



International Journal of Advanced Research in Arts, Science, Engineering & Management

Volume 10, Issue 2, March 2023



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 6.551

Effects of Otago Exercise versus Otago Exercise Combine with Postural Correction on Balance, Mobility and fall in Young Old Individual: A Pilot Study

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ABSTRACT

OBJECTIVES: Population declines in older age groups are a main cause of sickness and mortality. Falls in older adults can be caused by a variety of factors, including muscle atrophy, balance issues, poor posture, and visual impairments. neurological disorders of the muscles (such as ataxia, Parkinson's Gait and additional mobility are also factors in the ageing population. Exercises that increase strength and balance can help people move more easily and prevent falls and falls-related injuries.

METHODS: 40 subjects who were meeting inclusion criteria are taken and randomly assigned into two group. Group A underwent otago exercise program whereas Group B underwent otago exercise with postural correction exercise program for 4 weeks. In this study, Timed up and go test for mobility, Fall efficacy scale for evaluating fear of fall and for static balance Four stage balance test was used.

RESULT: There was statistical significant improvement shown by Wilcoxon Mann Whitney test in shoulder stability and throwing accuracy post intervention ($p < 0.05$). On comparison of pre and post intervention mean difference of closed kinetic upper extremity and throwing accuracy test show significant improvement in shoulder stability (4.04 ± 2.236) and (6.12 ± 2.551), throwing accuracy (1 ± 0.885) and (0.85 ± 0.732) for group A and group B respectively.

CONCLUSION: This study concludes that there was positive effect on balance, mobility and prevention of fall in both the treatment groups. The effect is more significant in the Group B which was treated with Otago Exercise with Postural correction in improving balance and mobility compare to Group A. The fall is prevented in both the groups but there were no significant differences noted between both the groups.

KEYWORDS: Otago Exercise, Postural Correction, Balance, Mobility, Young Old Individual

I. INTRODUCTION

Population declines in older age groups are a main cause of sickness and mortality. The severity of the injuries varies, but 2.8 million people had emergency room treatment for them, with about 800,000 of them ending up in hospitals. 37.5% of individuals who fell said they had at least one fall that necessitated medical attention or limited activity for at least a day. Over the same time period, falls are believed to have caused 27,000 deaths in older people.^[1]

Women are more likely than men to report falling and sustaining a fall injury. The proportion of older adults who fall rises with age, from twenty six percent among those between the ages of 65 and 74 to 29.8% among those between the ages of 75 and 84 to 36.5% among those above the age of 85. It is well-known that a variety of causes can lead to falls in the elderly. Consequently, rather than just one type of intervention, multiple therapies may be more successful.^[1]

Falls in older adults can be caused by a variety of factors, including muscle atrophy, balance issues, poor posture, and visual impairments. neurological disorders of the muscles such as ataxia, Parkinson's Gait and additional mobility are also factors in the ageing population. The maximum exercises should performed standing position, giving more

importance to lower limb muscles, and be structured and progressive in intensity and balance challenge for interventions to be most successful among those at risk for falling. ^[2]

Pathophysiology of falls:

Falls are one of the most common health concerns facing elderly persons today. About one-third of community-dwellers over the age of 65. ^[3] Fear of falling is common among elderly fallers, and fear of falling has been associated with impaired mobility and decreased functional status. ^[4]

The best predictor of falling is a previous fall. However, falls in older people rarely have a single cause or risk factor. A fall is usually caused by a complex interaction among the following:

Intrinsic factors

Age-related changes can impair systems involved in maintaining balance and stability and increase the risk of falls. Visual acuity, contrast sensitivity, depth perception, and dark adaptation decline.

Extrinsic factors

Environmental factors can increase the risk of falls independently or, more importantly, by interacting with intrinsic factors. Risk is highest when the environment requires greater postural control and mobility and when the environment is unfamiliar.

Situational factors

Certain activities or decisions may increase the risk of falls and fall-related injuries. Examples are walking while talking or being distracted by multitasking and then failing to notice an environmental hazard, rushing to the bathroom, and rushing to answer the telephone.

