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THE EFFECT OF CORE STABILIZATION AND BALANCE EXERCISES ON BALANCE IN ELDERLY WOMEN

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ABSTRACT

The aim of this study was to measure the effect of core stabilization and balance exercises on balance of elderly women. A total of 20 elderly people (average age 68/43 ± 6/60 years, height 1/52 ± 0/07 meter and weight 68/9 ± 12/19 kg) participated in the study and randomly divided into two groups Central stability (n = 10) and control group (n = 10). Static balance was done by one sided Sharpened Romberg test and Dynamic balance was measured using the Timed up and go (TUG) test. The experimental group held a period of stability and balance training program for 8 weeks and 3 times per week. To investigate the data, analysis of variance in repeated measures and post hoc multiple comparison test (LSD) was used. The results showed that the average of Sharpened Romberg balance test with eyes open and closed compared in the pre-test and post-test in core stabilization training group significantly increased (0/05> P). About the Timed up and go test results showed significant reduction in core stability exercises (0/05>p). According to the findings, it can be concluded that the overall balance of core stabilization exercises can improve static and dynamic balance in the elderly.

Keywords: Static balance, dynamic balance, core stability, elderly women

1. INTRODUCTION

The importance of posture and balance in activities such as sitting, standing and walking in the view of scientists is a controversial and undeniable topic. Various exercises are used on different countries to improve balance that we can point out

proprioceptive exercises for using a wobble board. Balance, is a complex motor skill that describes the dynamics of the body to prevent falls. Physiologically balance means a balance between different levels of balance control mechanisms and biologically it means the ability to keep or return the center of gravity in the range of stability which is determined by the level of support. Static balance as to keep the center of gravity within the level of support and dynamic balance as to maintain the center of gravity within the support or active motion of center of pressure (COP) during a skill and hence it is important in maintaining and evaluating dynamic posture (Page et al_2010). Ability to control the body to maintain health status during every day functional activities is very important. Loss of balance and posture control is associated with increased falls in the elderly. In addition, there are symptoms of age-related changes in physical control situation which leads to disruption of balance and posture control and falling (Ungar et al_2013).

In recent years, the central region of the body and exercises to strengthen and stabilize this region, has found many enthusiasts in many different areas. Waist, hips, thighs and muscles around the area are known as core area of body and considering the anatomical location of the center of gravity is located in this area and human movement are caused by this area, the stability of this region is very important. Core stability is as motor control and muscular capacity to maintain stability of this region against various postures and external forces acting on it (Panjabi et al_1989). In fact, the stability of the central region is influenced by different systems that interact closely with each other so that if one of them is disrupted other systems are trying to compensate for it (Swaney and Hess_2003). Falling down is one of the biggest problems that affect the health of the elderly. 20 to 30 percent of seniors who fall suffer moderate to severe fractures that reduce mobility and independence and in many cases increase the risk of early death (Sterling et al_2001). In addition, complications from a fall may lead to the heavy cost of treatment to elderly people, his family and the government. (Prendergast and colleagues_1993) reported muscle weakness in the elderly, increases the risk of falling in these patients up to four times. (Lee and Park_2013) in a study to investigate the effects of resistance training lower body on balance in elderly found that the balance in older people after this training was increased significantly. Regarding central stability, studies have shown the role of central stability on sports performance and injury prevention. (Clark

