EFFECT OF CORE STABILIZATION EXERCISE ON STATIC AND DYNAMIC BALANCE IN GIRLS WITH CEREBRAL PALSY SPASTIC DIPLEGIA

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Abstract. The aim of this study is to investigate a core stabilization exercise on static and dynamic balance Spastic diplegia. For this study, 20 volunteers were selected and randomly divided into two experimental and control groups. For data analysis, descriptive statistics to describe the data in each group and the test of Shapiro, one to determine the normality of the data and the analysis of covariance to test hypotheses and significance level 0.05> p was considered to computer software spss version 20 was used. The results showed that the static balance with eyes open and closed Romberg test, significant difference were observed but significant difference was seen in dynamic balance test Y. It can be concluded that postural control and as a result, the balance in patients with cerebral palsy Spastic diplegia by core stability training can be improved.

Words Balance: cerebral palsy, Spastic diplegia, static balance, dynamic balance, core stability, and proprioception.

1 Introduction

Since the beginning of human life have been countless accidents. Past and present significant proportion of people because of disability, of the pleasures of life, and are deprived of power production and construction (Chagatai et al., 2002). The first of the late nineteenth century, called LITTLE orthopedic described the disease and spastic rigidity of the term used to describe the disease (Tonekaboni 2010 and Qadiri and Mashallah 2008). Disability is one of the most important challenges for all countries regardless of their economic situation and policies of each country is to fix their problem, represents the culture and civilization of their people. Disabilities by increasing the number and severity of accidents remarkable growth, wars and acts of terrorism, economic weakness, limitation of motion activity, drug abuse and many other factors linked (Gharabaghi 2011 and Asmyrnva 2003). Undoubtedly special needs of persons with disabilities in your life that are much more difficult if not resolved. These problems usually over self-mutilation, between culture and awareness level of the community. According to a principle other biologically important, compensatory mechanisms to stimulate and launch. But research community such compensation to pay special attention to the problems people with disabilities. In contemporary humanitarian thinking, every human being has the right, not like the other. Cerebral palsy include non-progressive disease of the brain is growing which leads to a bunch of defects, neurological, motor, and about the state of the body and in the course of development of the brain (infants and children) occurs. Different causes such as brain development disorders, genetics, metabolism, ischemia, infection and acquired causes of cerebral palsy and can manifest in a neurological phenotype. The incidence cerebral palsy 1.4 to 2.4 per 1,000 live births and prenatal care despite technological advances in the last two decades and is still one of the main causes of childhood developmental disorders remains prevalent (Stanley et al., 2001). In developing countries, factors such as infections, accidents and trauma, malnutrition, maternal causes paralysis but the exact number of these countries are not available, but it looks at about 6 per thousand live births is (Lawson et al. 2003). CP based on the type of spastic muscle tone, including the highest prevalence (75/0), Hyper Connecticut, ataxia and mixed (case Smith et al., 2009). Among the causes of balance disorders in children, impaired muscle tone, difficulty in organizing symptoms of sensory and sensory-motor data integrity (Ryan et al, 2013). Liao (2007) observed that children with mild cerebral palsy in school age can walk independently, but walking ability compared to healthy peers that this problem increases with age and Loss of ability to walk leads hence effective intervention for children with mild cerebral palsy in order to maintain or improve the ability to move at school is very important (Liao et al. 2007). Different causes such as brain development disorders, genetics, metabolism, ischemia, infection and acquired causes of cerebral palsy and can manifest in a neurological phenotype. The incidence cerebral palsy 1.4 to 2.4 per 1,000 live births and prenatal care despite technological advances in the last two decades and is still one of the main causes of childhood developmental disorders remains prevalent (Stanley et al., 2001). Although this figure has been stable for 30 years, but the underlying causes of the disease has changed. Because of the increased survival of premature infants with low birth weight or very low incidence of cerebral palsy spastic diplegia for prematurity and low birth weight is often accompanied by increased bilirubin and brain is reduced in developed countries (Pellegrino, 2002). Cerebral palsy treated by a team of experts includes doctors, occupational therapists, physiotherapists, speech therapists, social workers and psychologists, possible. Parents are important members of the team must do chores in the training of these children (Wilson et al. 2007). This study investigates the effect of an exercise period of stability on static and dynamic balance in girls with cerebral palsy spastic diplegia will be discussed.