Otago Exercise Program

The Otago Exercise Program (OEP) is discovered to reduce falls Improve balance and mobility in older persons. The protocol consists of seventeen strength exercises, balance exercises and also walking program, after those 10 minutes rest is given performed three times a week by the older adult in at their home community settings, Exercises can be done individually or in a group setting. Studies show that Otago exercise participants experience a 35 – 40% reduction in falls. The treatment is given for 4 - week's period after that self-management is given to the population.

Timed Up and Go Test

The test is designed to assess and study the mobility namely timed up and go which is simple and inexpensive method which screens the basic mobility. The test consists of basic everyday movements like stand up from a chair, walk for 3 km, turn and walk back to the chair and sits down time stops when patient is sited be sure to use of assistive device on the basis of time to complete the task, we will find the risk of fall and mobility. ^[5]

Fall Efficacy Scale

The goal of the test is to evaluate the fear of fall in population with risk of fall, this test consists of 10 items and each is scored from 1 to 10 (1 is very confident, 10 is not confident at all). This scale contains following items, taking bath or shower, reaching to cabinets, walking around the house, prepare a meal, getting out and in of bed, answering the telephone or door, getting in and out of chair, dressing and undressing, personal grooming and going in and out of toilet. ^[6]

Four Stage Balance Test

Static balance is assessed by FOUR STAGE BALANCE TEST. Therapist gives task to maintain that position for 10 sec. Four positions are:

1. Stand keeping your feet aside.
2. Place the step of one foot so that it is touching with big toe of the other foot.
3. Tandem stand
4. Stand on one foot and posture will assessed by normal plumb line in lateral, posterior and anterior view. ^[8]

The time is to be noted for each position. If one position is not held by the patient then you cannot proceed to the next position. With increase in position number the difficulty level also increases. Precautions to be taken to avoid any incident of fall.



II. METHODS OF DATA COLLECTION

The source of data for this study consists of individuals from villages situated in close proximity to Parul University. The villages included in the study are Ishwarpura, Limda, Madheli, and Narmadpura. The individuals from these villages will serve as participants for the study. In terms of the method of data collection, the study will utilize a comparative study design with a closed envelop method of sampling. The sample size for the study is set at 40 participants, with Group A consisting of 20 participants and Group B consisting of another 20 participants. The study intervention involves a 4-week program, with sessions held three days a week. The aim of the study is to compare the effectiveness of two different interventions and determine which one yields better results.

INCLUSION CRITERIA

The inclusion criteria for this study have been established to ensure that the participants are suitable for the study and can provide accurate data for analysis. The first criterion is that the study will include individuals who are part of the old age population, specifically between the ages of 65 to 75 years old. Additionally, participants must have a MMSE score of 24 or above, indicating that they have the cognitive ability to participate in the study. Furthermore, participants must be willing to participate in the study and sign a written consent form. Both male and female participants will be included in the study. Lastly, participants must be able to understand and communicate in Hindi and Gujarati languages to ensure that language barriers do not impact their ability to participate in the study or comprehend instructions provided during the intervention. The inclusion criteria have been established to ensure that the study's results are relevant to the targeted population and can be used to inform further research and interventions for this demographic.

EXCLUSION CRITERIA

To ensure the safety and accuracy of the study, exclusion criteria have been established to exclude individuals who may be unable to participate fully or who may present a risk to themselves or others during the study period. The first criterion is that individuals with neurological and neuromuscular disorders will be excluded from the study, as these conditions can affect an individual's ability to perform physical tasks and may confound the results of the study. Participants with moderate to severe cardiovascular disorders will also be excluded, as they may be at risk of experiencing complications during the intervention. Individuals suffering from speech and cognitive deficits that could interfere with conducting the research will be excluded from the study as well. Participants with significant hearing or visual impairments will be excluded as these conditions can affect their ability to communicate and participate in the intervention. Lastly, individuals with musculoskeletal disorders will be excluded from the study as these conditions can affect their ability to perform physical tasks and may impact the results of the study.

MATERIAL USED

Consent form
Paper
Stop watch
Measure tape
Elastic band
Pencil/pen
Questionnaire

OUTCOME MEASURES

Timed Up and Go Test
Fall Efficacy Scale
Four Stage Balance Test

III. RESULT

The graph shows the mean data of outcome measures used in the study i.e Timed up and go for which pre and post treatment score was 13.42 and 8.69, similarly for Fall Efficacy scale the pre and post treatment score was 74.49 and 74.87 respectively and for Four stage Balance scale score was 26.87 and 33.31, Similarly 1.52, 1.42, 3.20, 2.92, 2.46, 2.09 is the Standard Deviation for all the outcome measures respectively in Group A which was treated with Otago Exercise only.