and colleagues_2000) reported that the ore stability with maintaining posture and appropriate body condition during lack of functional activities and thereby prevents the occurrence of faulty movement patterns and improves athletic performance. About effects of core stability exercises on balance, (Eric and Johnson_2007) examined the effect of 4 weeks of trunk muscle strengthening on balance in healthy people and reported a significant increase in balance after exercise program.About impact of core stabilization exercises on balance in older people is also research has been done; (Petrovsky and colleagues_2005) reported that 4 weeks of core stability training, has a significant effect on static balance of elderly people. (Kahle and Tevald_2014) in a study investigated the relationship of core muscle strengthening on balance in elderly and showed that the balance in older people has significantly increased after a period of practice. About the effectiveness of core stability training on balance, most research has been done on men and different results have also been reported. In this study, we decided to measure the impact of core stabilization and balance exercises on balance in elderly women, so that if this effect is confirmed, with proper planning we can take steps to improve the balance of this age group. 2. Research background the population consisted of 20 elderly people aged 50 to 70 years who participated in this study voluntarily. The participants were selected by convenience sampling. After filling out the consent form they were randomly divided into two groups, core stability and balance training (n = 10) and control group (n = 10). The selection criterion was that in the past several years they had not a history of heart disease or specific diseases and did not have a surgery. 48 hours before the exercise a pre-test was used to determine how much is the amount of their balance. After the evaluation, core stabilization groups for eight weeks, three times a week and each session takes about 30 minutes participated on core stabilization exercises. The basis of practices used in protocol was specific training stabilization of the spine, lumbar-pelvic proprioception training, Abdominal Hollowing Maneuver with Maltese multifidus muscle contraction and then maneuver to maintain stability under the dynamic stability achieved in different positions (supine, prone, knee) and Furthermore, adding to its dynamic components (limb movement, the use of the Swiss ball) was in the later stages. These exercises are provided based on core stability offered by Jeffreys and include 3 levels. Exercises starting from level 1, which includes the static contractions in a

fixed position, exercise level 2 static contractions in a volatile environment, and ultimately, exercises Level 3 consists of dynamic movements are in a volatile environment in this exercises the Swiss balls are used (Jeffreys_2002).

First and second week **Abdominal Hollowing, in supine position** **Abdominal Hollowing, in the prone position** **Abdominal Hollowing, in the squatting position**	**The third week** **Abdominal Hollowing, in supine position with one leg rolled up** **Abdominal Hollowing, in the prone position with one leg rolled up** **One Way bridge**
The fourth week **Abdominal Hollowing, in the supine position by keeping the limbs up and pushing hands and feet together** **Squatting with raising one leg from behind** **Rotate the body from side to side while holding weights**	**Fifth week** **Sit on a Swiss ball and practice pushing abdomen in** **Scott the ball between the wall and the scapula** **Bringing up the arms and legs simultaneously in the prone position**
The sixth week **Launch in an angle of 45 degrees to the left or right** **Bridge (shoulders and feet on the floor and raise the buttocks and lower back)** **Abdominal Hollowing while lying on a Swiss ball while foot are on the found and back is on the Swiss ball**	**The seventh week** **Laying in the Swiss ball while the foot is on the ground and back is on the Swiss ball and rotate to sides** **The above practice while holding weights** **One-way Bridge**
The eighth week **Lying supine on a Swiss ball and practice the abdominal Hollowing with one leg up** **Raise the opposite arm and leg in squat** **Bridge so that your feet are on the Swiss ball**	

During this period, the control group was asked to refrain from strength and balance exercises. In this study for the measurement of static balance Sharpened Romberg one-way test was used with eyes open and closed. The test procedure was that the subject stands with superior foot and raises other foot from the ground (hands should be placed on the lower back); When each participant is able to maintain this position with eyes closed his score is considered. Each of the subjects with eyes open and close did this test three times and the average of three times was recorded as their record (Paula et al_2000). For the measurement of dynamic balance timed up and go test was used. Implementation of this test requires that each subject without using his hands rose on a chair without a handle, returned after a three-meter track and sat back on the seat. The total time for this test were considered. Record of this test, such as testing of static balance was calculated as the average of three trials of individual was recorded as the mark (Paula et al_2000). For data analysis, SPSS software and variance analysis in repeated measures and post hoc multiple comparison test (LSD) was used.

3. ANALYSIS

Table 1 shows demographic characteristics, including age, height, weight and body mass index (BMI). One-way analysis of variance did not show significant differences between height, weight and age between the two groups which confirms homogeneity of the two groups in terms of

individual characteristics affecting the balance.

To compare the two groups in pre-test and post-test of balance test with eyes open, eyes closed and up an go test was used. Table 2 shows the mean of changes in the balance of the subjects before and after the exercise period.

As can be seen in average balance of these three tests in core stabilization group had a significant improvement according to the control group (0/05> P), but this difference was not significant for the control group (0/05<p) (Table 3).

Average Sharpened Romberg balance test with eyes open and closed in pretest 3/24 ± 1/88, 2/47 ± 0/79 to 7/82 ± 3/41, 5/62 ± 1/89, and the average of get timed up and go test was of 11/37 ± 2/48 to 7/15 ± 1/47. Figures 1, 2 and 3, show the changes to balance test with eyes open and closed and getting timed up and going of two groups before and after exercise period.

