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INVESTIGATION OF THE EFFECTS OF BADMINTON EXERCISES ON ATTENTION DEVELOPMENT IN AUTISTIC CHILDREN

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Abstract:

Background: The most common problems in individuals with autistic spectrum disorders are eye contact, being able to follow objects for a long time and lack of attention. Sports activities are known to prevent the negative symptoms of Autistic Spectrum Disorder. The Badminton sports branch has a positive effect on the individual's object control, ball focus, and attention, reaction, perception and coordination characteristics. For this reason, racket sports are considered to be an important tool in reducing the lack of attention in individuals with Autistic Spectrum Disorder.

Aim: The aim of this study, Investigation of the effect of simplified Badminton exercises on attention focus development of individuals with Autistic Spectrum Disorder and is the assessment of the level of retention of an acquisition.

Material and Method: The study group was randomly selected 3 out of 6 children who are not mentally retarded and responded to commands among 10 children aged 12-14 years in Isparta Gülşen Önal Autistic Children Education Centre. The mean age of children was 12.6 ± 1.15 years, height was 154,3±5,13 cm and weight was 52±3 kg. Benton Visual Memory Test, Bourdon Visual Attention Test and Stroop Effect Test were used as the measurement tool. Children were performed adaptation exercises for 2 weeks and from simple to difficult badminton exercise drills for 10 weeks. For each individual, 3 studies were performed at different times and 60 minutes per week. Tests

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were performed at 3 different periods, to be 10 weeks Badminton exercise process before and after and also retention test after 8 weeks interval. The obtained data were evaluated by Wilcoxon test.

Results: According to the results of all measurement instruments of the students participating in the research, there is a numerical rise between pre - test and post - test values. When the results of the retention test with the last test are evaluated, there was no decrease in the two participants according to the Benton visual memory test results, but the other participant had also decline, although not at the beginning level. Burdon attention test and Stroop effect test showed that there was no return to baseline in all participants despite a numerical decrease.

Conclusion: We can say that Badminton exercise program has a positive effect on attention level. Individuals with autistic spectrum disorder can be said to have a positive influence on the development of eye contact, long-time focus of objects and attention level development. Badminton exercises can be offered as a model to improve attentiveness to children with Autistic Spectrum Disorder if the duration of participatory study is increased.

Keywords: badminton, Benton, Bourdon, attention level, Autistic Spectrum Disorder, Stroop

1. Introduction

Autism is a specific neuropsychiatric disorder in terms of social relationships, communication, behavioural and cognitive developmental delay (Yavlal et al., 2015). Autistic Spectrum Disorder (ASD) is a syndrome that often develops in early childhood, characterized by disturbance of speech, the problems encountered in communication with the environment, display of certain skills, and developmental retardation in almost all cognitive functions (Rapin, 1991).

Attention deficit is defined by the concepts of hyperactivity and impulsivity (Häckerve et al., 2004). It is one of the most common problems in childhood and adolescence. ADHD (Attention Deficit and Hyperactivity Disorder) is a condition that seriously retards many aspects of everyday functioning lifelong, such as functioning of the affected adults in academic, social and business life (Tuğlu and Şahin, 2010)

Although Autism Spectrum Disorder and Attention Deficit and Hyperactivity Disorder are two separate problems, there are many important findings indicating that two disorders are related to each other (Koparan et al., 2016). Important findings are suggested in the literature, in that children with ASD (Autism Spectrum Disorder) have

attention deficit and hyperactive behaviours (ADHD) and it is even maintained that there might be distant relationship between two handicaps (Özeren, 2013). However, there is an opportunity for children to acquire and socialize with their peers in the case of early diagnosis of both ASD and ADHD (Sabuncuoğlu, 2015). Although it is possible that children with OSD have had this disturbance after the 2-year-old, diagnosis is delayed until children become 5-6 years of age due to the process of accepting the problem (McDermott et al., 2012),

Researches on drug treatment of ADHD accompanied with ASD are still on-going (Ardıç and Ercan, 2016). In addition, the researches focuses on overcoming the limitations of the individuals with ASD in social interaction, increasing interactions with the social environment and supporting and developing intervention based on cognitive skills (Özer and Özdemir, 2015). Along with these, there is an increase in interventions aiming at increasing the physical activity of children with OSD (Edwards et al., 2017).

In many studies, the most frequently reported deficiency in individuals with OSD is the lack of eye contact with the object or partner (Bruinsma et al., 2004). Several intervention methods have been used to improve the common attention levels of children with autistic spectrum disorders (Murza et al., 2016), and the results obtained are important in terms of attention development in direct interventions (Kerns, 1999).

In this study, we aimed to improve the eye contact ability with the object and attention level of the children with autistic spectrum disorder.

