

Effect of Table Tennis Training on Reaction Times of Down-syndrome Children

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Abstract The purpose of this study was to assess the reaction times of individuals with Down syndrome, aged 12-15 participated in table tennis exercise for 12 weeks. Twenty children with Down syndrome participated in the project "Every child succeeds if you give a chance" that the governor of Malatya started to work. Ten children with down syndrome voluntarily participated in the exercise group. Ten children with Down's syndrome were included different study and were evaluated as a control group. Children in exercise group and control group participated in the study were regularly trained 90 minutes three days a week by expert table tennis coaches. In the training sessions, ball throwing with racket, ball throwing on a wall, backhand exercise, forehand exercise, ball throwing with racket and control exercise, service exercise to specific area were done. Children in control group participated the programme that include ball throwing on a wall, hit to ball with foot, hitting the ball with the cuff, jogging, running. In order to find out whether the reaction time has improved, all individuals were subjected to a reaction test before and after at the end of 12 weeks. As a result of this study, it was determined that the reaction times of children with Down's syndrome participating in table tennis study were better than children with Down's syndrome who were control group.

Keywords Down Syndrome, Table Tennis, Reaction, Exercise

1. Introduction

Down syndrome results from trisomy of chromosome 21. The most common symptom of Down syndrome is mental retardation [1]. In our society, the way of inactive life is very common for individuals with mentally disabled. For this reason, individuals with Down syndrome have a low participation in physical activity because of articulation problem, mental retardation, pulmonary problem (obstruction, insufficient pulmonary circulation), causing

them to live an inactive life [2, 3]. The result of inactivity, in children with Down syndrome faces to obesity, slower reaction time and instable postural control. If we want mental disabled people to live a more active and healthy life, we should encourage them to do sports and provide support. The disabled people's active participation in the sport by getting out of their home life will make them more active individuals within the society [24]. Sharing of same environment together with the individuals with Down's syndrome and healthy individuals will provide them to live a more active and creative life in their daily lives [6]

It should be emphasized that the sportive activities have some kind of rehabilitation effect on people with or without mental disabilities [6]. Participation in well-planned sporting events affect improving balance, muscle strength, function of respiratory and circulatory systems [25, 26] When it's considered the positive effects of sports on individuals with disabilities, working activities should be prepared according to their age, abilities and information to meet the sporting needs of people with or without cognitive impairments [9,13]. Individuals with Down's syndrome generally have a more sedentary social life. The study of table tennis is an important sport in terms of the more active individuals with Down's syndrome. In addition, the training given by the trainer will be important for these individuals to be more disciplined. Reaction time refers to that assess with the application time or individual's muscle response to stimulation or exercise [2]. However, it is stated that the reaction time is improved by sportive studies [3, 7]. Because the table tennis is a sporting activity that needs to be played faster, the ability to quickly detect and respond. Meeting the ball of the opponent side and throwbacking made takes place in a matter of seconds. Therefore, the reaction time of the individual must be as soon as possible [5].

In individuals with Down syndrome have insufficient motor skills. Individuals who do not participate in physical activities or are not included in the games by their peers are reported to have progressively poor physical and motor skills [11]. Working of table tennis is a sport with fun and includes games for disabled people. It is aimed to increase

the behaviour patterns and cognitive skills of individuals with Down's syndrome by means of playing game [12]. One of the issues that scientists have been most interested in since the mid-19th century is the time of reaction [17]. The reaction time is also described as the preparation period required for the movement to occur by taking the stimulus [4, 22]. Some scientists have described the definition of reaction time as the internal timing between taking the stimulus and the answer [23] The movement time is the time from the beginning of the movement to the end of the movement immediately after the reaction time [15]. People with Down's syndrome are generally engaged in swimming sports. Apart from swimming, they rarely deal with different sport branches [21] The purpose of this study is to determine the effect of table tennis sport on the reaction time of disabled people with Down syndrome.