Table 1: Characteristics of subject

Research groups	Weight (kg)	Height (cm)	Age (years)	BMI
core stabilization group	68/1±11/04	1/531±0/06	69/6±7/51	27/26±6/36
control group	73/2±12/80	1/551±0/08	68/7±6/25	28/35±5/88

Table 2: Results of analysis of variance with repeated measures in the balance with eyes open, with closed eyes and timed up and go in two the groups

The amount of (P)	The test statistic (F)	Degrees of freedom (df)	Source of Changes	Standard deviation + average	Level	Test
0/001	8/017	1	**Effect of Phase**	3/261	**Pretest**	**Balance with eyes open**
0/002	13/421	27	**Interaction between stage and group**	5/264	**Posttest**	
0/000	23/077	1	**Effect of Phase**	2/493	**Pretest**	**Balance with eyes closed**
0/000	35/019	27	**Interaction between stage and group**	3/757	**Posttest**	
0/001	7/315	1	**Effect of Phase**	11/176	**Pretest**	**Balance with timed up and go**
0/000	12/142	27	**Interaction between stage and group**	9/587	**Posttest**	

Table 3: Mean change of balance of the subjects before and after the exercise period (time in seconds)

Variable	Stage of test Test group	Before practice period M±SD	After practice period M±SD
Balance with eyes open	**core stabilization group**	3/24 ± 1/88	7/82 ± 3/41
	Control group	3/17 ± 1/59	2/45 ± 1/5
Balance with eyes closed	**core stabilization group**	2/45 ± 0/79	5/62 ± 1/89
	Control group	2/45 ± 0/35	2/11 ± 0/76
Balance with timed up and go	**core stabilization group**	11/37 ± 2/48	7/15 ± 1/47
	Control group	11/46 ± 2/12	12/15 ± 1/84

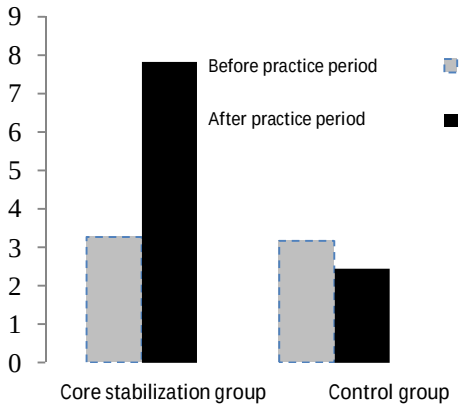

Figure 1: Comparison of the average balance of the subjects with eyes opens (time in seconds)

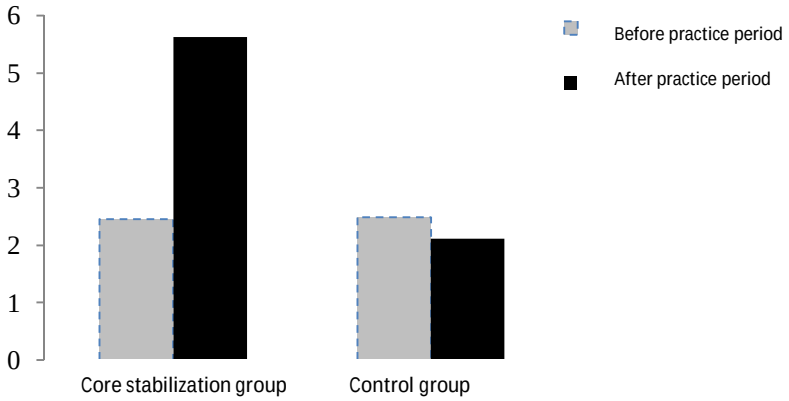

Figure 2: Comparison of the average balance blindfolded subjects (time in seconds)