2. Materials and Method

The sample group of the study was formed by randomly selecting 3 out of 10 children aged 12-14, who responded to the commands, from Isparta Gülşen Önal Autistic Children's Education Centre. According to the information and guidance provided by the institution's management department, the children who are not mentally retarded are included in the study. Due to the fact that the individuals included in the study are handicapped, the number of the children has been kept low and it is thought as case assessment.

During the 10-week training period, children were subjected to badminton racket control and object and racket matching activities. The first two weeks of the study were evaluated as compliance period and the next 10 weeks were performed as a process developing from the simple to the difficult. For each individual, 3 studies were performed for 60 minutes at different times of the week. After 2-week of acclimation period within the 12 week process, the first measurements were performed before the

10-week participatory program and afterwards the second measurements were made and after the 10-week study period, 8-week break was given and afterwards the third measurement was taken.

Three different visual attention tests, being Bourdon, Stroop and Benton tests were applied in the study in order to support each other and to verify the data.

A. Bourdon Attention Test: This aim of this test is to measure the level of attention of the individuals. Before applying the test, individuals should be given necessary information about the test and a personal information form must be filled in. The children are given randomly arranged letters on a page. These letters are arranged at certain and regular intervals. Each page has 407 letters. There are 20 lines on each page. Each number of the letters on the page is known. There are 150 (a), 75 (g), 50 (b) and 25 (d) letters on the page prepared for the trial. It is applied to individuals between the ages of 9 and 20 in the Bourdon trial (Tunç, 2014).

B. Benton Visual Memory Test: This test was developed by Benton in 1974. By looking at the test on which the shapes are used, the memory test is carried out in the form of drawing and recognition of the picture from many shapes. The Benton visual memory test, which assesses the ability of keeping in mind, enables visual memory to be distinguished from perception and motor ability. In the individually applied test, the drawn form in the form of C, D and E and the visual form of F and G are used. In the visual Benton test, the cards on which the geometric shapes are lined up are shown to the individuals. The first card is required to be found among the 4 cards shown later. The visual memory of the individuals is measured by the test requiring finding the shapes on the 10 cards within 10 seconds. In the drawing, Benton tests, it is asked from the individuals to draw the shapes in the cards within 10 seconds. The figures drawn by the individual, who draws the shapes on the 10 cards shown in 10 seconds, are compared to the cards. Thus, the visual memory of the person who draws as much as he or she can remember is measured again. Afterwards, the reporting process is realized after the drawn Benton test, which is the second test (Randall et al., 1988).

C. Stroop Effect Test: It is a test comprised of three parts, developed by J. R. Stroop in 1935. It is asked from the individuals to read quickly the colour names given in the first section. In the second part, the individuals are asked to state the colours in the printed point clusters in colour ink as fast as possible. In the third part, the individuals are required to state the colour names written in different colour in ink in a fast (and loud) manner. For example, the word 'blue' is written in red or yellow ink (MacLeod, 1991).

Measurements were conducted in the presence of a specialist teacher and guidance unit. The scores of the measurements were recorded by two different

guidance specialists and the average of the two assessments evaluated by two different specialists was subjected to statistical evaluation.

Data were evaluated by using the Wilcoxon test, and individual developments were presented graphically through using descriptive statistics.

3. Findings

Table 1: Benton attention test Wilcoxon test results

	Measure	N	$\bar{X}$	SD	z	p
Benton	Pre-test	3	13,333	1,155	-1,633	,102
	Post-test	3	15,000	1,000		
	Post-test	3	15,000	1,000	-1,000	,317
	Retention-test	3	14,667	0,577		
	Retention-test	3	14,667	0,577	-1,633	,102
	Pre-test	3	13,333	1,155		

When Table 1 is examined, a numerical increase was found in each individual although there was no statistically significant difference between the values obtained before and after participatory program implementation (p> 0,05). There is a decline between the final test values taken after the participatory program and the average values of the retention test after 8 weeks of break. However, this numerical decrease is not statistically significant (p> 0.05). Although there is no statistically significant difference between the values of the pre-test and the retention test according to Wilcoxon test results (p> 0,05), there is a numerical difference between the two measurements. This means that the attention test values obtained with the participatory program are partially preserved even after 8 weeks of break.

