

ORIGINAL RESEARCH

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THE EFFECTS OF OTAGO EXERCISE PROGRAMME FOR FALL PREVENTION IN ELDERLY PEOPLE

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ABSTRACT

Background: The 'Otago exercise programme' (OEP) is a strength and balance retraining programme designed to prevent falls in older people living in the community. The aim of this study was to find the effects of Otago exercise programme for fall prevention in community dwelling elderly people.

Method: The sample comprised 30 community dwelling elderly around sinhgad road, pune (out of 30, 4 were dropouts) aged over 60 years both male and female falling under moderate fall risk measured by Tinetti Performance Oriented Mobility Assessment. The intervention consisted mainly strength and balance training. Intervention was done for 1 hr every day, 5 days per week for 6 weeks. Outcome measure assessment was done pre, 3rd week and post intervention. Pre and post comparison of following three outcome measures was done.

Outcome measures: Tinetti Performance Oriented Mobility Assessment, 10RM and Chair stand test.

Result: Paired t-test was done. Results of p value for 10RM (p value = 0.00), Tinetti performance oriented mobility assessment (p value = 0.00) and chair stand test (p value = 0.01) was found to be highly significant. Out of 26 subjects with moderate risk of fall pre intervention, 24 subjects showed low risk of fall during post intervention assessment of Tinetti Performance Oriented Mobility Assessment.

Conclusion: The Otago exercise programme is significantly effective increasing strength of lower limb and improving in balance, gait and therefore ultimately preventing fall in community dwelling Indian elder people. Hence, Otago exercise protocol can be used in day to day clinical practice and also as a home exercise program.

Key words: Otago Exercise Programme, Strength, Balance, Elderly People, Fall, Tinetti Performance Oriented Mobility Assessment, 10RM, Chair stand test

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INTRODUCTION

Fall- "an unexpected event in which the participants come to rest on the ground, floor, or lower level".

Older population make up large and increasing percentage of population. As people grow older they are increasingly at risk of fall and consequent injuries. Fall may be the first indication of undetected illness. The prevention of falls is of major importance because they lead to considerable mortality, morbidity and suffering for older people and their families, and incur social costs due to hospital and nursing home admission.¹

Older adults are hospitalized for fall-related injuries five times more often than they are for injuries from other causes. Falls are the leading cause of injury deaths among people 65yrs and older; half occur in their own home.²

30% of people over 65 and 50% of those over 80 fall each year in the community. The prevalence of falls in Indian older adults ranges from 14% to 53%.³ Older adults who fall once are two to three times as likely to fall again within a year; 10% of referrals to emergency - people over 65 who have fallen. 20-30% of those who fall suffer injuries that reduce mobility and independence and increase the risk of premature death. Somewhat fewer fallers who require medical attention suffer fractures.

Non injurious falls (75%-80%) are never reported to health professionals. It can still be fatal if the person is unable to get up from the floor and cannot summon help. Lying on the floor for more than 12 hours is associated with pressure sores, dehydration, hypothermia, pneumonia, and death. Almost 50% of people who fall require help to get up after at least one fall, but only 10% of falls result in a lie of greater than one hour.⁴

Depression, fear of falling and other psychological problems - "post-fall syndrome" - are common effects of repeated falls. Loss of self-confidence as well as social withdrawal, confusion and loneliness can occur, even when there has been no injury.⁵

Need of the study

Falls in the elderly are common in India. Lack of Exercise, fitness and nutrition leads to gradual decrease in muscle strength, decreased physical activity, therefore affects the balance, strength and functional capacity which can result in falls in the elderly.⁶

There are many exercise interventions like balance training⁷, strengthening programme⁸ and endurance training which have proved their effectiveness in improving physical fitness and

reducing the falls in the elderly in the community.^{9,10,11,12,13}

Otago intervention includes almost all the components for improving balance, strength and functional capacity of elderly subjects^{14,15,16} It is a set of exercises which is simple and can be performed at home^{17,18} by the elderly community in India.

There are very few studies done to know the impact of Otago Interventions which has components of balance¹⁹, strengthening and mobility in the prevention of falls in the elderly population in India.²⁰

Hence Aims and Objectives of the study were as following,

AIM:

To find the effects of Otago exercise programme for fall prevention in elderly people.

