

Full Length Research Paper

Efficacy of Montessori education in attention gathering skill of children

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The aim of this study is to evaluate the efficacy of Montessori education which is offered to upskill the attention gathering skill of children with attention-deficit/hyperactivity disorder. In total fifteen pre-schooler participants, six girls and nine boys who are diagnosed with ADHD (7 of the children with ADHD, 8 with only AD), joined to this research. This is a research designed with pre-post test design study with a control group of experimental design. In this research with the aim of improving the attention gathering level; eye-hand coordination, development of tactile, visual and auditory senses and for improving their acquired distinctiveness “tactile boards, sound boxes, binomial cubes and color tablets” are used from Montessori materials. FTFK Attention test is applied to children before and after the intervention. After the training, when scores are compared, the significant improvement is seen in their post test scores.

Key words: Attention, hyperactivity, learning disability, visual sense, early childhood.

INTRODUCTION

Attention concept, which has an important place in human development, also has an important role in person's success in the course of live. Attention is not a habit innate but it is gained and developed by exercises. Attention span is different for each individual. For example; for children, attention span is shorter than adults. Problems of attention span and concentration are seen more in individuals who have difficulties in learning than the individuals normally developed. Difficulties about attention are both seen in visual and auditory areas. It is known that children with attention deficit and hyperactivity disorder are more easily distracted than children who develop normally and this affects their academic success

(Ataman, 2003).The role of attention gathering in behavior regulation and organization has a real importance. Moreover, because distractibility and attention deficit is frequently seen in childhood specialists of this field (doctors, psychologists and educators) are intensely dealing with the matter (Roth and Schlottke, 1991).Especially for academic success attention concept is emphasized. In student-centered education, it is aimed to determine all the factors that can cause student's failure, minimize the probability of their occurrence and take precautions before they exist and affect the student negatively. Attention skills develop children's reading, writing, syllabication, math skills and help to improve all

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other abilities that are necessary for academic success.

Children who have difficulty in attention gathering generally cannot pay attention to details and have careless mistakes in their homework or other activities. Therefore, attention and concentration improver activities should be included. To improve the attention gathering skill, different learning and teaching models are brought out. One of those is Montessori Method. Specialists of this field indicate that this method is planned to form students who have sense of mission and are motivated even for the hardest task (Rathunde and Csikszentmihalya, 2005: cited in. Holfester, 2008).

Development of attention consists of the skills which have important effects on child's preparation to school and should be developed until the age 6. Montessori counts the first 6 years as the teacher's most intensive period (Schafer, 2006: cited in. Durakoğlu, 2011). Games played with educative toys especially in early ages enable the child perceive, focus his attention to a subject, find solutions by trial and error method (Aral et al., 2001; Oğuzkan and Oral, 2003). In attention gathering and concentration of child's interest, learning environment and external stimuli have a great importance (Karaduman, 2004; Özdoğan, 2004; Lillard, 2011). In Montessori approach, children are given an opportunity to search, try, make mistake and correct their own mistake on their own; also, Montessori materials are designed to help children find these mistakes (Temel, 1994-2005). To develop this competence, education environments should be arranged by taking these properties into consideration. Montessori Method enables that. When examining the studies in this field; in a study done by Lopata et al. (2005), it is found out that concentration and focusing skills of Montessori students are better and they are show better academic success. As a result of his studies, Özdoğan (2001) emphasizes that problems about attention gathering are generally spotted while in elementary school years. In this period the child is asked to focus on a subject, sit in his seat for a long time and engage in a task. Thus, especially in elementary school years subject of attention gathering comes into prominence and the attempt of preventing to have a problem because of attention gathering problems gains importance. And by the study of Kayılı and Arı (2011), they infer that Montessori Method makes a positive contribution to the pre-schoolers' school readiness. By his research Bortolio (2000) infers that as an early intervention program, social contract model improves attention skills of children with intellectual ability loss and hearing disorders. Köster (1974), in his study, used Frostig Visual Perception Test and Montessori Material as educational tool and searched the effect of this education to children's development of attention. At the end of the education program, significant difference in perception and attention gathering is seen for the experimental group. In fact, no significant difference between pretest-posttest occurred for control group.

The purpose of the study

The objective of this research is to evaluate the efficacy of Montessori Education which is offered to upskill the attention gathering skill of children with learning disability. In this direction responses of these questions will be searched:

1. Is there a difference between the points of the children who receive Montessori Education and who do not?
2. Is there a significant difference between the Attention Gathering Test (FTF – K) points of the children who receive Montessori Education and who do not?
3. Do the sensorial materials used in Montessori Education affect children's attention gathering skills?
4. Does the effect of offered Montessori Education proceed to 3-5 and 7 weeks after the training?

METHODS

Research model

In this research pretest-posttest design study with a control group research model is used among the experimental designs.

