related information regarding each object to be remembered can be retained (Vogel et al., 2001). Taking perspective skills, is formed by the child's similar perception of someone else's emotions, thoughts and visual perspective. With the help of this skill, children learn to gain various perspectives over the same object. Making sense of thoughts and emotions are explained through empathy skills and the theory of mind. Out of the three areas mentioned, children are capable of having an idea on how others see their environment and how they make sense of it through taking visual perspective skill (Şener, 1996).

It is seen in studies on cognitive functions and emotions during early childhood that positive emotions impact the exhibition of a more successful performance in areas such as creating thinking, visual perception, planning and flexibility of thought (Isen, 1990; Masters et al., 1979; Rader & Huges, 2005). With the existing cognitive approaches, evaluation of potential is made easier and more effective strategies were developed due to the trainability of the process (Resing, 1990). It is known that the neurological factors that increase with age have direct influence on learning. It is observed that cognitive functions and learning skills do not sufficiently develop in children who do not have the brain function expected from his/her age or those that experience neurological anomalies (Oktay, 2002).

In this regard, it is foreseen that awareness can be raised towards identifying the potential delays and issues in developmental areas at an early period, and fostering the acquisition of cognitive functions by noting the influential factors.

METHOD

Aim

In this study, it is aimed to evaluate the cognitive functions of children continuing to pre-school education institutions and determine the potentially effective factors by using descriptive design, one of the quantitative research designs. Within the scope of this purpose, answers to the following questions will be sought.

- Do cognitive functions differ by gender?
- Do cognitive functions differ according to the duration of preschool continıing?
- Do cognitive functions differ according to adult support?

Study Group

The study was conducted with 100 children aged 48-60 months and continuing to pre-school in the 2018-2019 academic year. Children included in the study had no special needs diagnosis and have unbroken family. Children were randomly selected among the population that met the criteria from the randomly chosen pre-schools located in the central districts of Ankara, Turkey. Prior to launching the study, parents were contacted and informed about the scope and data collection process of the study and asked to sign consent forms; thus, the children of the families who consented were involved in the study. If parents or the child did not consent, that child were omitted from the study group.

Data Collection

Voluntary participation of children whose parents consented to the study was taken as the basis. As the first step, Application of Cognitive Functions Scale "ACFS", originally developed by Haywood and Lidz (2007), was implemented to the participating children. Turkey validity and reliability was done by Yavuz and Zembat (2017). As the scale has a dynamic assessment structure, a pre-test and a post-test score is gathered for each child. Dynamic assessment, unlike traditional scales, indicates what the child can do on his/her own and what he/she can do with the help of an adults, in other words, dynamic scale shows a child's potential. The things he/she can achieve on his/her own are named as pre-test and the things he/she can achieve with the help of an adult are known as post-test. The child's latest post-test score was taken into account at the analysis stage. The children were grouped in their institutions and instruments were implemented between February 2019 and August 2019. Each child was evaluated individually. Upon completion of implementation for each group, assessment and recommendation forms were prepared for the families and institutions.

Data Analysis

The pre-test and post-test scores from the six subscales and the total of the Application of Cognitive Functions Scale were recorded separately. However, children's behavior assessment scores were not used in the statistics. Prior to the implementation of the appropriate statistical methods to analyze the data collected from the data collection instruments, normality test was used to see whether the data is normally distributed or not. To this aim, kurtosis skewness values of the subscales and overall scores were observed to see whether normality assumption is met. According to George and Mallery (2016), normality assumption is met when skewness and kurtosis value is between +2 and -2. It is seen that the score distribution of the taking perspective subscale of the Application of Cognitive Functions Scale deviates from normality. The skewness kurtosis values were found to be .44-.95 in the classification dimension, .30-.30 in the auditory memory dimension, .24-.24 in the visual memory dimension, .01-.63 in the sequential pattern completion dimension, 1.56-2.72 in the perspective taking dimension, .98-.95 in the verbal planning dimension, .33-.15 in total score. The analyses of the normally distributed classification, auditory memory, visual memory, sequential pattern completion, verbal planning subscale scores and overall test score of the Application of the Cognitive Functions Scale according to independent variables were done through unpaired t-test and One-way ANOVA. Mann-Whitney U Test and Kruskal-Wallis Test were implemented for cases that do not meet the normality criteria. Post-hoc Tukey Test was implemented to see which group do the inter-group differences favor and Mann-Whitney U Test was done for each two variables in cases that do not exhibit normal distribution. As a common outcome of dynamic assessment, in the comparison of pre-test and post-test scores Paired Sample t-test was used in cases that meet the normality assumption and Wilcoxon Signed Ranks Test was implemented for cases that do not meet the normality assumption. Significance level at 0,05 was taken as the basis for all data resulting from the statistical analyses (Bursal, 2017; Büyüköztürk, 2018; Kilmen, 2015).