OBJECTIVES:

1. To find increase in strength after giving Otago exercise programme for fall prevention
2. To find balance improvement after giving Otago exercise programme for fall prevention
3. To find effect of otago exercise programme for fall prevention in elderly people using tinetti performance oriented mobility assessment scale

METHODOLOGY

Study Design- Pre and posttest experimental design

Sample Size-30

Sampling Method- convenient sampling

Treatment Duration- 6 weeks

Study Duration- 3 months

Inclusion criteria- Community dwelling elderly around sinhgad road

, Pune were included in the study. Subjects of 60 years and above having moderate risk of fall (tinetti performance oriented mobility assessment)

Exclusion criteria- People with recent fracture or surgeries, stroke, Parkinson's disease, uncorrected visual impairments, multiple medications.

Outcome measures-

1. 10RM
2. chair stand test
3. Tinetti Performance Oriented Mobility Assessment

PROCEDURE

Ethical committee clearance will be obtained from concerned authorities. Community dwelling elderly around sinhgad road, Pune were included in the study. Once the subject fits into the inclusion criteria, intervention will explained and written consent will be taken.

Pre-intervention outcomes like 10RM, chair stand test and Tinetti Performance Oriented Mobility Assessment will be assessed.

An older adult with moderate risk of fall according to Tinetti Performance Oriented Mobility Assessment scale is included in study.

Otago exercise intervention will be conducted for 6 weeks.

Otago exercise intervention programme consists of lower limb strengthening exercises, balance training exercises, and endurance. Progression of exercises will be done by increasing the duration and then intensity. It starts with warm up, consisting of flexibility exercises for 5 min.

STRENGTH TRAINING: 10 RM will be done to prescribe the intensity of weights for strengthening programme for quadriceps hamstrings and hip abductors. 50% of 10 RM will be taken for training and will be gradually progressed. Subjects are made to perform 8 to 10 good quality repetition before fatigue. Training begins with the subjects

performing the exercises for 30 min for 5 times a week. Progression will be given by increasing the sets to 2 or increasing the weight of the cuff.

BALANCE TRAINING: The balance exercises are dynamic as opposed to static. They can help to maintain balance but will also improve the recovery of balance. Balance exercises progress from holding on to a stable structure to performing the exercise independent of support. Once the level is achieved, progress to next level.

WALKING: Subjects are advised to carry walking for at least 30 min 2 times a week.

Assessment using 10RM, chair stand test and Tinetti Performance Oriented Mobility Assessment will be done after 3rd wk. At the end of the 6 weeks, outcome measures which are done pre intervention will be re-checked as post intervention. Data analysis will be done using appropriate statistical analysis.

Table 1 (a) and (b) shows strength and balance training exercises.

EXERCISE PROTOCOL (Table 1)

	STRENGTHENING	BALANCE RETRAINING	WALKING
Activities	5 leg muscle strengthening exercises, with up to 4 levels of difficulty*	12 balance retraining exercises, with up to 4 levels of difficulty*	Advice about walking
Assessment	The amount of weight in ankle cuff should allow 8-10 repetitions before fatigue	Set each exercise at a level that the person can safely perform	Discuss the present walking activities
Intensity	Moderate	Moderate	At own pace
Progression	Increase to 2 sets of repetitions or increase the weight of ankle cuff	From supported exercise to unsupported exercise	
Frequency	5 times a week	5 times a week	At least 2 times a week
Duration	Approximately 30mins for flexibility , strength and balance exercises		30mins, can be broken down to 3*10mins walk throughout the day

STRENGTHENING EXERCISES		
Knee extensors (front knee strength) Knee flexors(back knee strength) Hip abductors (side hip strength)	All 4 levels Ankle cuff weights are used to provide resistance to muscles and 10 repetitions of each exercise are carried out	
Ankle plantarflexors (calf raises)	Level C 10 repetitions, hold support, repeat	Level D 10 repetitions, no support, repeat
Ankle dorsiflexors (toe raises)	10 repetitions, hold support, repeat	10 repetitions, no support, repeat