Participants

In total 15 5-6-aged-participants, 6 girls and 9 boys joined this research. While 7 of these children are with attention deficit and hyperactivity disorder, eight of the students only have attention deficit. There is no combining problem according to their auditory, visual and tactile senses of the subjects. 8 of the children form the experimental group, while 7 form the control group. For assigning the children medical and educational evaluation results are taken into consideration. According to this, the children who are diagnosed in psychiatry clinic of full-fledged state hospitals considering DSM-V criteria form the target population of the research. By using the criterion-related sampling method the children are expected to have the following skills:

1. Making an eye contact (min. 5-10 sec),
2. Contributing regularly to the research,
3. Following the verbal instructions,
4. Having imitation skill,
5. Finishing the task.

To identify if the subjects have the mentioned prerequisite behaviors, subjects are observed while in individual work, asked for information from class teacher and it is determined that five of the subjects are fulfilling these prerequisite behaviors.

Data collection tools

FTFK Attention Test: With the purpose of data collection "Frankfurter Test for Five Years – Concentration (FTF – K)" was used. In this test, the children are expected to find and mark pears among a mixture of apples and pears. The instruction lasts for 8 min and the exercise lasts for 90 s. The instructions should be given verbally. The test was developed by Möhling (1971). In 1968 the test was applied to the 5;0-6;3 years old children, n=266. In 1970, it was applied to the five-six years old children, n=1170. In

the latest application, age, sex, social economic level were taken in consideration. Lastly test – retest was applied $n=100$, with a half-hour break in Frankfurt; $n=29$, with three weeks break in Nordschein29; $n=66$, with seven months break in Westfalen. In Turkey, this test was applied to 30 children of five-six years old by senior students of University of Ankara, Faculty of Educational Sciences in Clinical Psychology Applications course in terms of understanding the instructions and applying the tests. Besides, it was applied in province Giresun by the researcher with preliminary study. The reliability of the FTF – K test was determined by test – retest method. In autumn of the year 1969, FTF- K test was applied in 20 nurseries $n=100$ to 5 years old children with a half-hour break with test – retest method. The correlation of 1st and 2nd applications was $r=0.79$. In 1971, it was applied in 2 nurseries $n=29$ to 4 years old children with three weeks breaks. The correlation between two application was found as $r=0.85$ (Kaymak, 1995). "The scale is applied individually by each researcher to each student".

Intervention process

Environment and materials: The research is applied in an independent pre-school educational institution. In each phase a table for practitioner and student, another table to put the materials and chairs, "tactile boards, sound boxes, binomial cubes and color tablets" from Montessori materials are used. Other stimuli that could distract children's attention are left out. And to record data a camera was kept in the class. 30% of each phase is recorded.

Testing Process: To determine the attention gathering level FTFK attention test is applied. Children are trained by using "tactile boards, sound boxes, binomial cubes and color tablets" from Montessori materials. Educations are realized in 4 stages and three each sub-stages. In first sub-stage of the 1st stage children are asked to match and sort by intensity of the sounds by using sound boxes. In second stage, they are asked to differentiate rough and smooth surfaces by using tactile boards and lay them together to form very rough to nearly smooth. In third stage, they are expected to do the ordering of primary colors, intermediate colors and tones of the colors by using color tablets. In fourth stage by binomial cubes material, a training to form a cube by putting together the geometric figures in various colors is done. These trainings are held on from simple to complex. In each session at least three examples are used. At the end of the education, FTF-K attention test is applied to the children. Studies are done in sessions of 45 min a day (three sessions from 15 min) and three days a week. Study continued for two weeks for each material, eight weeks in total. After three, five and seven weeks from the end of the study permanence of the gained behavior is tested.

Analysis of data

SPSS Statistics Program is used for the scores of Frankfurter Test for Five Years – Concentration (FTF – K). For analyzing data Mann Whitney U Test and Wilcoxon Signed Rank Test are used. Interpretation of data is done by the help of these methods.

RESULTS

Data of the research are gathered before and after the education of pretest-posttest with control group model. The result of the subjects' of pretest-posttest FTF-K attention test is given in Table 1.

Table 1. Descriptive rate of experimental and control group scores of FTF-K Attention Test.

	Pretest			Posttest	
	n	x	SS	x	SS
Experimental group	8	28.60	11.78	38.50	9.36
Control group	7	27.30	9.01	27.10	9.76

Result of the "Is there a difference between the points of the children who receive Montessori Education and who do not?"

Looking at the scores that students of experimental and control group get from FTF-K Attention Test in Table 2, it is seen that the lowest rank is 27.10 for posttest of control group and the highest rank is 38.50 for posttest of experimental group. For participant number of less than 10 in Experimental and also Control Group, non-parametric techniques are used for gap analysis.