2. Method

In this study, the effect of table tennis activity, which lasted for 12 weeks, on the reaction times of individuals with Down syndrome, aged 12-15 years was examined. Twenty individuals with Down syndrome participated in the project "Every child succeeds if you give a chance" that the governor of Malatya started to work. All families provided their informed consent before the study was initiated. A total of ten participants with Down syndrome, 6 boys and 4 girls, voluntarily participated in the exercise group with the permission of their parents. In order to better understand the effect of the work on the reaction time, a control group consisted of 10 individuals with Down's syndrome. Children in control group participated the programme that include ball throwing on a wall, hit to ball with foot, hitting the ball with the cuff, jogging, running. Age, weight and height measurements of all the participants were taken twice before and after the study. The work of table tennis and control group has been made three days a week on Tuesdays, Thursdays and Saturdays for 90 minutes. The work of control group has been included the first 10 min general warm-up movements followed by the 15 min ball throwing on a wall, 15 min hit to ball with foot, 15 min hitting the ball with the cuff, 15 min jogging, 10 min running and 10 min recovery exercises. The work of table tennis for experimental group has been included the first 10 min general warm-up movements followed by the 70 min table tennis practice last 10 min recovery exercises. Each individual worked with his own racket for 12 weeks and a total of 5 table tennis coaches worked in this process. In addition, the trainers gave behavioural training to people with Down's syndrome in order to make their work more productive (The way of speaking, the appealing, getting permission, getting the right to speak, etc.) Weekly work is done as follows;

1. Week: Explanation of game rules and basic posture movements.
2. Week: Display of gripping techniques (Forehand-Backhand).
3. Week: Moving study of forehand and backhand techniques.
4. Week: Servicing techniques.
5. Week: Service reception techniques.
6. Week: Serving in a specific area.
7. Week: Body position at the moment of shooting.
8. Week: At the moment of reception, the position of the body and the distance to the table
9. Week: Posture position in pairs.
10. Week: Shooting techniques in pairs.
11. and 12. Weeks: Applying game rules in the competition.

In this study, reaction times were measured before and after the 12-week with Reaction Time Hubbard-Hap brand reaction measuring device for experimental and control group. The measurements were made with the hands used by playing table tennis by individuals participating in the table tennis activity otherwise hands used by the control group in daily life. This test repeated three times and better score recorded.

3. Data Analyses

Analysis of the data was made in SPSS 23 statistical package program. Differences between groups were determined by independent sample t-test. In the power analysis performed, assuming that the difference between pre-treatment and post-treatment was 1 unit with $\alpha = 0.05$ and $1-\beta$ (power) = 0.80, at least 18 patients were required for the sample. The Mann-Whitney U test was used for the comparison of the significance of data that did not meet parametric conditions. A value of $p < 0.05$ was accepted as statistically significant. Significance was accepted as $p < 0.01$ and $p < 0.05$.

4. Results

A total of twenty in children with Down syndrome (n:10 experimental group, n:10 control group) participated in this study. The mean age of the participants was 13.60 ± 0.84 years (range 12-15 years).

Clinical characteristic of the participants are shown in Table 1, There is no significant difference between the age, weight and height of the experimental and control groups ($p > 0.05$)

Table 2 shows the pre-test and post-test scores of the experimental group in the table tennis activity and the control group. Regarding the total scores between the applications, statistically significant differences were observed ($p > 0.05$).

Table 1. Characteristics of Experimental and Control Group Individuals with Down Syndrome.

Group		n	x	sd
Control Group	Age	10	13,60 years	1,26
	Weight	10	42,60 kg	6,01
	Height	10	150,90 cm	4,98
Experimental Group	Age	10	12,59 years	0,84
	Weight	10	46,00 kg	7,19
	Height	10	156,90 cm	7,59
Total	Age	10	13,60 years	0,84
	Weight	10	46,00 kg	7,19
	Height	10	156,90 cm	7,59

In Table 3, pre-test comparisons of the reaction times of the experimental group participating in the activity of table tennis and the individuals with Down's syndrome in the control group were made. The average of reaction time

of individuals in the experimental group was lower than the average of reaction time of the control group individuals. A statistically significant difference was found ($p < 0.05$).

Table 2. Normality test for Dependent Variables One-Sample Kolmogorov-Smirnov Test

	Experimental Group		Control Group	
	Pre-test	Post-test	Pre- test	Post-test
	10	10	10	10
x	68,0000	55,4000	86,6000	82,4000
sd	16,46545	14,62266	6,04060	6,73448
Kolmogorov-Smirnov Test	,219	,222	,192	,182
p	0,192	0,178	0,200	0,200

Table 3. Pre-Test Comparison of Reaction Times for Individuals with Down syndrome in the Experimental and Control Groups

	Group	N	x	ss	Independent T-testi	Sd.	p
Pre test	Experimental Group	10	68,00	16,46	-3,354	18	0,004*
	Control Group	10	86,60	6,04			

In Table 4, the reaction times of the experimental group were compared with pre-test and post-test. A statistically significant difference was found between the pre-test and post-test of the individuals in the experimental group ($p < 0.01$).

