

Implementation of Otago exercise programme combined Balance exercise: A sustainable way to renovate balance and avert fall risk in Older Community-Dwelling Adults

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ABSTRACT

Background: Elderly adults are prone to unexpected falling due to meagre balance. Otago Exercise Programme (OEP) is a feasible balance providing and muscle strength reinforcing exercise, likely conceived for the old age dwelling community people. OEP integrated with balance exercise is implemented for the aged people with intended focus line of acquiring possible muscle balance and vanquishing the fear of fall. Measurement of balance and fall risk rate is valued by deploying Berg Balance Scale (BBS) and FES-I (Falls Efficacy Scale International).

Method: 60-65 years of people are randomly selected from a Hyderabad old age home and investigation is conducted among 2 groups- Group A (OEP + balance exercise) and Group B (Common balance exercise), 15 individuals per group. The schedule for the experiment is set to one month, about 3 days per week for 20 minutes. Pre and post phase interventions are carried out for comparative evaluation with effective tools- FES-I for fall efficacy detection and BBS for balance score determination.

Outcome measures: BBS and FES-I

Result: *Prelim to the planned programme, during the pre-intervention stage, the outcome measures FES-I scores and BBS scores are calculated for all the selected subjects. In the meantime of post intervention stage, the OEP with balance exercise and conventional balance exercise protocol is practiced by set A and set B respectively, followed by measurement prediction with the efficient tools. The average BBS score for Group A and B are estimated as 46 and 41.2 during post phase and 37.13 and 37.33 during pre phase, with 95% significance. The mean FES-I scores are rated as 22.27 and 30 for group A and B during post phase and 38.53 and 37.2 during pre phase, with 99.96% confidence level. The obtained results point out that decrease in fall rate and increase in balance score for experimental group is an assured value, confirming the effect of OEP integrated with balance exercise.*

Conclusion: *The experiment proves balance exercise combined with OEP is highly valuable in comparison with the standard balancing exercises. The subjects those who have undergone the combined training attains more balance strength and they experienced minimized fear of fall. Perfectly, OEP together with balancing exercise is recommended as a practical solution for adult people who wants balance renovation, fall avertion and to be free from dependency type of life style.*

Keywords: *Old age falls, Balance exercise, FES-I, Community adults, Otago, BBS*

INTRODUCTION

Error in motor and sensory movements results in elder communities hold in independent life with weak state of mind [1], [2], [3]. Due to unforeseen falls, moderate operation of balancing system fails, causing fatal wounds [4]. Eventually, the fear of fall is accepted as a psychological element with additional risk factors

such as intake of medications, muscle impairment and loss of balance [5],[6], [7], [8]. Fall rate is predicted to be 33% among adult age of 65 years old and it affects the quality of life too [9]. Muscle weakness persists in lower and upper body, specifically the area near to knee is worse beared [10]. In order to sustain the balance in muscles and preventing falls, exercise should be undertaken consistently [11]. There exists a well-built association between fall and loss of balance. So, it is necessary to inculcate balancing aids to strengthen the muscles and improve balance, thereby, minimizing the fear of falling.

Lot of research works has been propounded, in relation to static body posture maintenance [12], soft and hard surface balancing exercises [13] and muscular strengthening strategy [14]. No correct method is proposed for an effectual solution for the old age problems. To be specified, balancing exercises are manifested to be one of the paradigm in adult fall minimization [15].

Prevention of true aspects that causes falls in adults can be balanced by body activation and muscle strengthening, leading to postural balance [16]. OEP, developed at Otago Middle School is a composite of walking, balance training and muscle strengthening [17]. In previous study, OEP is vested to be a specific training method for regenerating balance.

Tools for analysing balance and fall rate are wide. For fall rate analysis, FES-I, an accurate tool, dispatched by Prevention of Falls Network Europe (ProFaNE) [18], [19], is considered and for balance analysis, BBS, a reliable tool is deployed. Research works on otago training in addition to balancing exercise to minimize the fear of fall and generating balance is scarce and hence, the current study is concentrated on implementing OEP together with balance exercises for adult communities.

BACKGROUND

The process of ageing is linked to disability, and morbidity [20]. About one-third of old age people are prone to fall each year and totally 24% aged people who have fallen suffer from fractures and injuries and requires medical attention [21]. Unintentional injury seems to be the 6th prime cause for death in 65 year old people [22]. Loss in movement maximizes the danger of consecutive falls with limited home based activity participation [23]. Exercise is an important tool to overcome falls, uniquely when applied in the form of elemental strategy focussing combined fall risk features related to behaviour, intrinsic and environment [24].

