

## Effect of Play Therapy on Visual Memory in ADHD Children

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### Abstract

**Purpose:** There is a growing attention to the role of teaching executive function including reasoning, organization and planning in the early childhood, and accordingly it is announced that fine training and education of executive functions have a key role in social development, social competence and academic achievement of the children. The most powerful and consistent weakness of executive function in patients with attention deficit hyperactivity disorder (ADHD) has been considered in measuring response inhibition, working and planning memory. The purpose of this study was investigation the effect of play therapy on visual memory as one of the executive function in ADHD children.

**Materials and Method:** The participants of the study were 22 ADHD children that were selected randomly and divided in to two groups of control and experimental (Control=12, Experimental=10). The experimental groups were under play therapy with behavioral-cognitive approach in 8 sessions (two sessions per a week) and each session lasted 30 to 45 minutes. Before and after play therapy sessions (8 sessions), visual-memory test was used as the pre-test and post-test and one-way analysis of covariance was used and the confidence interval was fixed at 0.05 level.

**Results:** The results of covariance analysis indicated that play therapy was effective in improving the visual memory of ADHD children ( $F_{1, 20}=4.8, P < 0.04$ ).

**Conclusion:** According to the findings, it can be said that the plays which increase children attention and concentration gradually effect on the function of the frontal lobes and increase attention, concentration and visual memory of ADHD children. Because executive functions develop in early childhood and it will be growing throughout life, it is possible that therapy interference have positive effects on these functions.

**Keywords:** Play therapy, Visual Memory, ADHD

### Introduction

“Executive function” is a general and an umbrella term that is considered essential for all complex cognitive processes in completion of purposeful functions (Elliott, 2003). From an evolutionary perspective, the development of executive capacities and capabilities considerably depends on maturation of frontal areas of human brain (Lezak et al., 2004; Allman et al., 2001). Executive function can be described as an indicator of how and when doing normal behavioral functions (Chan et al., 2008) that help people in planning goals, self-regulation, inhibition of inappropriate responses, flexibility, and future behavior (Martel et al., 2007; Garner and Tocker, 2011; Garner, 2009).

When a person is faced with a problem, it is necessary to proceed reasoning and a series of logic action for solving the problem. So reasoning depends on a task or an external object. Also, organization is defined as the ability to organize or placing objects orderly and coherently (Miyake et al., 2000). Finally, planning is the ability to preparing a plan to achieve a goal or complete a task. It should be noted that the planning is also the ability to make decisions about priorities. Over the past decade, there is a growing attention to the role of teaching executive function including reasoning, organization and planning in the early childhood, and accordingly it is announced that fine training and education of executive functions have a key role in social development, social competence and academic achievement of the children (Laura et al., 2009; John et al., 2011; Riccio et al., 2006; Bull et al., 2008).

The studies indicated that deficiency in executive functions as planning, organization, and self-regulation is related to ADHD (Pennington and Ozonoff, 1996). 83 cases of meta-analysis on more than 6000 ADHD participants showed that these damages will lead to higher critical processing of insufficient productivity that is related to executive functions such as planning, work memory, abstract reasoning and mind flexibility (Willcutt et al., 2005). The human brain naturally has sudden and rapid growth in several stages: 3 to 10 months, 2 to 4 years, 6 to 8 years, 10 to 12 years and 14 to 16 years. The rate of brain growth in some children comes down in this stage and the clinical form of hyperactivity deficiency appears that should be normalized at age 5.

There are evidences of development and top of the maturity from early childhood to adulthood. In fact, it is found that growth will accelerate in the range of 7 to 10, and it reaches highest level of its maturity in late adulthood. The findings support that essential executive function is created from and proceeds throughout childhood and adulthood (Anderson, 2002). The most powerful and consistent weakness of executive functions in ADHD patients are in measurement of response inhibition, work memory, planning and watching out. According to (Castellanos et al., 2006) ADHD patients have problem in doing cool executive function tasks but the ones with overactive-impulsivity are incapable of doing warm executive function tasks. It is necessary to say that cool executive function refer to the tasks that are related to the control of emotion and cognitive functions. There is a positive relationship between playing game and students' learning; and playing game can improve the students' attention, planning skills, perceptions, creativity, divergent thinking, and emotion and language developments (Kafai, 2006; Boot et al., 2008; Greenfield et al., 1996; Green and Bavelier, 2003). In some studies it is reported that the symptoms of ADHD participants decreased after play therapy (Ray, 2007; Panksepp, 2007; Pontifex et al., 2013). The results a study on rats with frontal damage (modeling of attention deficits hyperactivity disorder in human) indicated that self controlling and other executive functions don't grow properly without playing game. In fact, physical games decrease extra naughtiness and impulsivity of the rats with damaged frontal lobe (Panksepp et al., 2003). The purpose of the present study is to investigate the effect of play therapy on visual memory of ADHD children.

## Methods and Materials

### Participants

The methodology of this study was experienced with pre-test and post-test of control group. The participants were 22 children with attention deficit hyperactivity disorder that were selected from on hand visitors of consulting center and psychological services of Imam Hossein in Yazd. They were selected randomly and divided in to two groups of control and experimental (control=12, experimental=10). The experimental group was used play therapy with behavioral-cognitive approach for 8 sessions (two sessions a week) and 30 to 45 minutes each session. Visual memory test was applied for both groups as the pre and post-test before and after 8 sessions of play therapy of experimental group. This test was also used for control group before and after intervention in experimental group.

