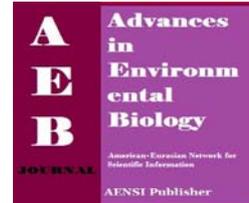




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Effect and Sustainability of 8-weeks Rebound Therapy Exercise on Dynamic and Static Balance of High School Male Students Affected by Down syndrome

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ABSTRACT

Background: Participation in athletic exercises results in motivating self-confidence and promotion of social acceptance; Also Lack of balance leads to rising probability of falling down and several injuries. **Objective:** The aim of the study was to assess effect and sustainability of 8-weeks Rebound Therapy exercise on dynamic and static balance of high school male students affected by down syndrome. 15 person were placed in the control group with mean age 18/54year and standard deviation of 3/86 year, mean weight of 76/8kg and standard deviation of 14/1kg, mean height of 164/2cm and standard deviation of 5/3cm, and 15 persons were chosen as the test group with mean age of 19/36 year and standard deviation of 4/34 year, mean weight of 74/35kg and standard deviation of 15/3kg, mean height of 165/7cm and standard deviation of 6/8cm. To measure the static balance, BERG standard test was used and T.G.U.G test was used for dynamic balance. For descriptive statistics, mean and standard deviation were used. KS test was employed for the groups normalization, and in the section inferential statistics, t-test [dependent and independent] at $\alpha = 0.05$ was performed and Anova test for extra group comparison. **Results:** Difference of the variables in the rebound therapy group is found significant, but it isn't significant in the control group. Also, results showed that effect of rebound therapy exercise on enhances of static and dynamic balance is not Sustainability on high school male students affected by Down syndrome. Rebound therapy exercise is effective for improvement of static and dynamic balance the male high school students affected with Down syndrome but its effect on the dynamic balance is more than static balance. **Conclusion:** Rebound therapy exercise is effective for improvement of static and dynamic balance the male high school students affected with Down Syndrome but the effectiveness of it is not Sustainability.

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INTRODUCTION

English neurologist, John Longsdon Down, in 1866 for the first time distinguished Down syndrome disease from other diseases and disabilities and called these people Mongol due to the morphology of their faces. In 1950, 63 years after Longdon's death, a French genomics expert, Jerome Lejeune, discovered genetic causes of this disease. He found that in people with Down syndrome, there are 47 instead of 46 chromosomes meaning that one of chromosomes, at the time of division, has become Threesome instead of being doubled [1]. One of the problems affecting motor function in people with this syndrome is feeble and weak joints and muscles leading to weakness in motions and lack of balance. Participation in athletic exercises results in motivating self-confidence and promotion of social acceptance [2]. Research shows that balance is related to optimal position of COP [Center of pressure] gravity center at BOS [Base of support] point of support and it is lost when gravity center moves to outside of stability limits [3]. Lack of balance leads to rising probability of falling down and several injuries [4]. Meldrum and Finn defined balance as the ability for maintaining dynamic balance while doing functional activities [5]. Rebound therapy is a therapeutic use of Trampoline. This device was first used for treatment of children with special needs and eventually was applied in Physiotherapy for adults [6]. This device is composed of a square stretch fabric connected to a metal panel by stretch bands or a metal spring [7]. Rebound therapy practice includes: up and down jumps, coming down on both feet or one foot, several motions of shoulders, arms, body, thigh, hands, knees and feet[10]. Assuming that rebound therapy is an effective treatment method for mental invalids for improving balance, current research tries to confirm or reject this hypothesis.