There is no significant difference between the pretest scores Experimental and Control Groups get from FTFK Attention Test ($z=0.49$, $p>0.05$).

Result of the "Is there a significant difference between the Attention Gathering Test (FTF – K) points of the children who receive Montessori Education and who do not?"

There is no significant difference between experimental group and control group on behalf of experimental group in comparison to the scores they get from posttest of FTF-K Attention Test ($z=2.55$, $p<0.05$) (Table 3). The significant difference between the pretest and posttest of experimental group and between posttests of experimental and control groups reveals the success of the experiment.

Result of the "Do the sensorial materials used in Montessori Education affect children's attention gathering skills?"

When Figure 1 is examined, it is seen that subjects get from pretest of Montessori materials' utilization 26.19% for tactile boards, 19.27% for sound boxes, 16.66% for binomial cubes and 21.42% for color tablets. When posttest scores are examined, it is seen that subjects get 76.02% for tactile boards, 75.38% for sound boxes, 47.14% for binomial cubes and 73.80% for color tablets.

Result of the "Does the effect of offered Montessori Education proceed to 3-5 and 7 weeks after the training?"

When Table 4 is examined, it is seen that there is no

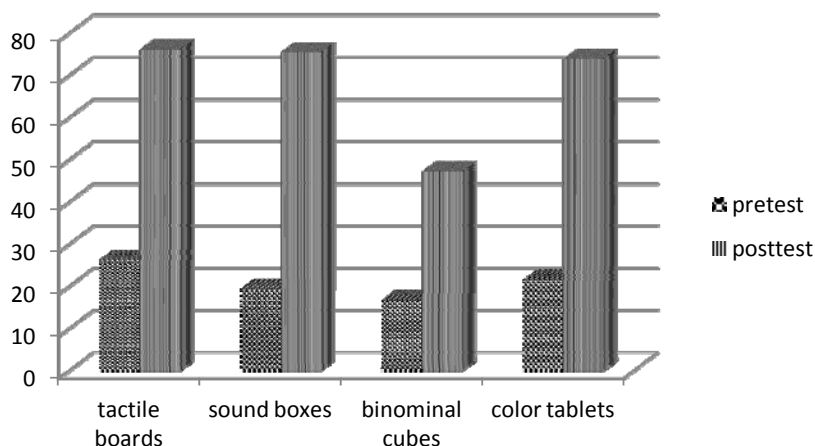
Table 2. Results of Mann Whitney U test done between pretest scores of FTF-K attention test for experimental and control groups.

Group	n	Mean rank	Mean rank	u	z	p
Control	7	9.85	98.50	43.50	-0.49	-
Experimental	8	11.05	111.50			

Table 3. Results of Mann Whitney U test of the experimental and control group children's FTF-K attention test pretest and posttest scores.

Pretest-posttest	Mean rank	Rank sum	u	z	P
Control	7	7.20	72.00	17.00	-2.55 p<0.05
Experimental	8	13.80	138.00		

*p<.05.

**Figure 1.** Data of the subjects utilization of Montessori materials baseline and after the experiment tests.

statistical difference between children's FTF-K Attention Test general attention level posttest scores and the maintenance test scores applied 3 weeks later ($z=-.368$, $p=.713$, $p>.05$). There is also no statistical difference between the scores of the children's posttests and maintenance test done 5 weeks later ($z=-.406$, $p=.684$, $p>.05$). Besides, there is no statistical difference between posttest scores and maintenance test scores done 7 weeks later ($z=-.542$, $p=.588$, $p>.05$). According to these statistical data, it can be said that the training program applied to experimental group still maintains in 3rd, 5th and 7th weeks.

DISCUSSION

In this research, the efficacy of using "tactile boards, found boxes, binominal cubes and color tablets" which are used in Montessori Education to upskill the attention

gathering skill of children with attention deficit and hyperactivity disorder is evaluated. As a result of the research, it is found out that offered education is effective in children's attention development (There is no significant difference on behalf of experimental group between the posttest of FTFK-K Attention Test in comparison to the experimental group and control group scores ($z=2.55$, $p<0.05$)). The result of the research coincides with the principle of polarization which is origin of Maria Montessori education. The research verifies that Montessori materials make a major contribution to attention gathering skills of five-six years old children with attention deficit.

When literature of this subject is examined, Hale (1993) examined the inclusion of children with retarded development to Montessori school pre-school class. 5 children with retarded development were put in two pre-school classes of Montessori school. In that research, first situations of children with retarded development were

Table 4. Results of Wilcoxon signed ranks test of the experimental group children's FTF-K Attention Test Posttest and maintenance scores.

