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Comparisons of berg balance scale following core stabilization training in women elderly

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ABSTRACT

Since imbalance considers as main cause of falling among the elderly, balance is part of the scientific challenge for last decades. The aim of this study was to comparisons of Berg Balance Scale (BBS) following six weeks core stabilization training in female elderly individuals. Sixty adult female subjects (age: 66.58±5.98 years, weight: 57.76±5.78 Kg, heig ht: 159.76±7.8 cm) voluntarily participated in stud y. A week prior to starting training program the balance measured with the BBT and subjects divided in two groups on obtained score in BBT, low risk falling (group1), high risk falling (group2). Then subjects divided to two control and experimental groups. The experimental groups performed a core stabilization program included 6- week and three times per week. The post-test of BBT did for two groups afterward. Paired sample t-test, and t-test for independent groups used to analyze the data (P≤0.05). Significant differences were seen between pre and post BBT after the applying core stabilization training program for experimental groups. However the results not showed any difference between pre and post BBT for control group. Core stabilization specifically considering the methods of this study could be implemented for balance in older adults.

Key Words: core stabilization training, postural control, Berg Balance Test, elderly population.

INTRODUCTION

Nowadays, falls are one of the largest public health problems among elderly people due to the high morbidity, mortality and costs for the family and society (1). These falls, a real problem in public health, are the main cause of accidental death in the elderly (2). One-third of people ages 65 and over fall at least once each year, and falls are the leading cause of death from injury in

this age group (3). It has been documented that the causes of falling among elderly subjects could be attributed to internal factors (including lower limb muscle weakness, loss of balance, reduced mental ability, loss of sensory information and slow motor responses) and external factors (induced by environmental conditions, including psychotropic drugs, environmental conditions such as dim light in passageways, uneven surfaces, moving the base of support and gliding, cumbersome furniture in passageways) (4).

It has been also documented that balance deficit is one of the main risk factors that affect falling among adults (5). Balance is a component of basic needs for daily activities and it plays an important role in static and dynamic activities. Postural control or balance system is a complicated mechanism that coordination in three balance systems include visual, vestibular and proprioceptive systems have the basic role in it (6).

Therefore, its aspects including rehabilitation of balance are the main concern the researchers and physiotherapist attend to. Balance is a component of basic needs for daily activities and it plays an important role in static and dynamic activities.

It is well proven that the conventional training programs, which had been used to improve balance, significantly affected balance, gait, strength and aerobic endurance; while in some occasion, they led to reduce incidence of falling among adults (7-8). Though the conventional exercises perform on the ground have benefits for many adults, however, there are certain medical conditions among adult subjects (i.e. osteoporosis, arthritis, stroke and obesity) which, because of pain and or decrease in joint mobility, decrease their ability to participate or prevent them from doing training programs (6). Recent findings emphasize that core stabilization training may provide another way of training for those who are less willing to participate in exercise classes in gyms, or the ones who have difficulty in walking.

The core encompasses the lumbopelvic-hip complex (with 29 muscles of insertion) in which the center of gravity is located and where all movement begins (9). Core stability is the motor control and muscular capacity of the lumbopelvic-hip complex. Normal function of the stabilizing system is to provide sufficient stability to the spine to match the instantaneously varying stability demands due to changes in spinal posture and static and dynamic loads (10). Studies have shown that strengthening core muscles does aid functional abilities (11). This increase in functionality translates into better performance in activities of daily living. This is turn leads to great psychological gains by allowing a person to be more independent (11). Clark et al (2000) suggested that core stability to maintain postural alignment during functional activity, which helps to prevent serial distortion pattern and leads to improve performance (12). Few researches have study effect of core stabilization training on the balance in elderly people. The purpose of this study is to consider the effect of core stabilization training on balance in active elderly males.

MATERIALS AND METHODS

Study participants

Institutional approval for all phases of this experiment was obtained from the Committee of Ethic in Research with Humans of the University where this study was developed. The women who took part in the exercise program were informed about the study characteristics. These volunteers

provided their written informed consent in order to participate in this study. Sixty healthy female adults (age: 66.58±5.98 years, weight: 57.76±5.78 Kg, height: 159.76±7.8 cm) were recruited from a local community center to participate in this study. Prior to the beginning of the program, all participants signed an informed consent and were required to provide a medical consent signed by their primary care physician.

Study Protocol and Intervention

At the orientation meeting, subjects were explained the purpose of this study, training protocol and balance test. A week prior to starting training program, the balance measured with the Berg Balance Test (BBT) which is a criterion for falling, static and dynamic balance in adults. The Berg Balance Test is a 14-item scale that is designed to measure 3 dimensions of balance. Subjects performed activities to maintain a posture and activities that included movement, and they responded to external perturbations of a posture. Each of the items was scored on a 5-point (0–4) ordinal scale, with a score of 0 representing the inability to complete the task and a score of 4 indicating independence. Independence on all 14 items results in a total possible score of 56 (13). Subjects divided in two groups on obtained score in BBT, low risk falling (equal/above 45), high risk falling (below 45). Then, they were randomly assigned in to two groups of experimental (Exp) and control (Con).