Table1 (a) Strength Training

BALANCE RETRAINING EXERCISES				
	Level A	Level B	Level C	Level D
Knee bends	10 repetitions Hold support	1)10 repetitions, no support or 2)10 repetitions, hold support, repeat	10 repetitions, no support, repeat	3*10 repetitions No support
Backwards walking		10 steps, 4 times Hold support		10 steps, 4 times No support
Walking and turning around		Walk and turn around (make figure of 8) twice Use walking aid	Walk and turn around (make figure of 8) twice no support	
Sideways walking		10 steps, 4 times Use walking aid	10 steps, 4 times No support	
Tandem stance (heel toe stand)	10 sec, hold support	10 sec, no support		
Tandem walk (heel toe walk)			Walk 10 steps Hold support, repeat	Walk 10 steps No support, repeat
One leg stand		10 sec, hold support	10 sec, no hold	30 sec, no hold
Heel walking			10 steps, 4 times Hold support	10 steps, 4 times No support
Toe walk			10 steps, 4 times Hold support	10 steps, 4 times No support
Heel toe walking backwards				Walk 10 steps No support, repeat
Sit to stand	5 stands, 2 hands for support	1)5 stands, one hand support or 2)10 stands,2 hands for support	1)10 stands, no support or 2)10 stands,2 hands for support, repeat	10 stands, no support Repeat
Stair walking	As instructed	As instructed	As instructed	As instructed, repeat

Table 1(b) Balance Training

RESULTS

Paired t-test was done. Results of p value for 10RM, Tinetti performance oriented mobility assessment and chair stand test was found to be very significant. Out of 26 subjects with moderate risk of fall pre intervention, 24 subjects showed low risk of fall during post intervention. Hence showing significant effect of otago exercise programme on Indian population

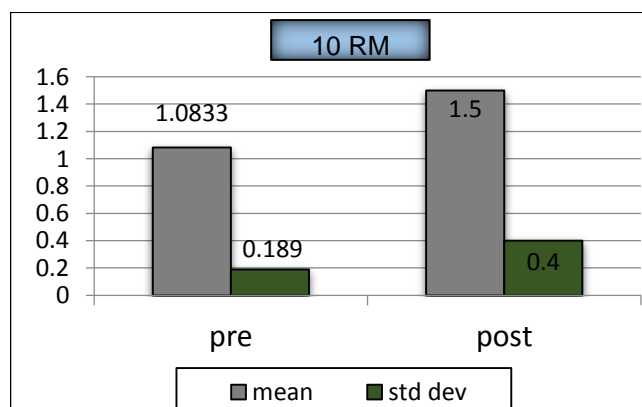


Figure 1

Mean	Std dev	t-value	p value
1.083333	0.189525	-6.499	0.000
1.5	0.4		

Table 2

Figure 1 and table 2 show results of 10RM. Figure 1 shows pre and post intervention difference in mean and standard deviation of 10RM while Table 2 shows p value of 10RM which is 0.00 i.e. highly significant.

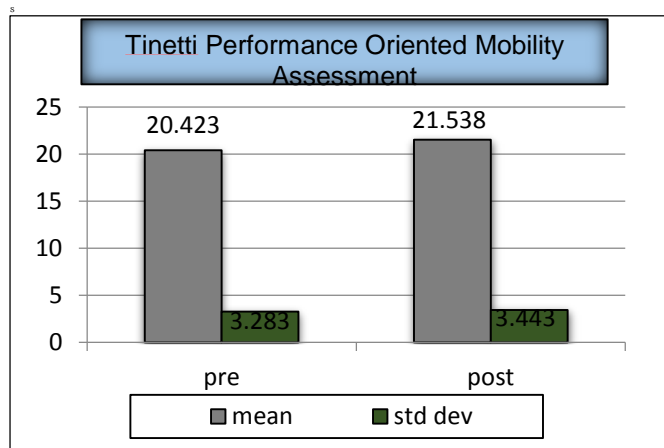


Figure 2

Mean	Std dev	t-value	p value
20.42307692	3.283678483	-6.257	0.000
21.53846154	3.4436117		

Table 3

Figure 2 and table 3 show results of Tinetti Performance Oriented Mobility Assessment. Figure 2 shows pre and post intervention difference in mean and standard deviation of Tinetti Performance Oriented Mobility Assessment while Table 3 shows p value of Tinetti Performance Oriented Mobility Assessment which is 0.00 i.e. highly significant pre and post difference.