2 Research purposes

The overall goal:

The effect of core stabilization training on static and dynamic balance of girls suffering from cerebral palsy spastic diplegia

2.1 Specific objectives

1. The effect of core stabilization training on balance and girls suffering from cerebral palsy spastic diplegia.

2. The effect of core stabilization training on dynamic balance in girls suffering from cerebral palsy spastic diplegia.

2.2 hypotheses

1. One of the core stabilization training on static and dynamic balance of girls with cerebral palsy spastic diplegia implications.

2.3 specific assumptions

1. One of the core stabilization training on Static balance with spastic diplegia cerebral palsy affects girls.

2. One of the core stabilization training on dynamic balance with spastic diplegia cerebral palsy affects girls.

2.4 Research presuppositions

1. The validity and reliability of measuring devices is acceptable.

2. The participants have cooperated in the investigation appropriately.

3. The experimental group did the exercises correctly and under the supervision of a researcher.

4. The subjects of nutrition during training appropriate.

5. The subjects had to be motivated to participate in the study.

6. Participants do not have the mental and emotional problems.

2.5 Range and areas of research

1. All research population with spastic diplegia cerebral palsy girls make up rehabilitation centers in the city of Karaj.

2. The research Range girls with cerebral palsy spastic diplegia 10 to 15 years.

3. Both the experimental and control groups in terms of age, height and weight are in the range are homogeneous.

4. Subjects' ability to sit alone or with its support.

5. The perception enough to understand the subjects' verbal requests and instructions during the test and its practice.

6. Failure to orthopedic surgery in the past year.

7. Researcher the strict implementation of training and tests as much as possible and control.

2.6 Conceptual and operational definitions research words

2.6.1 Conceptual definitions:

1. Cerebral Palsy: This term is used to describe brain damage as a static non-progressive encephalopathy caused by abnormal development of the brain or brain damage each time before, during, or after birth occurs. Musculoskeletal disorders of the nervous system, resulting in movement disorders, poor posture and poor performance is one of the main indicators of this disorder (Robinson and Gribble, 2008).

2. Core stability: the chest as a cylindrical central region - the upper third of the shoulder girdle and pelvis of the plate as the lower third of the plate legs impressive performance, which reflects the state of the chest and belt shoulder.

3. Static balance: When the sum of all external forces acting on an object is zero, the body is in a state of static equilibrium in other words, static balance, the ability to keep the center of gravity of the body, inside the building with minimal.

4.Dynamic balance :When torque is the sum of all external forces acting on an object is zero, the body is in a state of dynamic equilibrium in other words, means the body's ability to maintain a state at the time of the move.

5. Proprioception: Related to deep tissues such as bone and pods of sensing pressure and deep sense of deep pain.

2.6.2 Operational definitions:

1. Cerebral Palsy: by damage to the brain before birth, during birth or after they are born. This failure to appear for movement disorders usually spite of the damage to the brain and its lack of progress, the problems caused by the disease in the patient's life is changing.

2. Core stability: In this study, the order of core stabilization training exercises without a Swiss ball from the wing and the wing Swiss ball exercises is provided by Jeffrey in 2002.

3. The ability to maintain the center of gravity in the range of support that in this study the Earth's surface (with eyes open and eyes closed) done.

4. Dynamic balance: The ability to maintain the center of gravity in the range of support in the case of support is stable and in this research is moving up in three directions.

5. Proprioception: the ability to feel and understand the spatial location relative to each other without the use of eye organs (Lephart et al., 1997).