Ethical Permissions of Research

In this study, research ethics principles were observed and necessary ethics committee permissions were obtained. Within the scope of ethics committee permission; The document dated 20.02.2019 and numbered 05/92 was obtained from the Ethics Committee of Ankara University.

Table 3.1 Unpaired T-test and Mann-Whitney U Test scores regarding cognitive functions based on children's gender.

COGNITIVE FUNCTIONS	GENDER	n	$\bar{X}$	t	df	p
Classification	**Female**	55	8,07	2,21	98	**0,03**
	Male	45	6,91			
Auditory Memory	**Female**	55	9,76	1,12	98	0,26
	Male	45	9,17			
Visual Memory	**Female**	55	8,34	2,32	98	**0,02**
	Male	45	7,53			
Pattern Completion	**Female**	55	11,87	1,89	98	0,06
	Male	45	10,55			
Verbal Planning	**Female**	55	10,78	3,16	98	**0,00**
	Male	45	9,00			
Total ACFS	**Female**	55	62,43	3,21	77,08	**0,00**
	Male	45	55,44			
Perspective-taking			**$\bar{X}$** **MR** **SR**	**U**	**Z**	**p**
	Female	55	13,60 56,86 3127,5	887,5	-2,468	**0,01**
	Male	45	12,35 42,72 1922,5			

As can be seen in Table 3.1, unpaired sample t-test was used to compare the cognitive function scores according to children's gender and the results showed a significant difference [t(98)= 2,21; p=,03] in favor of female children ($\bar{X}_{female}$= 8,07; $\bar{X}_{Male}$= 6,91). In regards to visual memory skills as another subscale of cognitive functions, a significant different is also seen between female and male children [t(98)= 2,32; p=,02]. It was noted that the difference between genders is in favor of female children as in all subscales ($\bar{X}_{Female}$= 8,34; $\bar{X}_{Male}$= 7,53). The difference resulting from the comparison of the mean scores of female and male children in regards to verbal planning skills was found to be statistically significant [t(98)= 3,16; p<,001]. It is seen that female children have a higher mean score compared to male children ($\bar{X}_{Female}$= 10,78; $\bar{X}_{Male}$= 9,00). The conducted analyses revealed a difference between the total cognitive function scores between genders [t(98)= 3,21; p<,001] and that this difference is in favor of female children ($\bar{X}_{Female}$= 62,43; $\bar{X}_{Male}$= 55,44). The Mann-Whitney U Test conducted to see whether taking perspective skills differ according to gender showed that a significant difference is formed between female and male children and that the mean ranks of female children are relatively higher than male children (U=887,5; z=-2,468; p=,01).

Table 3.2. One-way ANOVA and Kruskal-Wallis Test results regarding cognitive functions based on pre-school education duration.

COGNITIVE FUNCTIONS	Source of Variance	SS	df	MS	F	p	Diff.
Classification	**BetweenGroups**	79,51	2	39,75	6,23	**0,003**	**3>1**
	WithinGroups	619,24	97	6,38			
	Total	698,75	99				
Auditory Memory	**BetweenGroups**	23,17	2	11,58	1,73	0,18	
	WithinGroups	649,83	97	6,70			
	Total	673,00	99				
Visual Memory	**BetweenGroups**	3,29	2	1,64	0,51	0,60	
	WithinGroups	310,67	97	3,20			
	Total	313,96	99				
Pattern Completion	**BetweenGroups**	130,87	2	65,44	5,86	**0,004**	**3>1**
	WithinGroups	1083,29	97	11,17			
	Total	1214,16	99				
Verbal Planning	**BetweenGroups**	8,62	2	4,31	0,50	0,61	
	WithinGroups	841,34	97	8,67			
	Total	849,96	99				
Total ACFS	**BetweenGroups**	1022,09	2	511,05	4,53	**0,01**	**3>1**
	WithinGroups	10938,50	97	112,77			
	Total	11960,59	99				
		n	**MR**	**sd**	X^2	**p**	**Diff.**
Perspective-taking	**0-1 year**	57	47,04	2	5,23	0,73	
	1-2 year	36	51,63				
	2-3 year	7	72,93				

