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ORIGINAL ARTICLE

EFFECTIVENESS OF WHOLE BODY VIBRATION AND OBSTACLE TRAINING IN IMPROVING BALANCE AND REDUCING RISK OF FALLS IN ELDERS

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ABSTRACT

Background of the Study: Aging is associated with balance and risk of falls. Balance problems are among the most common reasons that elders seek help from doctors and others. Balance disorder is one of the factors that prompt falls in the elders. Whole body vibration and obstacle training has gained loss of attention in recent years and these are considered as it improves balance and reduces the risk of falls in elders. Objective of the study is to find the effectiveness of whole body vibration and obstacle training in improving balance and reducing risk of falls in elders. **Methodology:** Total 40 subject of elders fulfilling inclusion criteria were included in the study. The subjects were asked to complete the Berg balance and Timed up and go test. Subjects were selected in a controlled group performing whole body vibration and obstacle training. The subjects received it for 8weeks. After the completion of 8 week of intervention the post-test value was obtained from the subjects using the same questionnaire and the test. **Result:** On comparing Berg Balance score in terms of balance assessment, the study (whole body vibration and obstacle training) shows highly significant difference between the post-test values when compared with pre-test. On comparing Timed Up and Go Test Score in terms of lower extremity function, mobility and risk of falls, the study (whole body vibration and obstacle training) shows highly significant difference between pre-test and post-test. **Conclusion:** The present study concluded that 8 weeks duration of whole body vibration and obstacle training was effective in improving balance and reducing the risk of falls in elders.

Keywords: Balance, Risk of falls, Whole body vibration, Obstacle training

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INTRODUCTION

Aging involves a progressive, gradual and natural deterioration of various physiological functions of balance[1]. Balance and gait are important considerations in the health of elderly subjects [1, 2]. Balance is the ability to collect sensory and proprioceptive signals related to a person's position in space and to produce the motor responses to control body movement [3]. Balance is considered as a key component in many activities of daily living, from simple activities such as quiet standing to more complex activities such as walking while talking or while changing directions[4]. Most studies investigating balance impairment in older people have incorporated a limited range of balance assessment tools only. To measure these variables, several scales and special tests can be used. One of the scales that have been suggested for balance is the Berg Balance Scale as a clinical test that is used in the elderly population who faces a problem of balance and risk of falls [5, 6].

Falls are defined as an accidental event in which a person falls when his/her center of gravity is lost and no effort is made to restore balance or when this effort is ineffective. Falls are considered as the most common cause of injuries among the older population. Nearly 28-35% of people aged 65 years and above fall each year and this percentage increases to 32-42% for those over 70 years of age. Moreover, 20% to 39% of people who fall experience fear of falling, which leads to further limiting of activity, independent of injury (7). The increased risk of falling is with aging is multi-factorial in nature (8). The Timed Up and Go test is a clinical instrument to assess the tendency to fall in individuals of this age group [9].

Whole body vibration is an applicable intervention method for super-aged population. Whole body vibration training thus not only results in muscle function improvement but also increases proprioception sensitivity. Whole body vibration (WBV) training is a type of exercise that seems beneficial in frail older persons to improve functional mobility, but the evidence is inconclusive. Vibratory training may be attractive for those who are unwilling or unable to exercise [10-12]. Whole body exercise had a significantly better outcome in balance confidence. It is recommended as a fall prevention intervention method by increasing balance. The benefits of whole body vibration training on balance in independently living elderly women are still unclear [10].

Most of the slips in elderly age group occur when they come across obstacles in the form of flooring, carpets and objects along the pathway. Obstacle Training is one of the activities which increases balance and reduces the risk of falls in older adults. The obstacle courses attempt to provide the main advantages of the low technology balance and mobility evaluation methods [15, 16]. Cones obstacles are used in this training course. With further development, the obstacle course may be utilized by rehabilitation personnel in clinical and research settings, as a practical method of evaluating patients with balance dysfunction who are the risk of falls and fall-related injury [11].

METHODOLOGY

Study Design is experimental study and study type pre and post-test type, conducted at ACS Medical College and hospital, Velappanchavadi, Chennai. 40 subjects participated in the study. Sampling Method used was purposive sampling method. The study conducted for a duration of 8 Weeks and intervention duration was 3 sessions per week.

Inclusion criteria: TUG score > 14 secs, Co-operative patients, History of falls / slip, both genders, Age group of 60-75 years old.

Exclusion criteria: Non-cooperative patients, Cancer , Seizures , Epilepsy , Arrhythmia, Cardiac pacemakers , Renal bladder stones, Untreated orthostatic hypotension, Amputated patients, Handicap patients.,

Materials used: Whole body vibrator, Obstacles,, Scoring sheet, Wrist watch, Pen

Outcome Measure: Berg balance scale, Timed up and go test.

Procedure: The current research was performed in OPD Department of Physiotherapy, ACS Medical College and Hospital to examine the effectiveness of Whole body vibration and obstacle training in improving balance and reducing risk of falls in elderly patients. 40 subjects of both male and female in the age group of 60-75 years were included with fulfillment of inclusion criteria, subjects with non-cooperative, mentally retarded, any recent history of covid-19, seizures, epileptic, any type of cancer, any neurological deficits of vision, speech and hearing disorders, arrhythmia, cardiac pacemaker, renal or bladder stones, any untreated or orthotic hypotension, any amputated, handicap, intake of medications for conditions such as vertigo were excluded.