In this study, using quasi-experimental research design pretest - posttest control group.

3 Statistical Society

The population study of all spastic diplegia cerebral palsy rehabilitation centers in Karaj girls aged 10 to 15 years up.

3.1 Sample and sampling method

In this study, 20 female patients with spastic diplegia cerebral palsy that have been criteria and the research was approved by the supervisory doctor and were randomly assigned to two experimental and control groups of 10 patients matched for age, height and weight are in a range of homogeneous groups.

Inclusion criteria for research:

1. The samples are spastic diplegia cerebral palsy research.

2. The ability to sit alone or with its support.

3. Perceived enough to understand simple verbal requests and instructions and practice the test is over.

4. Absence of orthopedic surgery in the year before the test.

Exclusion criteria from the research:

1. The lack of cooperation during the exercise.

2. Hearing loss, vision and illusion of being based on medical examinations observer.

3.2 variables

3.2.1 Independent variables

Core stability exercises

3.2.2 Dependent variable

1. Static balance

2. Dynamic Balance

3.3 Collection tool data

1. The consent form

2. Personal Information Form

3. Inventory PAR - Q medical advice to determine the activity

4. Balance for weighing

5. tape measure to measure the height

6. Romberg test to evaluate static balance

7. Y test to assess the dynamic balance

8. Stopwatch to perform the Romberg test

9. The core stabilization training protocol

10. Mattresses to implement the practice test

11. The wing Swiss ball exercises to implement

• Romberg test to evaluate static balance:

In this test, participants will be asked to open and close your eyes for 30 seconds with feet parallel to the stand. Fluctuations in person at the same time maintaining the balance and the situation is assessed, and excessive volatility, balance disorders or abnormal numerous steps. If your balance with your eyes open but with closed eyes cannot maintain, difficult to use sensory information - figure shows (Arian et al., 2010). The reliability of this test in healthy subjects with eyes closed eyes open 0.91 and 0.77 have been reported.

• Y test to measure dynamic balance:

To measure the dynamic balance of subjects, the test Y (Y BALANCE TEST) in three directions (anterior, posterior medial, posterior-external) are drawn with the angle of 135 degrees from each other, are used. Before starting the Y test, dominant leg will be determined subjects. If the right foot is superior fitness test conducted in counterclockwise and clockwise if left foot was superior in tests done.

Each subject performed three times in each direction, and the mean values were calculated and the length of the foot (in centimeters) from the anterior superior iliac spine to the inner ankle and lying supine on the ground to be measured divided and then multiplied by 100 to obtain the achievement gap as a percentage of leg length. Balance Test y valid 0.91 is.

3.4 Procedure

Data collection method:

After signing the consent to participate in research by parents and filling out forms and questionnaires of personal information PAR - Q and Targeted subjects randomly into two groups (10 patients in the experimental group and 10 in control group) were divided. Then the experimental group pre-test include: (Romberg test to evaluate static balance and dynamic balance test to evaluate Y), core stabilization exercise protocol consists of: (3 sessions per week for 8 weeks and each session was 45 minutes and include warm-up , stretching and strengthening exercises without the ball, Swiss ball, who first week include: 1. You're the abdomen in the supine position (3 rounds and each round of 20 repetitions), (2) your abdomen in the prone position, (3 rounds and each round of 20 repetitions), (3) your abdomen to the knee (3 rounds and each round 20 repetitions). The second week includes: 1. you the abdomen in the supine position (3 rounds and each round of 20 repetitions), (2) you have the stomach in the prone position (3 rounds and each round of 20 repetitions), 3. You're in the belly of the squat (3 rounds and each round of 20 repetitions). Third week: 1. You gather the abdomen in the supine position with one leg (3 rounds and each round of 20 repetitions), (2) you roll up the stomach in the prone position with one leg (3 rounds and each round of 20 repetitions). 3. Paul unilateral (6 reps for each side of the body and 10-second pause). The fourth week include: 1. you hold the abdomen in the supine position with the upper limbs and hands and feet close together (3 rounds and each round of 20 repetitions), 2 squat with one leg bringing up the rear (20 repetitions for each leg three rounds and each round), 3. rotate the trunk from side to side holding weights (3 rounds and each round of 20 repetitions for each side of the body) and Swiss ball exercises with wings that fifth week include: 1. Sit on a Swiss ball and your practice to the belly (3 rounds and each round is 10 seconds), 2. Scott while Swiss ball between the wall and the shoulder (3 rounds, each round of 15 repetitions), 3-raising hands and feet simultaneously in the prone position (3 rounds, each round of 10 repetitions). Six weeks include: 1 launch route miles in a 45-degree angle to the left or right (3 rounds and each round 12 reps), 2. Paul (shoulder and one leg on the ground floor and raise the buttocks and legs (3 rounds and each round of 15 second pause), 3. thee in the belly lying on a Swiss ball so that the soles of your feet on the ground behind the ball and Switzerland (3 rounds and each round of 20 repetitions). week Seven: 1- and 15 repetitions of each round). 3. Paul a way to get a leg up with (6 reps for each side of the body and 10-second pause). Eight weeks include: eight weeks include: (1) lying supine on a Swiss ball and your practice with the belly up get a leg (3 rounds and each round of 20 repetitions), (2) raise the opposite arm and leg in a squat (3 rounds and each round of 20 repetitions), 3. Paul feet on a Swiss ball is so high get a leg (3 rounds and each round of 15 second pause) that during the break between rounds 1 minute and 5 minute cool-down was conducted between movements (Jeff Ray 2002). After doing core stabilization exercise from both the experimental and control groups post-test includes: (Romberg test to evaluate static balance and dynamic balance test to evaluate y) were performed.

3.5 statistical methods

To analyze the data, descriptive statistics to describe the data and determine the orientation of the center of each group (mean and standard deviation) of the Shapiro-one test to determine the normality of the data, covariance analysis to test the hypothesis, significance level 05 / 0 and SPSS software version 20 was used for calculations.

Table1 mean and standard deviation static balance with open eyes closed and dynamic balance training and control groups shows. Average rates static and dynamic balance shows that the average balance open eyes closed and dynamic balance in post-exercise control group further.

Table (1) describing the variables

Post-test		**Pre-test**		**Group**	**Variable**
standard deviation	Average	standard deviation	Average		
18.2	27.1	4.37	22.4	Practice	Static balance with open eyes (time in seconds)
3.6	26.2	3.1	23.4	Control	
4.14	23.1	4.36	18.2	Practice	Blindfolded in a state of static equilibrium (time in seconds)
4.5	22.9	3.1	18.9	Control	
13.1	75.81	10.6	62.71	Practice	Dynamic balance (are achieving cm)
9.50	57.59	9.50	57.5	Control	

Information provided in Table 1 shows that the average pre-test in static balance with open eyes, eyes closed in a state of static balance and dynamic balance training group, respectively, 22.4, 18.2, 62.71and in the control group, respectively, 23.4, 18.957.5 is (figures 1, 2 and 3).

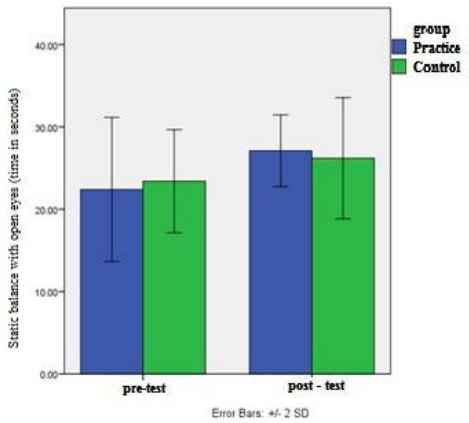

Figure (1) Average static balance with open eyes before - the post-test in two groups: research