	FTF-K attention level	Posttest-maintenance test	N	Mean rank	Rank sum	Z	p
Posttest- 3 wks after	General attention level	Negative rank	6	2.00	6.00	-.368	.713
		Positive rank	1	4.00	4.00		
		Equal	1				
Posttest- 5 wks after	General attention level	Negative rank	6	2.0	6.00	-.406	.684
		Positive rank	2	4.50	9.00		
		Equal	0				
Posttest- 7 wks after	General attention level	Negative rank	6	3.17	9.50	-.542	.588
		Positive rank	2				
		Equal	0	2.75	5.50		

determined. Afterwards, Montessori Education was applied to those children. Parents were informed simultaneously while children were having the education. According to the research results, it is seen that because of the positive effect of Montessori materials on children with retarded development, other children take those children in Montessori classroom environment. In addition, it is determined that children with retarded development improve their skills and social relations (cited in. Erben, 2005). The research of Chattin – McNichols (1981) that investigates the effects of Montessori Method emphasizes that Montessori Method contributes to attention gathering skills of children. Wagner (1990) also indicates the positive effects of Montessori materials on children's attention gathering skills. As a result of Beken's research (2009) which examines the effect of Montessori Method on 5-6 years old children's manual skills (Scratching-Painting and Using the Objects Skills) improvement, it is found out that the children of experimental group who get Montessori Education acquisition of manual skills is higher than the children of control group who get the education of Ministry of National Education Pre-school Education Program.

In attention gathering and concentrating child's interest, learning environment and external stimuli have a great importance (Karaduman, 2003; Özdoğan, 2004). In Montessori Method children turn into an activity towards their interest. A child himself chooses the material he wants to work on and goes to the place he wants to work, and work there. By this way, the child can more easily focus on a work that he is interested in and he can concentrate on it for a longer time. An experimental study is done by Lillard (2005) which aims to reveal the Contributions of Montessori Education against Traditional Education on Development of 3-6 Years Old Children. In this study, cognitive, academic, social and behavioral skills of the children of experimental group who attend

Montessori school and of the children of control group who attend a school with traditional method are compared and supremacy is seen on behalf of experimental group. These studies resulted in a positive way of children's social, academic, cognitive and behavioral skills improvement. Besides, children easily oriented their selves and find solution ways for complex problems. After gaining these experiences their success in school and in life increased (cited in. Yiğit, 2008). In another research done by Lillard and Else-Quest (2006), school readiness of the children who get Montessori Education in early childhood is examined. As a result of the research, it is put forward that children who get Montessori education in early childhood show higher performance from the point of orientation skills and coping with increasing complex problems skills than the children who are traditionally educated.

The effect of Montessori Method on attention gathering skills for five-six years old children is analyzed by Koçyiğit et al. (2010). The research is done by experimental method and posttest with control group model is used. According to the results of the research, significant difference is found out on behalf of experimental group in comparison of attention gathering skills of five-six years old children in control group who get the Ministry of National Education Pre-school Program education and the children in experimental group who get Montessori education.

According to Özdoğan (2004), one of the essential principals of attention gathering training is child's finding his mistake himself and correcting it. Child should check himself and find his mistakes and correct them. The teacher should never show child's mistakes. In Montessori Method the teacher only explains how to use the materials. The teacher guides the child in forming his own experience by using the material and learning on his own. Montessori materials are prepared considering the opportunity of children finding the mistake they did and

correcting them on their own. To ensure that, generally, for each material there is only one problem that will be solved. For example; one of the most common materials of Montessori cylinders are different either in color or in size. There is not a task to line up cylinders different in color and in size at the same time (Oğuz and Köksal Akyol, 2006). According to this, children can notice their mistakes more easily and correct these mistakes fast. This keeps a child's attention on the subject for a longer time. When all these factors are taken into account, it can be thought that attention gathering skills of the children who have Montessori education can be positively affected by these factors.

CONCLUSION AND RECOMMENDATIONS

At the end of the study, by attention training, improvement in Attention Test (FTF-K) is seen. Besides, it is determined that the efficacy of the offered attention training continues 3-5-7 weeks after the intervention as well. According to these, following points may be suggested:

1. It is thought that using Montessori Education Program as a supportive program of general education will be beneficial for the education of the children with attention deficit and hyperactivity disorder.
2. Using attention training as a supportive program, for the children who have problems with learning and attention to upgrade children's attention and concentration can be suggested.
3. By the thought of negative effects of attention deficit in children's elementary school life, especially reading-writing and math skills, popularizing activities that improve attention skills in pre-school period can be suggested.
4. In-service or special training courses can be arranged for pre-school teachers about Montessori Method. Educators can be informed about the importance of attention gathering and improve their selves in how to support children's attention skills.
5. In this study from among the Montessori materials only sensorial materials are used. Future studies can be done by other kinds of materials and can be applied to children with other specialties.

Conflict of Interests

The author has not declared any conflict of interest.

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