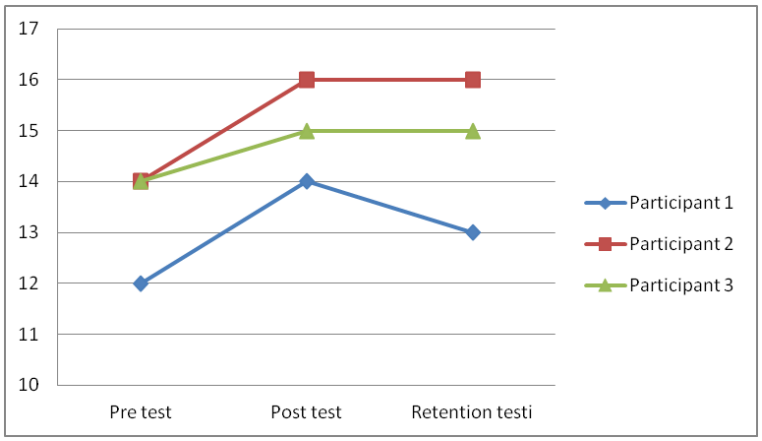


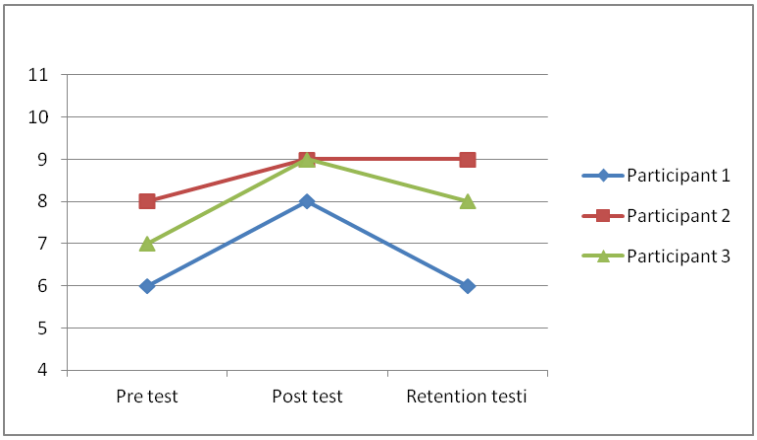
Figure 1: Individual development results of Benton Visual Memory Test

When Graph 1 is examined, a numerical increase occurred between the values obtained before and after each participatory program application. There is a parallel relation between the final test values taken after the participatory program and the average values of the retention test taken after the 8-week break after this process, while in the participant, 1 there is a decrease though not being at the initial level.

Table 2: Stroop test Wilcoxon test results

	Measure	N	$\bar{X}$	SD	z	p
Stroop Effect	Pre-test	3	7,000	1,000	-1,633	,102
	Post-test	3	8,667	0,577		
	Post-test	3	8,667	0,577	-1,414	,157
	Retention-test	3	8,000	1,000		
	Retention-test	3	8,000	1,000	-1,342	,180
	Pre-test	3	7,000	1,000		

When Table 2 is evaluated, it is concluded that there is no statistically significant difference (p> 0,05) between the average data obtained before and after 10 weeks of participatory program application, even though there is a numerical increase. There is a statistically insignificant decrease between the final test mean values and the retention test values after the study period (p> 0,05). On the other hand, there was no statistically significant difference between the pre-test and retention test, however the retention test averages were found to be higher than the pre-test values (p> 0.05). This means that the level of attentiveness after the participatory program is partially preserved after 8 weeks of break.



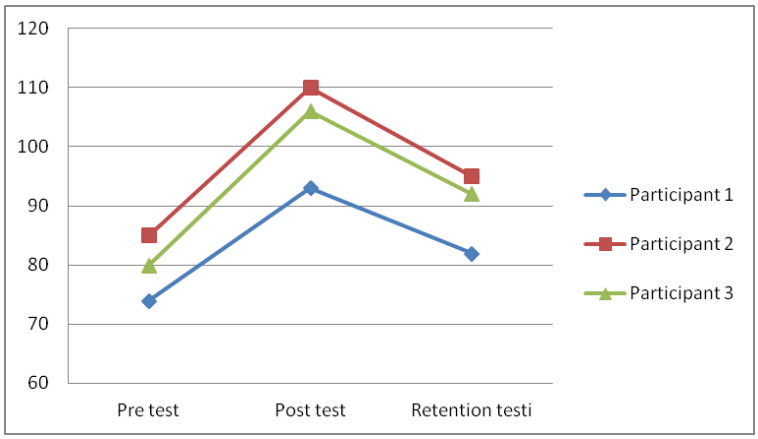
Graph 2: Individual development results of Stroop Effect Test

When Graph 2 is evaluated, it is inferred that there is a numerical rise between the average data of all participants before and after 10 weeks of participatory program implementation. When the values of the post-test and the post-8-week test scores are assessed, the results of participatory 2 are the same as the post-test results, while participatory 3 are not in the pre-test level. In participatory 1, this decline returned to the initial level, contrary to participatory 3.