Table 1. Core stabilization training program

First level
Hollowing abdominal in supine position
Hollowing abdominal in prone position
Hollowing abdominal in quadruped position
Hollowing abdominal in supine position with curling foot
Hollowing abdominal in prone position with curling foot
Modified side bridging
Second level
Bridging with hollowing abdominal
Pelvic bridging
Dying bug with hollowing abdominal
Seated on Swiss Ball with hollowing abdominal
Third level
Pelvic bridge with Swiss ball
Bird dog
Twist on Swiss ball
Bird dog exercise on Swiss ball

The Experimental group performed a score stabilization program included three levels for 6-week and three times per week on alternative days and 30 min in section. This program consisted of three levels that subjects began at exercise level one and proceeded to the next level according to the protocol for that day. Level 1 include Static holds in stable environment; level 2 include dynamic movement in a stable environment; level 3 include dynamic movements in an unstable environment such swissball and resisted dynamic movement in an unstable environment (Table 1) (14). It was asked control group that did no special exercise and avoid from balance and strengthening training. Post-test of BBT done for two groups afterward.

Statistical Analyses

Descriptive statistics were used to report means, standard deviation, and range for baseline characteristics. Paired sample t-test, and t-test for independent groups used for determine significant differences among groups and between pre-test and post-test periods. Statistical analyses were conducted in SPSS, Version 16.0 (SPSS Inc, Chicago, IL). Statistical significance was established a priori at $P \leq 0.05$).

RESULTS

General characteristic of subjects including age, height and weight is given in Table 2.

Table 2: Personal Characteristics of subjects

Group			Weight(kg)	Height(cm)	Age(yr)
Low risk falling	**Exp**	n =10	57.75±3.6	162.14±8.55	62.34±6.51
	Con	n =10	59.36±8.01	160.90±1.32	60.12±8.5
High risk falling	**Exp**	n =10	53.25±5.67	159.73±4.27	70.73±8.20
	Con	n =10	56.42±2.3	157.00±6.3	71.61±7.14

T-test results showed no significant differences between control and experimental subjects in the pretest of BBS. Significant differences were seen between pre and post BBS after the applying core stabilization training program for experimental subjects in two groups. However the results not showed any difference between pre and post BBS for control groups (Table 3).

Table 3: Mean and standard deviation for subjects in pre-test and post-test results for the BBS Test

		pretest	Post test
Low risk falling	Exp	53/20±1/93	55/00±1/05 [ab]
	Con	52/60±1/83	53/10±1/66
High risk falling	Exp	38/50±1/26	44/30±2/11 [ab]
	Con	37/80±1/03	39/20±1/31

Significant difference between (a: pre-test and post-test; b: post-test), all at the $p \leq 0.05$.

DISCUSSION

The aim of this study was to comparisons of BBS following six weeks core stabilization training in female elderly. The main hypothesis was that adults who participate in core stabilization training for six weeks would significantly improve balance compared against the control group. The results of this study confirm the effect of these training programs on aforementioned factors on the adult samples. The score of BBS test for post-test in comparison with the pre-test increased 3.34% in low falling and 15.06% in high falling group respectively. Increase in BBS score represent improvement in static and dynamic balance in training groups.

Our results are in accordance with previous studies reported in the literature. Indeed, Petrofsky et al. (11) studied the effect of 4 weeks of core stability training program in aged women. In their study, balance was assessed using a force platform. They reported a significant effect of exercise on the evaluated parameters. The present study doesn't in line with the findings of Swaney and Hess (15) that can be probably attributed to the type and time of training. They reported the 9 weeks of core stability training program did not affect significantly balance swimmers. Although

there were some basic similarities in their findings, the subject population and design of the studies were different.

Studies have shown aging is associated with a loss in muscle strength. Muscle strength is lost not only to the radial muscle such as the gastronomies but to the axial muscles in the central core of the body, making increase body sway and Balance difficult(11). Core stabilization training makes strengthen these muscles and improve balance and postural control. Furthermore the core is important because it is the anatomical location in the body where the center of gravity is located and movements stem from, therefore it seems strengthening of muscles of core causes to improvement of neuromuscular system and decrease of center of gravity displacement and sway (12). Core stabilization training improves neuromuscular system efficiency that this leads to optimal arthrokinematics in the lumbopelvic-hip complex during functional kinetic chain movements, optimal acceleration, deceleration, optimal muscular balance and provides proximal stability for efficient lower extremity movements (16). This effects lead to optimal function and lower extremity muscles strength. Contraction of core stability muscles before initiation of limb movements, which is the feedforward posture reaction from neuromuscular system, shows that voluntary movement of the upper extremity is preceded by postural movements occurring in the lower extremity (pelvis, hips and trunk) that contribute to general dynamic organization of balance and inhibits postural disturbances. Core stabilization training program leads to sequencing of anticipatory activity and then reduces early perturbations of the center of gravity, which is a benefit for the individuals who need to remain in constant postural control (16-17).

Training protocol in order to strengthen core muscles like this training protocol can be used at home, targeted key muscles in the abdominal and lower back area, which translated to an increase in muscle strength and functional reach in all directions.

CONCLUSION

Regarding the results of the research, it seems that applying the core stabilization training programs can increase postural control of the elderly. As a result, the core stabilization training not only can improve the core muscular strength, but can increase dynamic balance and in this way the fall risk of the elderly is decreased. Finally, it is highly recommended that using the core stabilization training can decrease the risk of fall in the elderly and improve their activities of daily living.

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