When Table 3.2 is reviewed, differences in the cognitive function scores of children are seen according to the duration of their pre-school education. The significance values of the classification skills [F(2,97)= 6,23; p=,003] revealed a significant difference between groups. Similarly, sequential pattern completion scores [F(2,97)= 5,86; p=,004] show that there is a significant difference between the groups regarding the independent variable. In addition to the classification and sequential pattern completion subscales, total cognitive function score also indicates a significant difference based on the duration of pre-school education [F(2,97)= 4,53; p=,01]. Additionally, Kruskal-Wallis Test determined that there is no significant difference associated with the taking perspective subscale (p>,05). Tukey Test from the post-hoc tests was implemented for the cognitive function scores with differences in order to find out which group the difference favors. For the classification subscale, the average difference between children who have been continuing pre-school education for 2-3 years and those who are in their first year was found to be $\bar{X}_{2\text{-}3years} - \bar{X}_{0\text{-}1year} = 3,34$ and determined that there is a significant difference between groups as p=,004. Along with this, it was concluded that the difference in both sequential pattern completion and total score is in favor of children who have been continuing to pre-school education for 2-3 years.

Table 3.3. Paired Sample t-test and Wilcoxon Signed Ranks Test scores regarding the pre-test and post-test scores of cognitive functions.

COGNITIVE FUNCTIONS	Pretest - Posttest	n	$\bar{X}$	t	df	p
Classification	**Pretest**	100	3,98	-14,67	99	**0,00**
	Posttest	100	7,55			
Auditory Memory	**Pretest**	100	5,45	-15,89	99	**0,00**
	Posttest	100	9,50			
Visual Memory	**Pretest**	100	5,89	-13,36	99	**0,00**
	Posttest	100	7,98			
Pattern Completion	**Pretest**	100	10,27	-5,29	99	**0,00**
	Posttest	100	11,28			
Verbal Planning	**Pretest**	100	8,26	-10,29	99	**0,00**
	Posttest	100	9,28			
Total ACFS	**Pretest**	100	45,82	-30,17	99	**0,00**
	Posttest	**100**	**59,29**			
Perspective-taking	**Pretest - Posttest**		**MR**	**SR**	**U**	**Z**	**p**
	Negative	0	0	0	993,5	-6,82	**0,00**
	Positive	59	30	1770			
	Equal	41					

As presented in Table 3.3, paired sample t-test was used to evaluate whether there is a significant difference between the pre-test scores received without the help of an adult and the post-test scores received with the support of an adult due to the dynamic assessment basis of the scale. The review of the findings from the table indicate a statistically significant difference between the pre-test and post-test scores from all subscales and overall score (p<,001). When cognitive functions are reviewed over the total score [t(99)=-30,17; p<,001] and the mean scores of the pre-test and post-test scores are examined, it is noted that the found difference is in favor of the post-test ($\bar{X}_{pre\text{-}test}$=45,82; $\bar{X}_{post\text{-}test}$=59,29). In addition to this, it is seen that the difference is in favor of the post-test in all subscales. Wilcoxon Signed Ranks Test was implemented for the taking perspective subscale that did not show a normal distribution and the findings indicated a significant difference between the pre-test and post-test (z=-6,82; p<,001). The comparison of the rank average values revealed that the values calculated for the positive ranks are more than those calculated for the negative ranks. This points out that the post-test scores of the children are significantly higher than their pre-test scores.