The above graph shows the mean data of outcome measures used in the study i.e Timed up and go for which pre and post treatment score was 13.51 and 8.13, similarly for Fall Efficacy scale the pre and post treatment score was 79.51 and 73.34 respectively and for Four stage Balance scale score was 25.85 and 38.68. Similarly 1.50, 0.96, 3.14, 2.72 , 3.07, 5.14 in Group B which was treated with Otago Exercise along with Postural Correction.

The difference between pre and post treatment in Group A which was treated with Otago Exercise. The data was analyzed with 95% confidence interval. The Timed Up and Go test shows significant difference between pre and post treatment with the $p < 0.05$ ($p = 0.00$) with mean 4.73 and 1.51 standard deviation. The Fall Efficacy Scale shows significant difference between pre and post treatment with $p < 0.05$ ($p = 0.00$) with 4.62 mean and 1.31 standard deviation. Similarly, in the Four Stage Balance Scale, there is significant difference was found between pre and post treatment with $p < 0.05$ ($p = 0.00$) with 6.26 mean and 3.14 standard deviation. The t value here is positive and > 1.96 which suggest that there is significant variances between the data.

The difference between pre and post treatment in Group B which was treated with Otago Exercise along with Postural Correction. The data was analyzed with 95% confidence interval. The Timed Up and Go test shows significant difference between pre and post treatment with the $p < 0.05$ ($p = 0.00$) with mean 5.38 and 1.70 standard deviation. The Fall Efficacy Scale shows significant difference between pre and post treatment with $p < 0.05$ ($p = 0.00$) with 6.17 mean and 3.88 standard deviation. Similarly, in the Four Stage Balance Scale, there is significant difference was found between pre and post treatment with $p < 0.05$ ($p = 0.00$) with 12.82 mean and 5.38 standard deviation. The t value here is positive and > 1.96 which suggest that there is significant variances between the data.

The comparison between the pre and post treatment effects of both the groups. Here the TUG shows significant variances between Group A and B, with $p = 0.02$ ($p < 0.05$). This says that Group B shows more improvement compare to Group A on Balance. The Fall Efficacy Scale doesn't show significant no variances which concludes that there is no differences with the scores in FES in both the groups. The Four stage Balance scale also shows significant variances between both the groups post treatment. The $p = 0.00$ ($p < 0.05$) which highly significant, concludes the effect of treatment is more in Group B compare to Group A.

Hence, the above table concludes that the Balance and Mobility is significantly improved more in Group B which was treated with Otago Exercise and Postural Correction compare to Group A which was only treated with Otago Exercise. But there were no significant differences noted in the prevention of fall between both the groups.

IV. DICUSSION

Improvement in FES, TUG and FSBS in Group A

The results were analyzed using paired sample t test in group A for pre and post treatment comparison. The means differences were, 4.73, 4.52 and 6.26 respectively in the outcome measure used which was TUG, FES and FSBS. The t test showed significant improvement in all the three outcome measure to assess mobility and balance with a significance p value .00 which is < 0.05 which says that there is significant differences between post and pre treatment. Thus, this statistically says that post treatment there is improvement in mobility and balance after Otago Exercise.

The results were supported by previous literatures as well in which was One of the previously conducted study by Leila Ali ali et al, (2022) conducted a study with a title "The Effect and Persistence Of Otago Exercise Program On Balance, Cardiovascular Endurance And Lower Limb Strength In Elderly Women With A History Of Falls" in which randomly, two equal experimental groups of 15 people in Otago and a control group of 30 elderly women between the ages of 60 and 70 years old were divided (15 people). The test group engaged in Otago exercises (8 weeks, 3 sessions per week and 45 minutes per session). Prior to and after 8 weeks of training, as well as one month after training, the subjects' balance, cardiovascular endurance, and lower limb strength were measured using the Y test, the 6-minute walk test, and the 30-second standing-up test. The results revealed that the Otago training group significantly increased the elderly subjects' balance, cardiovascular endurance, and lower limb strength. Otago exercises can therefore be used to lower the risk of falls and enhance postural control in seniors.