### Play Therapy Sessions:

First session: paper tower game, group activities. (The purpose of this session is to organize leadership and empathy in the group. The individuals of the group realize and learn team work, communication, cooperation to solve the problem and not to discourage of accomplishing a difficult task).

Second session: Thread and paper game (design thread) is a very suitable, inexpensive, and a creative game that is used in different situation for ADHD children with low self esteem, too distracted, impulsive, aggressive and aloof (individually, with family or group).

Third session: Look and guess game. Children should try to memorize objects or activities while focus on them.

Fourth session: Wrath inflatable game (the goal is to identify anger and how to deal with it).

Fifth session: Anger scale game (This method is practical for aggressive, nervous, impulsive and ADHD children. It helps them to control their actions and to recover their self esteem).

Sixth sessions: Balance and accuracy and ball throw game (The aim is to attract children attention to details and being able to work accurately and do the exact movements).

Seventh session: Accuracy and concentration game (alarm clock). The aim of this game is to increase the accuracy and concentration of children on the activity that they do.

Eighth session: The last session activities are in line with previous session aims.

**Materials**

Kim-karad Visual memory test:

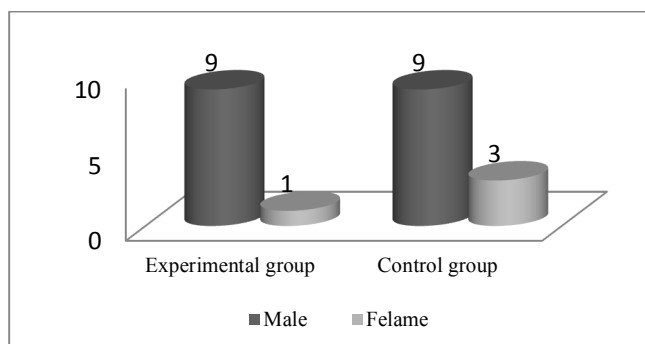
This test is a cardboard screen which has 20 white houses and a cardboard which each house has a colorful picture. Moreover, it has 20 cardboard pieces on which one of the main test images are drawn. This test can evaluate short, medium and long term visual memory. The subjects had one minute to look carefully at the main page, then the papers were collected and a white paper with 20 pictorial pieces were given to them and wanted them to arrange the pieces (Heidari et al., 2012). The scoring of this test depends on the child’s arrangement. The child not only must put the picture in appropriate place, but also he must put them in right order; otherwise, his score is not complete. Coefficient reliability of this test was 0.81 (r=0.81) that is acceptable and reliability of the test was reported 0.78 (r=0.78). Before and after play therapy sessions (8 sessions), visual-memory test was used as the pre-test and post-test and one-way analysis of covariance was used. The confidence interval was fixed at 0.05 levels. Detailed description of the test is required.

**Table 1: Estimation of the results in accordance with the number of pieces**

	Quantity of memory→	Weak	Medium	Strong
↓Quality or the kind of Memory				
Short term memory		2-4	5-8	9-15
Medium term memory		3-8	9-14	15-18
Long term memory		9-11	12-14	15-16

**Results**

The subjects of this study were ADHD children. The frequency of experimental and control group is shown in figure 1 (Initially each group consisted of 12 subjects, but two subjects of experimental group were excluded due to lack of proper collaboration).



**Figure 1: Frequency of experimental and control group**

To evaluate the effect of play therapy on dependant variable (visual memory), one-way analysis of covariance was used that the results are shown in table 3, and before that regression correlation hypothesis was confirmed (see table 2).

In regression homogeneity test, F value in interaction level between the group and pre-test should be considered, and the result would be meaningful if F value was more than 0.05.

**Table 2: Regression Homogeneity**

Variable	F	df	Mean Squar	p-value
visual memory-Pre test	1.8	1	31.81	0.19

F<sub>1, 20</sub>=4.8, and P value (P=0.04) indicated that the hypothesis of the study was confirmed and play therapy affect on visual memory of ADHD children (Table 2).

**Table 3: Covariance analysis of the effect of play therapy on visual memory**

Variables	Mean Square	F	p-value	Effect size	df	Statistical power
Group effect	90.07	4.8	0.04	0.2	1	0.5
Pre-test effect	1600.16	86.5	0.0001	0.8	1	1

### Discussion and Conclusion

The results of this study indicated that play therapy can improve visual memory of ADHD children and this improvement can reduce memory disorder and attention deficits. Based on the results of this study and other researches, it can be concluded that games which increase ADHD patients' concentration and attention will gradually affect on the frontal lobe function and increase attention, concentration and visual memory of ADHD children. Because executive functions is created in early childhood and its growth continues throughout life, it is possible that therapy interventions affect positively on the functions. It was reported that The EEG power characteristics were correlated significantly with the visual attention function in ADHD children ( $p < 0.01$ ). Higher-order level cognitive dysfunction affects ADHD pathogenesis (Shi et al., 2012). There is a direct relationship between ADHD patients' visual information and nerve producing related to attention. Play therapy is a kind of function that improves visual memory of ADHD children. In relation with symptoms of early hyperactivity, short term verbal, visual and spatial memory, it was indicated that the symptoms of attention deficit disorder, verbal and visual disorder and short term memory disorder develop in adolescence. So, attention deficit can be diagnosed in childhood and can be prevented its development (Gau and Shang, 2012). Correspondingly according to this study it can be suggested that play therapy as a psychotherapy method for improving the executive function of ADHD children.

One of the limitations of this study is the instrument that was used. Some of the visual memory tests normalized for children are suggested for future research. Also this study had been conducted on ADHD children in Yazd, so in generation of the results, cultural and local consideration should be taken in to account.

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