The study included 40 subjects in the age group 60-75 years were taken in an random sampling manner were selected and assigned after signing a consent form. Subjects were assessed with berg balance scale and timed up and go test. Berg balance scale was measured using questionnaire and subject scored below >45 were selected. Timed up and go test was done by instructing patient to stand and walk 10 feet as quickly as they feel safe and return to their chair without assistance. The time was noted and below ≥14 secs were taken for the study. Selected subjects were treated with whole body vibration and obstacle training for the duration of intervention of 8 weeks, 3 sessions per week. The BMI was selected for each and every subjects and controlled group on an average.

Whole body vibration was performed on subjects in the frequency of 06 -10 hertz (hz). The amplitude was set at 4 mm (high) with the hold and rest period of 30 seconds (secs). The treatment was given for the duration of 5 minutes in first four weeks and 8 minutes in second four weeks. After the completion of WBV, the subject is made to relax for 10 minutes and made to walk and step over the square obstacles with size of 1 cm, 10 cm and 20 cm and asked to continue walking for the total path length of 3.2 meters. The subjects were assessed with berg balance scale and modified star excursion test for balance and timed up and go test for risk of falls was measured before and after the study.

Treatment Procedure

Balance Training

Whole Body Vibration:

Subjects were instructed to stand on a vibration machine. Subjects were instructed to hold the vibrator machine strongly. After giving brief instruction; vibration is given on the frequency adjusted from 6-10 hertz. The amplitude is set at 2 – 4 mm. Hold and rest period is of 30 to 60 seconds. Duration is increased progressively and frequency is adjusted according to the patients need. Duration on the first week is 5 mins; 10 mins in the second week; 20 minutes in the third to eighth week.

Instructions given to the patient standing on a whole body vibrator

Fig 1. Training on Whole body vibration machine

Obstacle Training:

Patient standing on a whole body vibrator during treatment

3.2 meters must be measured with obstacles placed every one meter.

Subjects should be instructed to step over the obstacles progressively from 1st to 8th week.

No obstacles on the first week.

1 obstacle on the second week

2 obstacles on the third to fifth week

4 obstacles on sixth to eighth week

Fig 2. Patient crossing the obstacle after receiving the instruction from therapist

Precautions: Intake of regular medications (blood pressure, diabetes, etc.)

Knee braces is advised to use if needed, Vital signs are monitored regularly before and after the treatment session. Intake of food is advised mandatorily before the session.

Data Analysis: The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Shiparo Wilk test was used to test the normality of the data. Dependent variable data are normally distributed BBS (significance 0.415) & TUGT (significance 0.591) at P>0.05. Hence parametric test was adopted. Paired t-test was adopted to find the statistical difference within the groups.

A. Parameters	B. Group A
C. N	D. 40
E. Age	F. 68.23 ± 2.81
G. Height (cm)	H. 163.28 ± 1.96
I. Weight (kg)	J. 67.18 ± 1.13
K. BMI (Kg/m^2)	L. 25.35 ± 1.01
M. Abbreviations: cm-centimeter; kg-kilogram; BMI-Body Mass Index,	

Table-1. Anthropometric measurement of the study population

Comparison of Berg Balance Scale Score within Group between Pre & Post Test Values

#BBS TEST	PRE TEST		POST TEST		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP	36.05	5.96	46.77	1.51	-11.97	.000***

Table- 2. Comparison of Berg Balance Scale Score within Group between Pre & Post Test Values **(***- P ≤ 0.001)**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group.

There is a statistically highly significant difference between the pre test and post test values within Group (***- P ≤ 0.001

Comparison of Time up and Go Test Score within Group between Pre & Post Test Values

#TUGT TEST	PRE TEST		POST TEST		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP	64.07	3.18	12.67	5.71	23.96	.000***

Table-3: Comparison of Time Up And Go Test Score Within Group Between Pre & Post Test Values **(***- P ≤ 0.001)**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group.

There is a statistically highly significant difference between the pre test and post test values within Group (***- P ≤ 0.001).

RESULT

On comparing Berg Balance scale score in terms of balance assessment between Pre test**36.05** and Post test 46.77 mean values within Group (Whole Body Vibration and Obstacle Training) shows highly significant difference between Pre test and Post test mean values at P ≤ 0.001. The Post test values have shown improvement when compared with pre test. Hence the null hypothesis is rejected.

On comparing Time Up and Go Test score in terms of lower extremity function, mobility and risk of fall between Pre test 64.06 seconds andPost test 12.67 seconds mean values within Group (Whole Body Vibration and Obstacle Training) shows highly significant difference between Pre test and Post test mean values at P ≤ 0.001. The Post test values have shown improvement when compared with pre test. Hence the null hypothesis is rejected.

DISCUSSION

The purpose of the current study is to improve the ability of balance and their by reducing the risk of falls among elderly people. The study showed statistical significant results using the Berg balance scale and the Timed up and go test score. Balance disorders and falls are common among elders and they can be associated with various risk factors. Whole body vibration and obstacle training is a type of physical exercise in which people perform in a standing position on a platform device. The whole body vibration is a new type of exercise that improves the proprioception information from the cerebellar pathways, processed unconsciously in the cerebellum and gains the enneagram and thereby repetition of whole body vibration protocol, balance gets improved [11-13].

Whole body vibration and control groups respectively on improving body balance have been reported by many studes. This type of exercise is safe and easy without any risk of producing overuse of muscles in elders. A study reported whole body vibration is an appreciated and considered as safe training method[14-16].

The Central nervous system is trained simultaneously to prevent the falls by training the obstacle crossing. By the regular training, the subject gets learned to manage their speed of walking. The repetition of training sessions of both the whole body vibration and the obstacle crossing together showed the improvement in the balance and helps reducing the risk of falls in elders [17-19].

CONCLUSION

The present study concluded that 8 weeks duration of whole body vibration and obstacle training was effective and together shown better results in improving balance and reducing risk of falls in elders.

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