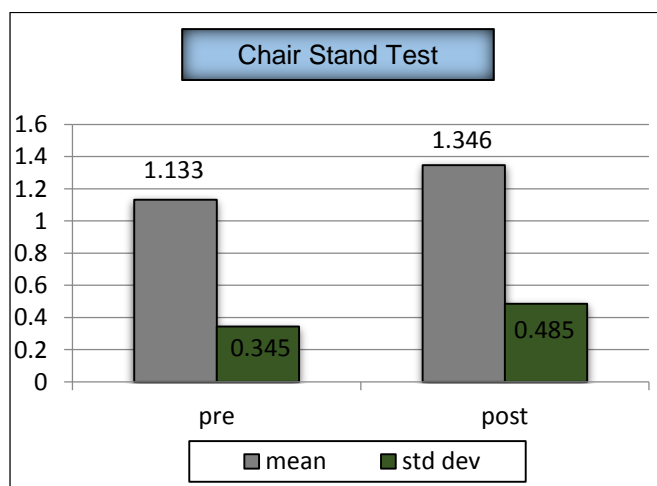


Figure 3

Mean	Std dev	t-value	p value
1.133333	0.345746	-2.739	0.01
1.346154	0.485165		

Table 4

Figure 3 and table 4 show results of Chair Stand Test. Figure 3 shows pre and post intervention difference in mean and standard deviation of Chair Stand Test while Table 4 shows p value of Chair Stand Test which is 0.01 i.e. it shows significant pre and post difference.

DISCUSSION

Otago was developed, tested, and proven to be effective for preventing falls among adults 65 years of age and older in four randomized controlled trials in New Zealand. Otago has been shown to reduce falls by 35 percent among high risk individuals. It was most effective for adults 80 years of age or older, who have fallen within the last year, and who have moderate to severe decreased strength and balance due to multiple risk factors including arthritis, de-conditioning, and inactivity. Otago improves both strength and balance—two of the most readily modifiable risk factors for falls.

The nationwide implementation of effective fall prevention exercise programs i.e. Otago Exercise Program in India is limited. In contrast to an epidemiological approach, in this trial, we will conduct an intervention based on three major intrinsic fall risk factors (balance impairments, gait instabilities, and muscle weakness). This will allow the use of several extensive clinical measurement tools for evaluation purposes.

The Otago Exercise Program require relatively low supervision and material costs. Previous studies showed that combined balance and resistance training may positively affect physical (i.e., balance and strength), mental (i.e., quality of life and fear of falling), and functional performance (i.e., ADL). Uncertainty remains if resistance training alone is sufficient to prevent falls in older adults.

The purpose of this study was to determine whether there were measureable differences in strength and balance in a group of community dwelling elderly people over the age of 60 years participating in the Otago Exercise Programme for six weeks which consisted strengthening, balance and endurance training.

The outcome measures used to measure strength of lower limb were 10RM and chair stand test and

to measure improvement in balance was Tinetti performance oriented mobility assessment.

A systematic review and meta-analysis on muscle weakness and falls in adults over the age of 65 years living in institutions or community dwelling, identified that while decreased strength is a risk factor for falls, more trials are needed to ascertain the effectiveness of strength training in falls prevention (Moreland et al 2004). Similarly a systematic review of resistance training in older adults over the age of 60 years concluded that resistance training does result in strength changes in older adults (Latham et al 2004) which is also consistent in our study.

Results showed that there was significant improvement in strength and balance in the participants. In this study along with balance and strength, gait improvement was also seen. Hence the Otago exercise programme is clinically significant in Indian elderly population.

CONCLUSION

The Otago exercise programme is significantly effective increasing strength of lower limb and improving in balance, gait and prevention of fall in elderly people in Indian elder people so it is effective for prevention of fall in elderly people.

Hence, Otago exercise protocol can be used in day to day clinical practice and also as a home exercise programme to improve strength and balance which will ultimately result in prevention of fall in elderly population.

LIMITATIONS

1. Equal number of male and female were not taken

FUTURE SCOPE OF THE STUDY

1. Study can be performed on large population
2. Study can be performed on specific population eg: women
3. Study can be performed on specific conditions eg: osteoporosis
4. Comparison of effectiveness of exercise programme in male and female can be done

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DECLARATION OF INTEREST

We declare that we have no conflict of interest.

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