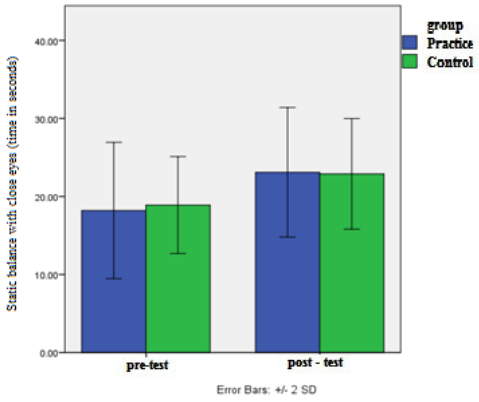

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Figure (2) in a state of static equilibrium blindfolded average pre - and post-test in two groups: research

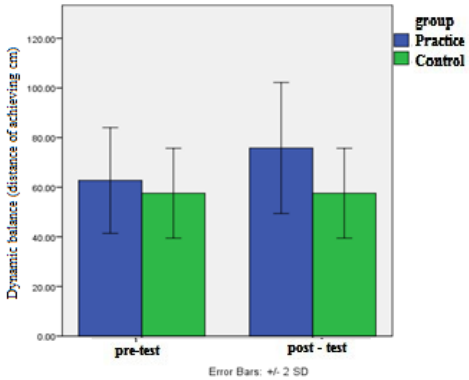

Figure (3) Average balance of static and dynamic pre - and post-test in two groups: research

4 Analysis of the research findings

4.1 Test assumptions of analysis of covariance (ANCOVA)

A) The nature of the data:

Vic Shapiro-test results Table 2 shows the data of static balance with open eyes in two independent variables were not normally distributed (05.0> p). Therefore, relevant data to static balance with open eyes using Mann-Whitney nonparametric test was tested.

On the other hand, static balance in a state of dynamic equilibrium eyes closed and normally distributed (p <0.05). Thus, according to make two assumptions of homogeneity of the variety of line slope and linear relationship between variables and the dependent variable (see section below) to test hypotheses in a state of static balance and dynamic balance of covariance was used blindfolded.

Table (2) Shapiro-wilk test results

Post-test			Pre-test			group	Variable
Sig.	df	D	Sig.	df	D		
0.007	10	0.774	0.037	10	0.834	Practice	Static balance with open eyes (time in seconds)
0.003	10	0.738	0.292	10	0.914	Control	
0.063	10	0.853	0.687	10	0.952	Practice	Blindfolded in a state of static equilibrium (time in seconds)
0.348	10	0.919	0.531	10	0.938	Control	
0.357	10	0.920	0.477	10	0.933	Practice	Dynamic balance (are achieving cm)
0.585	10	0.943	0.585	10	0.943	Control	

Information presented in Table (2) shows that the average pre-test in static balance with open eyes, eyes closed in a state of static balance and dynamic balance training group, respectively, 0.037, 0.687, 0.477 and in the control group, respectively, 0.292, 0.531, 0.585is. The mean post-test static balance with open eyes, eyes closed in a state of static balance and dynamic balance training group, respectively, 0.007, 0.063, 0.357 and in the control group, respectively, 0.003, 0.348, is 0.585.

B) Assumption of homogeneity line slope:

F-test results in Table (3) show that the slope of the regression line in a state of static equilibrium data blindfolded and dynamic balance homogeneous study groups (P <0.05). Therefore, the assumption of homogeneity line slope is established.

Table (3) the results of assumption of homogeneity of slopes

Sig.	F	Variable
0.571	0.335	Static balance of closed eyes
0.792	0.072	Dynamic balance

C) The assumption of a linear relationship between the variables of the variety (pre-test) and the dependent variable (performance):

Figures 4 and 5 shows the relationship between two variables and the dependent variable is linearly is the variety. Thus, according to assumptions contact data distribution, homogeneity line slope and the linear relationship between two variables and the dependent variable is the variety of covariance analysis to test the hypothesis static balance and dynamic balance used blindfolded.