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MATERIALS AND METHODS

30 students were selected as the sample from the statistical population from whom 15 person were placed in the control group with mean age 18/54 year and standard deviation of 3/86year, mean weight of 76/8kg and standard deviation of 14/1kg, mean height of 164/2cm and standard deviation of 5/3cm, and 15 persons were chosen as the test group who voluntarily took part in the experiment [i.e. rebound therapy] with mean age of 19/36 year and standard deviation of 4/34year, mean weight of 74/35kg and standard deviation of 15/3kg, mean height of 165/7cm and standard deviation of 6/8cm. To measure the static balance, BERG standard test was used and T.G.U.G test was used for dynamic balance. The balance exercise program was performed by means of trampoline which lasted 8 weeks, for 3 sessions of 20 minutes each week. For descriptive statistics, mean and standard deviation were used. KS test was employed for the groups normalization, and in the section inferential statistics, t-test [dependent and independent] at $\alpha = 0.05$ was performed and ANOVA test for extra group comparison.

Subjects were selected randomly as available sample and divided into a control group including 15 people and an experimental group with 15 members. Those with one of the following conditions were removed:

- 1- Record of multiple ankle sprain over the last year
- 2- Taking medications affecting on balance
- 3- Record of ankle sprain over the last 6 months
- 4- Having pharyng it is or sore throat at the time of exercise
- 5- Existence of multiple knee injuries over the last year [3 times or more]
- 6- Injuries or surgery on the knee over the last year
- 7- Record of multiple hip joint injuries over the last year
- 8- Injuries or surgery on the thigh over the last 6 months
- 9- Record of instability [imbalance] in atlanto-axialjoint
- 10- Record of anesthesia for 3 times or more during lifetime
- 11- Anesthesia over the last 6 months

In order to measure static balance, BERG standard test was used and dynamic balance was measured by T.G.U.G test. BERG test has 14 sections [static or dynamic] that has 0-4 score. Zero shows the lowest performance and 4 conveys the highest function across a section and score 56 is for that who has the highest balance. T.G.U. G test includes 6 steps in which the subject should perform all steps within the shortest possible period of time.

A Berg Balance Scale:

1. Purpose:

The Berg's utility includes grading different patients' balance abilities, monitor functional balance over time and to evaluate patients' responses to treatment.

2. Content:

The Berg is a test of 14 items; it is performance based and has a scale of 0-4 for each item [higher score for independent performance] with a maximum score of 56.

The Berg is considered the gold standard assessment of balance with good intra-rater reliability and inter-rater reliability and good internal validity.

Total Score [Maximum = 56]:

Interpretation of Berg Scores:

Please take note that these values are based on the Berg score alone and the patient mobilizing without the assistance of a walking device. They do not take into account other falls risk factors

- A score of 45 or less indicates a greater risk of falls
- In the range of 56-54 each 1 point drop was associated with a 3-4% increase in falls risk
- In the range of 54-46 each point drop was associated with a 6-8% falls risk
- Below 36 falls risk is close to 100%

T.G.U.G [Time To Get Up And Go] Test:

The participant should sit on a chair and then should stand up and go straight toward another chair that the distance between them is 3 meters, then he should turn around the second chair and go back to start point. Time is the score.

Practice protocol:

Rebound therapy training includes Health jumping and strength jump son Trampoline that in first week takes 10 minutes and finally it lasts 30 minutes. Within the first week, subjects were not able to exercise without keeping the handle of trampoline but over the next weeks they did it easily without taking the handles.

Health jumps:

This practice strengthens cardiovascular system and includes soft and mild jumps.

Strength jumps:

Include high single-leg jumps for manipulating the subjects' balance.

An example of this practice is as follows: the subject stands motionless on the trampoline for a while and keeps her sole contact with the mat. Then he opens his legs as wide as his shoulders width and takes a few deep breaths while keeping the neck, thigh, abdomen and arms in a relaxed position. The knees are slightly bent. Then he must put his sole in a position of vertical jump, slowly going on his sole and then his toes so that his heels are completely are up the surface without any contact with the mat. He jumps up as much as some inches and then descends on the mat. He descends on the five toes, sole and finally his heel. Consider how this position in rebound therapy is different from the floor where the largest pressure on is imposed on the heel leading to injuries. But on the trampoline, 85% of body weight is captured by this device. If performed correctly, this position helps people against imbalance while jumping. The legs in people with Down syndrome is constantly checked by the researcher and trainer. At the end, the subjects were asked to walk on their toes on the floor to make their body familiar with gravity. The order and type of exercises for all subjects were almost the same.