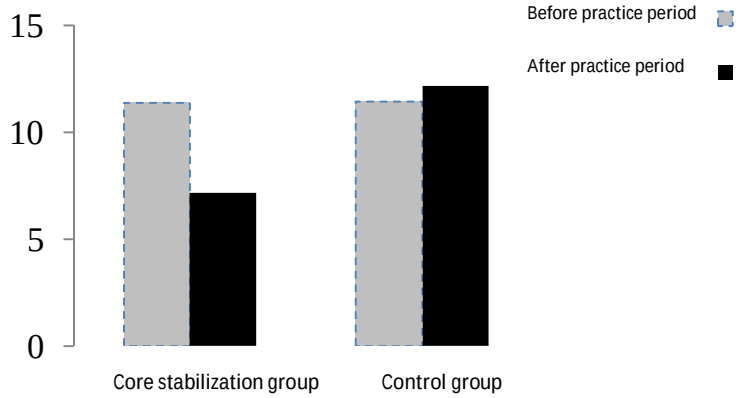

Figure 3: Comparison of the average balance of timed up and go of subjects (time in seconds)

4. CONCLUSIONS

Aim of this study was to measure the impact of exercise on balance in elderly women. According to the results, after the protocol exercise, balance and posture in the elderly improved. Research has shown that with increasing age, decreases muscle strength. This power not only in radial muscles such as gastrocnemius muscle, but in core muscles of the trunk like the core muscles of the body decreases, which increases volatility and therefore may

disrupt the balance of the body (Petrofsky et al_2005). Core stability training, leads to strengthen muscles and improves balance and postural control. In addition, the anatomically center is the area in which the center of gravity is located and motion arises from it (Clark et al_2000). It seems that the muscles of this region as a result of core stabilization training improves neuromuscular system and reduce the displacement of the center of gravity away from the supporting surface and to reduce volatility and increase balance.

Also, according to this study, balance in people who were in the core stability group was more than control group. This can be explained based on the principle that core stability exercises facilitate recruitment neuromuscular. And we can conclude that this practices for people who have weaker postural control leads to more effective neuromuscular facilitation. Studies show that core stability training can lead to improvements in static and dynamic balance. In this regard, we can point to studies of (Eric and Johnson_2007) who showed participation in 4-week training program to strengthen the trunk muscles leads to significant differences in the dynamic balance of participants. (Craps et al_2008) reported a 20 session program of core stability exercises has a significant effect to improve balance.

The results of (Clary et al_2006) also showed that core stability exercises improve balance. The results of this study are consistent with results from studies (Petrofsky et al_2005); They showed balance in older people after 4 weeks of muscle strengthening exercises, has been significantly improved. The results of (Casio and colleagues_2003) showed that 5 weeks of core stability exercises on a Swiss ball and on the ground, have similar effects on balance, and both trainings improves balance, which is consistent with the results of this study. Difference in training variables such as assessing, age and activity level of the subjects can be effective in inconsistent results.

(Lewarchik et al_2003)&(Swaney and Hess_2003) used healthy young participants as the control group and used young athlete for the experimental group. Moreover, unlike the present study which balance was evaluated by functional tests, in mentioned studies, the balance was assessed by laboratory. Another factor that may involve in the contradiction of this study with other studies is the training program that has been used. In this study, core stabilization training lasted for eight weeks and was focusing more on core stability of deep local muscles but in other studies, the duration of training is different and more global and bigger muscles was

amplified. Core muscle strengthening exercises protocols (such as the study protocol), can be used in the home and requires no special equipment and aims to strengthen key muscles in abdomen and lower back which increases muscle strength and performance at all level of movements. Therefore, without a specific plan for strengthening core muscles, using any standard exercise program to strengthen other muscles used may not be effective in increasing performance. Despite the usefulness of other training programs, to maintain daily functional activities, application of protocol presented in this study is more effective. Consensus about core stability exercise duration and time of exercise in a training session is small and it is not possible to provide a certain protocol that can have the best effect. Therefore offering and administering the training mode requires extensive research in the future.

CONCLUSION

According to the findings of this study it can be concluded that the overall balance of core stabilization exercises can improve static and dynamic balance in older people and can be used alongside other training programs.

RECOMMENDATIONS

1. It is recommended that future research on the impact of balance training on both men and women with a high number of samples to be addressed.

2. Since there no specific agreement on a protocol of specified time for core stabilization training, Core stabilization exercises for 12 weeks and more be compared and investigated.

3. Core stabilization exercises with other exercises like strength training or balance training methods be compared and evaluated.

4. Effect of core stabilization exercises be investigated using other tests that apply laboratory methods to asses balance.

5. Effect of core stabilization exercises on balance of people after injury be investigated.

RESOURCES

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