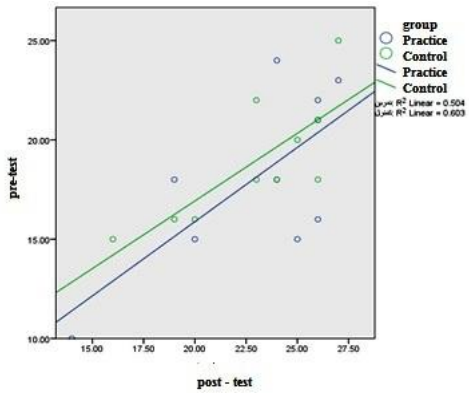

Figure (4) variable distribution of the Curite (pre-test) and the dependent variable in a state of static equilibrium eyes closed (post-test)

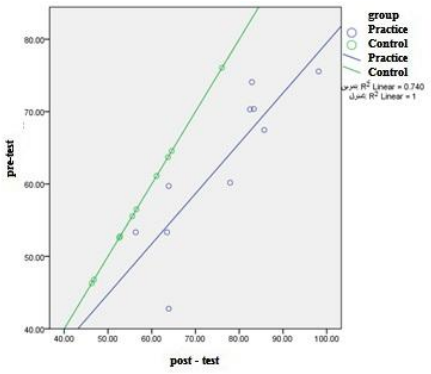

Figure (5) variable distribution of the Curite (pre-test) and the dependent variable dynamic balance (post-test)

4.2 Testing hypotheses

The first hypothesis assumes the following:

First, the null hypothesis: core stability training on balance in a state of blind girls with cerebral palsy spastic diplegia effect.

The results of analysis of covariance (ANCOVA) in Tables 4, 5 show that between static balance in the pre-test and post-test mode blindfolded there is a significant relationship (F (1, 17) =19.67, p =0.000). Also, it was observed that core stabilization exercise significant effect on the balance of closed eyes is after controlling for pre-test. In other words, the average balance of closed eyes adjusted core stabilization training group (23.3) and control (22.63) there is no significant difference between (F(1 , 17)=0.353, p =0.560). Therefore, the null hypothesis is confirmed.

Table (4) analysis of covariance

ETA^2	Sig.	F	MS	df	SS	Source
0.536	0.000	19.6	143.6	1	143.6	pre-exam
0.020	0.560	0.353	2.58	1	2.58	Group
			7.30	17	124.1	Error

The first hypothesis assumes the following:

The second null hypothesis: core stability training on balance in a state of open-eyed girls with cerebral palsy spastic diplegia effect.

Due to the lack of normal distribution of data, static balance with open eyes in order to test this hypothesis pre-test and post-test scores were low, Mann-Whitney test was conducted on the data. Mann-Whitney test results showed that the mean change in Tables 4, 5, and 6 static balance with open eyes girls with cerebral palsy spastic diplegia training group (4.7) and control (2.8) There was no significant difference (p =0.143, z = -1.55). Therefore, the null hypothesis is confirmed.

Table (5) Mann-Whitney

Sig.	Z	W
0.143	-1.55	85

The third null hypothesis:

Of core stability training on dynamic balance that girls with cerebral palsy spastic diplegia not affect.

The results of analysis of covariance (ANCOVA) Table 4-5 shows the dynamic balance between pre-test and post-test there is a significant relationship (F(1 , 17)=78.74, p =0.000). Also, it was observed that core stabilization exercise a significant effect on dynamic balance control after their pre-test. In other words, the dynamic balance between the average adjusted core stabilization training group (73.1) and control (60.24) there is a significant difference (F(1 , 17)=32.17, p =0.000). Therefore, the null hypothesis is rejected. That is, core stabilization exercises resulted in significantly improved dynamic balance was elected.