Table 4. Comparison of Pre-Test and Post-Test of Experiment Group Reaction Times

	x	N	ss	Depended Groups T-test	Sd.	p
Pre test	68,00	10	16,46	5,816	9	0,000*
Post test	55,40	10	14,62			

In Table 5, the reaction times of the control group were compared with pre-test and post-test. No statistically significant difference was observed between the pre-test and post-test of the control group ($p > 0.01$).

Table 5. Comparison of Pre-Test and Post-Test of the Control Group Reaction Times

	x	N	ss	Dependent Groups T-test	Sd.	p
Pre test	86,60	10	6,04	-2,905	9	0,017
Post test	82,40	10	6,73			

In Table 5, the reaction times of the control group were compared with pre-test and post-test. No statistically significant difference was observed between the pre-test and post-test of the control group ($p > 0.01$).

Table 6. Post-Test Comparison of Reaction Times for Individuals with Down syndrome in the Experimental and Control Groups

	Group	N	x	ss	Independent T-test	Sd.	p
Post test	Experimental Group	10	55,40	14,62	-6,500	18	0,000*
	Control Group	10	82,40	6,73			

5. Discussion

This study investigated the effect of table tennis sport on the reaction time of disabled people with Down syndrome. It was found that the reaction times of individuals with Down's syndrome who have participated in the table tennis activity have decreased. This is the first study to compare the effect of table tennis sport on the reaction time of disabled people with Down syndrome.

The development of motor skills in individuals with Down's syndrome differs from that in non-disabled individuals. The motor skills and development of these individuals are markedly slower. Özdemir et al. [20] have indicated that the inability of individuals with mental disabilities to participate in physical activity adequately would lead to an inactive lifestyle [20] When we look at the work done, it seems that there is no training program for individuals with Down's syndrome. However, there are studies to determine the physiological and motoric properties of individual ls with Down's syndrome [10,14]. Aggon et al [1] point out that 12-week table tennis training practices significantly improved hand and foot reaction times in the study titled "The effect of table tennis basic training on flexibility and reaction times" [1] This study is similar to the study of Aggon et al [1] in this sense Bempa [8] notes that one of the most important features of improving reaction time is the reaction to a moving subject, and at the same time, he also notes importance of attention [8] The table tennis game is a play based on considerable consideration due to the game feature. When we think that motor skills and reflexes of disabled people with Down's syndrome are very lower, a game based on consideration such as table tennis will make an important contribution to the development of reactions of these individuals. As a result of attention to the individuals with Down's syndrome in this study that continues to table tennis training shows that the reaction times change positively (Table 4). When statistical results were examined, a significant difference was found between the test group and the pre-test results of the control group. (Table 3). In this case, we can deduce that the individuals who have participated in table-tennis activity are volunteering and more willing. When the last tests between experimental group and control group were examined, statistically significant difference was found. (Table 6). Regular training or sporting activities affect positively some behavioural changes and motor development in individuals with mentally disabled [12, 23]. Un and Bahçeci [18] stated that the reaction times of the individuals with mentally disabled who sport are shorter than those who do not [20]. Özdemir et al. [19] concluded that participation in sports activities had a positive effect on physical development, motor development and reaction times of disabled people [19]. The difference between the pre-test and post-test averages of the experimental group we studied is significantly higher than the difference between the control group averages (reaction time is

shorter) this shows the effect of attention and concentration studies (Table 2). There was no statistically significant difference in the pre-test and post-test reaction times of individuals with Down's syndrome that we did not study and considered as only control group (Table 5) ($p>0.05$).

6. Conclusions

As a result, this study found that participated in the table tennis activity reduced the reaction time of children with Down syndrome. Activities target a specific area in the brain that is usually responsible for decreased of reaction time. Shortly, the reaction times of individuals with Down's syndrome who have participated in the table tennis activity have improved, so that the effectiveness of the event has a positive effect on the reaction time of individuals with Down's syndrome.

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