DISCUSSION AND CONCLUSION

Studies on cognitive skills such as memory, comprehension and language suggested that there are differences between the contents of cognitive structures of children from different ages and differences in relations among the dimensions which form each of these structures (Scheuner et al., 2004). Thus, cognitive functions are shaped by the uniqueness of each child. Studies have indicated that children around the ages of three and four do not store information as hierarchical or part of a rational concept, but rather recall it from memory as the outcome of the experiences connecting it to each other within a relational association (Krackow & Gordon, 1998). As the experiences change, children's performance in various subscales of the cognitive functions goes to the forefront. The statistical analyses conducted regarding whether cognitive function scores vary according to gender revealed a significant difference in favor of female children in all cognitive functions except auditory memory and sequential pattern completion. It is believed that the higher cognitive performance of female children is influenced by not only biological factors such as early maturing but also by environmental factors and success in behavior regulation skills. Most of the studies available in the relevant literature show that female children's skill level is better than male children. One of such studies by Oktay et al. (2006) on cognitive readiness found a significant different in favor of female children. In another study that found a difference between genders, Jorgenson et al. (1981) revealed that female children are capable of more improvement in their test scores. Considering that female children show a better

performance in the effective use of language within the verbal planning skill associated with language development, they are expected to show a significant difference in this subscale. According to the study conducted by Şimşek (2007), female children's linguistic memory and phonological memory are more improved and they are more successful in tasks that cover these. In support of this, the existing literature suggests that female children are ahead in language development, have more complex language skills and more improved vocabulary skills. It is argued that more rapid maturity of female children than male children can be an explanation for this situation. This gap is gradually closed over the years (Halpern, 2000).

Pre-school education is the first stop to be consulted in cases of inconsistencies experienced in developmental areas. It is seen as a tool for strengthening weak areas especially in terms of development that originate from the increased interaction with the combination of multiple factors and peer education. The impact of the duration of pre-school education on the cognitive functions of children aged 48-60 months was investigated and found that the classification, sequential pattern completion and overall cognitive function mean scores of children who are continuing to pre-school education for more than two years is higher than those who are continuing for 0-1 year. It is one of the most common cases in literature that as the duration of pre-school education increases, children's academic and cognitive skills also increase. An increase in children's cognitive performances is expected with the longer pre-school education duration as the level of information, skills and stimuli would increase. In a study comparing the mathematical skills of pre-school children based on their duration of pre-school education, it was found that the lowest mean scores belonged to children in the first year and the highest mean scores were from those who are receiving education for three or more years (Ergün, 2003). The findings from the current study overlap with such cases and determined that the duration of pre-school education has a positive impact on development.

The post-test scores are significantly different from the pre-test scores for all subscales of cognitive functions and overall scores. This indicates that children's cognitive functions are improve even further with adult support. Vygotsky stated that children, with the help of an adult, can use their existing knowledge to learn new things or improve current skills (Blake, 2015). All experimental studies from the literature that reach a significant difference actually present findings regarding children's learning potential. Atli (2019) investigated the impact of home-centered cognitive support program on babies' cognitive development and concluded that there is a significant difference between the pre-test and post-test scores of the babies. In another study, the effects of a mother-child training program on the verbal and numerical skill levels during pre-school period were examined and the study found a significant difference between the pre-test and post-test scores (Kartal, 2005).

Statistical analyzes on whether cognitive functions scores differ according to gender show a significant difference in favor of girls in all cognitive function scores except auditory memory and pattern completion. However, within the scope of the research, the effect of the duration of attending pre-school education on the cognitive function skills of 48-60 month-old children was examined. Classification, pattern completion and total cognitive functions score averages of children who received more than two years of pre-school education were higher than those who continued for 0-1 years. As seen in all sub-dimensions of cognitive functions and the total score, the post-test score differs significantly from the pre-test scores. This shows that the existing cognitive functions of children can be improved further with adult support.

At the end of the research, the following suggestions can be made within the framework of the findings:

- It has been demonstrated how the child's performance within the potential development area increases when the right developmental support is provided. For this reason, developmental potential should be emphasized rather than the concept of intelligence in educational institutions.
- In order to support cognitive functions in the early years, it should be ensured that every child has access to pre-school education.
- Studies on cognitive functions can also be done longitudinally in order to reveal the changes on children's development more clearly.

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