Improvement in post treatment in Group B

The group B included Otago exercise along with postural correction. As the movement in correct posture is required for effective movement which increases the effects along with the Otago exercises. The paired t test was used to analyze the comparison between pre and post treatment data for TUG, FES and FSBS respectively. The mean difference between these outcome measures was 5.38, 6.17 12.82 respectively. This result says that there is significant



improvement seen in all the outcome measures for mobility and balance. Here, the p value is <0.05 which is statistically significant.

The above mentioned statistical analysis shows the improvement with the Otago Exercise and postural correction because, this training programme includes strength, endurance and balance with multi task conditions so that we can stimulate the cognitive and physical abilities focusing on attention. This effects is also seen in one of the study which supports the same results, in which the BBS and short Physical performance battery tests were used in the study for which the conclusion was like eight weeks of multicomponent exercise training has beneficial effects on balance and physical function and results improved equilibrium and decreasing probability of falling. Thus, practitioner can use this 8 week programme for older individuals.

There have been researches which have proven effect of OTTAGO and Postural exercises on FSBT, FET and TUG but very few studies showed the combined effect of postural exercises and OTTAGO combined on FSBT, FET and TUG. Hence the current study has statistically proven that when OTTAGO exercises are combined with Postural exercises, the effect is doubled and the improvement is seen faster and in a much better fashion.

Comparison between the Otago exercise group and Otago and Postural correction group (Between group analysis)

The independent samples t test was used to compare the means between the two independent data to find the difference between these data and to know the effectiveness of the exercise and which exercise is more effective. The test results shows that there is equal variances observed in Timed Up and Go test between Group A and Group B which says there is significant differences between these groups with the significant value 0.01 respectively. Similarly, in Four Stage Balance scale there is equal variances observed with p value 0.00 which is highly significant.

Thus if these exercise regime are incorporated in the day to day life of elderly individuals significant risk of fall and postural imbalances can be prevented and hence the rate of co morbidity and disability due to fall in elderly can be minimized and also the level of physical activity can be improved which in turn can give them a better life.

V. CONCLUSION

In conclusion there was positive effect on balance, mobility and prevention of fall in both the treatment groups. The effect is more significant in the Group B which was treated with Otago Exercise with Postural correction in improving balance and mobility compare to Group A. The fall is prevented in both the groups but there were no significant differences noted between both the groups. Hence, in clinical practice with geriatric rehabilitation Otago exercise should practice to improve balance and mobility which ultimately improve the confidence of the patient and help with the prevention of falls.

LIMITATION AND FURTHER RECOMMENDATIONS

Sample size was small, hence

All the participants may not have continued the training after study duration. Long term protocol should be designed and the duration of intervention should be increased.

After completion of post intervention outcome measurement for long term effect up was not taken. Long term follows up to check the effect of the exercise regime shall be done.

All the participants were healthy individuals hence the effect of intervention was not analyzed on patients. Hence another study can be conducted which may include individuals with neurological or musculoskeletal conditions in order to find the effect of exercise regime in those conditions.

INFORMED CONSENT PROCESS

A written and informed consent about enrolment in the study and maintaining adequate privacy and confidentiality were taken from all the participants recruited for the study.

CONFIDENTIALITY ISSUES AND DATA SAFETY

Adequate privacy and confidentiality of participants were also maintained by the researcher.

SOURCE OF FUNDING

This study was not funded by any public, commercial, or not-for-profit agencies.

ETHICAL APPROVAL

Ethical clearance is obtained from ethical committee of institution and institution where the subjects belongs at Parul University of Physiotherapy, Waghodia, Vadodara.



CONFLICT OF INTEREST

None

CONSENT FOR PUBLICATION

Prior to the study, participants received information about it. After receiving consent, we maintained proper privacy and confidentiality for all of the study's patients.

AUTHORS CONTRIBUTION

VG: conceptualization, project administration, methodology, reviewing, writing, and editing; methodology, formal analysis, and reviewing; MV: writing, and editing; methodology, formal analysis, and reviewing; CS: reviewing and editing. The final draft of the manuscript has undergone critical review and approval by all authors, who take full responsibility for its content and similarity index.

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