Results:

The results of dependent t- test [$\alpha = 0/05$] are presented in the table below. Difference of the variables in the rebound therapy group is found significant, but it isn't significant in the control group. Thus, it can be concluded that rebound therapy exercise is effective for improvement of static and dynamic balance the male high school students affected with Down syndrome. Thus, As you can see in Table2, there was no significant difference in Rebound therapy group after second post test [after 4 weeks of the first post test for evaluating the effect of sustainability] therefore effect of rebound therapy exercise on enhance of static and dynamic balance, is not Sustainability on high school male students affected by down syndrome. Therefore, for comparing the effect of 8-weeks of Rebound therapy training on static and dynamic balance of High School Male Students Affected by Down syndrome, the gain score was calculated at the first and then ANOVA test was used at a significance level of 0.05. As we can see in table 3, between Rebound therapy and control groups, in static and dynamic balance, there were significant differences, but, Rebound therapy exercise is more effective on dynamic balance. Thus, we conclude that Rebound therapy exercise is effective for improvement of static and dynamic balance the male high school students affected with Down syndrome but its effect on the dynamic balance is more than static balance.

Table 1: The mean and standard deviation before and after static- and dynamic balance test on patients.

Balance test	Group	Stages	Mean	Standard deviation	t	Sig
BERG Test	rebound therapy	Pre-test	41	7/44	-5/39	0/00
		Post-test	9/53	2/69		
	Control	Pre-test	38/53	12/12	-3/33	0/06
		Post-test	30/39	11/44		
T.G.U.G Test	rebound therapy	Pre-test	13	8/82	3/70	0.03
		Post-test	10/90	7/36		
	Control	Pre-test	8/44	2/50	-0/73	0/47
		Post-test	8/90	2/12		

Table 2: The mean and standard deviation in Rebound therapy group[the second post test for evaluating sustainability].

Group	Stages	Mean		Standard deviation		t		Sig	
experiential	Pre-test	static	dynamic	static	dynamic	-1.39	0.19	0.18	0.84
		41	13	7.44	8.82				
	Post-test	42	11.9	7.1	8.76				

Table 3: Balance sheets and one-way analysis of variance [ANOVA] using BERG and T.G.U.G test.

Dependent variables	Groups	Sig
[BERG][static]	rebound therapy - Control	0/003
[T.G.U.G][dynamic]	rebound therapy - Control	0/000

Image: Trampoline that used for this study



Discussion:

This study was focused on the effect of 8 -week rebound therapy exercise on static and dynamic balance of male school students suffering from Down syndrome. The results indicate improvement in the static and dynamic balance following the training sessions, and a significant difference between the pretest and posttest in the rebound therapy group. Rebound therapy exercise led to improvement of static and dynamic balance in the students affected by Down syndrome. The results are consistent with 4 other studies [8-11] conducted in this area. This consistency can be attributed to the effect of rebound therapy on improvement of balance and muscle tone owing to the 3-dimensional movement the continuous changes it brings about in the body's center of gravity and support then, rebound therapy exercise can be recommended for the purpose static and dynamic balance in girls affected by Down Syndrome. Finally, Benefits of exercise in people affected with Down syndrome is more than improving physical health. Participating in sports activities, will lead to enhance self-esteem and acceptance by the community. The importance of sport activities for people with disabilities according to their characteristics is double and eliminates complications of disability[2]. then, Rebound therapy training, as a sport activity, will be useful for these people. There was no significant difference in Rebound therapy group after second post test, therefore effect of rebound therapy exercise on enhance of static and dynamic balance, is not Sustainability on high school male students affected by down syndrome. The reason for this is a student affected by Down syndrome is associated with mental and physical retardation and it Reduces the chance of sustainability. The results are consistent with Rees and colleagues [11].

Photos:



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