Table 3: Bourdon visual attention test Wilcoxon results

	Measure	N	$\bar{X}$	SE	z	p
Bourdon	Pre-test	3	79,667	5,508	-1,604	,109
	Post-test	3	103,000	8,888		
	Post-test	3	103,000	8,888	-1,604	,109
	Retention-test	3	89,333	5,132		
	Retention-test	3	89,333	5,132	-1,604	,109
	Pre-test	3	79,667	5,508		

When Table 3 is assessed before and after the 10 week study period, it is seen that there was no statistically significant difference between pre-test and post-test values, despite the numerical increase ($p > 0,05$). As in the other attention tests, there is a numerical decrease that is not of significance between the final test and retention test ($p > 0,05$). However, despite this decrease, there is no statistically significant difference between the retention tests, with higher mean values compared to the pre-test ($p > 0.05$).



Graph 3: Individual development results of Bourdon Visual Attention Test

When the Graph 3 is evaluated, it is concluded that there is a numerical increase between pre-test and post-test values. As determined with the other attention tests, there is a numerical decrease between the post-test and the retention test. However, in spite of this decrease, there is no return to the pre-test level.

4. Discussion and Results

Often, autism and lack of attention are regarded as the same with each other, a phenomenon that stands out in many studies. In this context, within this study, aiming the determination of level of attention of the children with autism spectrum disorder and improving attention levels, the results of three different attention test tools gave similar results according to the data obtained. It was determined that the 10-week participatory program, which was applied after the pre-test at the beginning of the study, positively affected the attention level, and the retention test results obtained after the 8-week intervention after the participatory program showed a decrease by not returning to the baseline level.

According to the study carried out by Bikic et al., in 2012 investigating the effects of computer cognitive studies on cognitive function of adolescents with attention deficit and hyperactivity disorder, when the data obtained before and after the participatory study were evaluated, it was determined that there was a statistically significant difference between the visual attention values and short-term memory was reported to be positively affected (Bikic et al., 2012).

According to result of the Cliekman and his colleagues study on attention education, it was established that visual attention was improved in terms of children's levels of attention deficit and hyperactivity disorder (Clikeman et al., 1999). In another study, Pan and his colleagues investigated the effects of table tennis exercises on

cognitive and behavioural performance of children with attention deficit and they found that participatory program with table tennis for 12 weeks positively affected motor skills in positive statistical direction. Moreover, it has been observed that there is a decrease in the retention values of motor skills obtained after the application period break (Pan et al., 2016). In another study, Edwards and his colleagues investigated the effect of video games containing sport-activity on the development of object control skills of children with autistic spectrum, and the data obtained emphasizes the fact that their actual skill levels are not affected but their perceptional skill level is positively affected (Edwards et al., 2017).

According to the results of the study conducted by Kunzi in 2015 in terms of social skills of adults with autistic spectrum disorders, it was determined that physical activity, team sports and games were effective in the social development of individuals with ASD (Kunzi, 2015). In the study conducted by Tunç and his colleagues in 2014, the attention level of the children who played golf were examined and the obtained data revealed a statistically significant difference in the attention level after the participatory program (Tunç et al., 2014)

According to the results of the study carried out by Lee and his colleagues, it was confirmed that sporting activity during puberty period reduces adverse symptoms of the Autistic Spectrum Disorder (Lee et al., 2014). In the study conducted by Kartal and his colleagues in terms of the effects of fencing on the level of attentiveness, meaningfulness level was obtained and it was observed that the athletes ensured more concentration than the non-athletes (Kartal et al., 2016). As confirmed with the study conducted by Gözalan, investigating the effects of the game-based attention program, participatory program was determined to have a positive effect on the attention level (Gözalan, 2013).

In a study by Yarımkaya and his colleagues (2015) in which children were investigated in terms of the effect of sprint training on attention, it was determined that sprint studies positively affected the attention levels of participants in the study (Yarımkaya et al., 2015). It was determined by Dereceli (2011) that there was a statistically significant improvement in the level of attention of the study group within the participatory program that investigated the effects by Thai Chi studies on Attention Deficit and Hyperactivity Disorder in children's attention level (Dereceli, 2011).

Kang and his colleagues investigated the effects of sport activity on socialization, cognitive and attention development through the studies they conducted in 2011. The obtained data indicated that sport activity positively affected attention development (Kang et al., 2011).

Children with attention deficit appear to be affected positively in terms of attention and concentration if they are directed towards appropriate activities, sports or any other branches he/she takes pleasure (Topçu et al., 2007). These previously conducted studies support our study.

According to the results obtained, the participatory program positively affects the improvement of attention level. Although there is a partly development in the level of the attention, it sustains its retention despite decline. It is envisaged that in the case of prolonging the application period of the applied work program, the improvement to be achieved will increase and sustainability will be maintained.

However, in order to determine whether this development in ability will improve at the chronic level, taking a measurement after a longer interval is of importance in terms of achieving more accurate results.

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