Table (6) the results of analysis of covariance

ETA^2	Sig.	F	MS	df	SS	Source
822.0	000.0	7.78	9.1895	1	9.1895	pre-exam
654.0	000.0	17.32	7.774	1	7.774	group
			07.24	17	2.409	Error

5 Discussion and conclusion

5.1 Discussion

Central nervous system combines the stability of the central nervous system and peripheral systems. The system of internal and external forces acting on the body's ability to process and system of the body active in the resistance against disturbing the balance right level of intensity control. Core stability can be divided into three sub-sections that include dynamic systems, static and nervous. In order to stabilize fit, the interaction of these systems is required. Defects in one or more than one system can have a delayed effect on core stability. Static balance can be made by bones, ligaments, tendons and connective tissues are organized. Active-balance system, refers to the muscle system is global and local .These textures can be actively shrunk and the forces of the ligaments and bones resist and more power to balance production and increases the stability of the central patio. Core stability exercises to reinforce the proprioceptive receptors. At the beginning of the proprioceptive receptors are highly stimulated and after a while earn a little consistency. But by the end of the message are sent to the CNS .Wireless joint body together to make a conscious understanding of the situation with the organs until change their status to be able to show the necessary reaction. Information on posture from three sources collected and will be sent to the central nervous system. These include: Visual system, vestibular system and proprioceptive systems. Central nervous system receiving information from these three sources and integrating this information to maintain the balance of export orders. Wireless joint body together to make a conscious understanding of the situation with the organs to able to respond to reveal their status changes. Core stability and posture by maintaining the good condition during functional activities can prevent the occurrence of faulty movement patterns. Proper functioning of the body's center of maintenance of postural and dynamic postural balance during functional activities of destructive patterns that disrupt the balance will stop. When the body naturally works to keep the balance to control nerve and muscle function (such as static and dynamic balance) will give. People with nerve and muscle control and strength, core stability are good, with biomechanical chain will be the perfect move because it tends to affect the dynamic balance and posture is appropriate. Swiss ball exercises stimulates and strengthens the vestibular apparatus in the inner ear is responsible for balancing the public body. Receptors in the vestibular apparatus are sensitive to motion. Head movement stimulates and activates these receptors. As a result of impulses that are sent to the CNS are signs head. Vestibular apparatus to

control the movement of head and eyes when performing physical activity is responsible and the help maintain balance and body awareness through movement .Vestibular apparatus is sensitive to the location of the head in space And in order to achieve the goals of stability and postural orientation and sudden change of direction of the body to the CNS report. The role core stability exercises stimulate the nervous system - the cognitive, muscular - skeletal strengthen abdominal muscles, trunk muscles and pelvic floor muscles are. Swiss Ball Exercises to strengthen the role of the vestibular apparatus, visual and proprioceptive receptors in bone and pods is, is. Core stability is an important component in maximizing balance. Exercise improves balance.

5.2 Conclusion

The results of this study showed that a core stabilization exercise improves dynamic balance samples and the balance of girls with cerebral palsy spastic diplegia not affected, However, due to the fact that in the control group did not show any changes in static and dynamic balance can be improved dynamic balance in the experimental group attributed to the effect of core stabilization exercise. Limitations are as follows:

1. The mental attitude control subjects

2. Control hours of sleep the night before the test subjects

3. Individual differences subjects

4. Subjects for exercise motivation

5. The level of economic and social subjects

6. Fed subjects

According to the results of the above study that the positive effect core stability training on dynamic balance with cerebral palsy spastic diplegia, it is recommended that this training as a therapy to create and enhance their balance and occupational therapists are taken into consideration.

It is recommended that the:

1. Static and dynamic balance of people with cerebral palsy spastic plegias Mono.

2. Static and dynamic balance of people with cerebral palsy spastic hemiplegia.

3. Static and dynamic balance spastic quadriplegic cerebral palsy sufferers.

4. Static and dynamic balance of people with cerebral palsy spastic hemiplegia more.

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