Wide variety of fall prevention programs are present [25]. But most of the exercises are time consuming and costly [26]. OEP is a home based exercise and it is an alternative to minimize falls. Moreover, such types of home based exercises are demanded by the elder populations. Some disadvantages exist in home based exercises too.

Since, falls and morbidity are interlinked in adult aged people, the experimental trial is done to diminish the risk linked factors associated with falls and balancing. Works have been executed with numerous balance exercises and so, the present study incorporates OEP and balance exercise for outcasting the fall fear and improving balance.

METHODOLOGY

The focal point lies in decisive study of ascertaining the outcome of otago exercise in averting falls and procuring strength by availing FES-I and BBS respectively.

Objectives

1. To thrive the anxiety of fall and to generate balance by intensifying the use of otago exercise.
2. To avert falls by computing FES-I scale and improving balance by BBS to recognize the fitting exercise for 60 to 65-year old persons.

Critical Points

Sample size: 30

Sampling method: Convenient sampling.

Treatment duration: 30 days.

Study duration: 45 days.

Inclusion criteria: Hyderabad community dwelling matured individuals of 60 to 65 years.

Exclusion criteria: Aged people with surgical treatments, bone crackings, cerebrovascular accidents, continuous medications, visual ailments, heart problems, muscular ailments, brain-related disorders, Parkinson's disease.

Outcome Points

1. BBS
2. FES-I

The experimental group comprises of 30 matured people of 60-65 years with danger of falling and reduced balancing, splitted in to 2, 15 individuals/group- experimental group A and control group B. In the mean time of pre phase and post phase, BBS and FES-I will be examined.

The employed session is set about with a startup warming exercise. Group A is enriched with balance cum otago exercise and meanwhile, group B is affixed with balance exercise. The total duration is about 1 month and for both groups, the fall risk study and balance improvement is analysed with the help of tools such as FES-I and BBS respectively. The values are compared before and end of the scheduled sessional experiments.

PROCEDURE

The trial includes a comparative study between experimental and control group of members 60-65 years old. The trials are done in the presence of trained physiotherapists and attendance of the adults are computerized. After warm up exercise for 10 minutes, the practice starts. The balance exercise is practiced by control set and experimental set goes on practising otago exercise along with balancing exercise for 30 minutes, 3 times/week. Constant health examination is required throughout the experiment and the extent of hardship can be maximized proportionally in relation to the stance movement of the adult people. The cessation of practicing ends with a mild walk for about 7 minutes.

The executed balancing exercises include tightrope walk, knee bends, tandem walk, stair walking, toe the line, back leg raises, balancing wand, squat to a chair, rock the boat, flamingo stand, side leg raise, wall pushups, tandem stance and heel raises. For otago exercise participants, knee extensor, hip adductor, ankle dorsiflexors, knee flexor, ankle plantarflexors are provided in addition to the balancing exercises.

BBS-14 point scale is an efficient measure to evaluate balance with constructive, concurrent validity and it is based on various items. Each item is assigned with a 5 point score- zero specifies the function at lowest level and 5 shows the highest level function.

FES-I-16 point scale is a widely used fall rate assessing tool in old age persons in a particular dwelling community. It is done in a self reporting questionnaire format.

Student's t-test is used to test hypothesis of sample means and it is calculated as follows:

$$t = \frac{m_A - m_B}{\sqrt{\frac{s^2}{n_A} + \frac{s^2}{n_B}}}$$

where, A and B comprises the two sets to be compared, m_A and m_B indicates the means of groups A and B respectively n_A and n_B indicates the sizes of group A and B respectively.

MAIN OUTCOMES

Fall linked fractures are high due to lack of balancing and it creates less confident life among the adult people. This sensational problem can be solved by adding priority mediated exercise with the conventional exercising techniques. Current work is intensified on applying otago exercise along with the traditional balancing exercise and collectively examining the balance development cum agitation of falling. In the course of post intervention period, group A shows the BBS scores as 46 and 41.2 for group B. However, throughout the pre intervention phase, the score is 37.13 and 37.33 for group A and B respectively and the statistical parameters for BBS scores are mentioned in Table 1. Finally, the otago exercise cum balancing exercise group discloses the scores to be minimized from 38.53 to 22.27 in post phase which is projected to be a unique way to lessen the rate of falling when compared to the balancing exercise group, where the score tends to diminish from 37.2 to 30. The standard error mean, mean and standard deviation of the FES-I values are interpreted in Table 2 for both the groups.

Anxiety of tumbling down is because of low strength and postural balance and it is a lead reason for mental tension, paramounting to activity diminution. As a part of intervention trials, the sensitivity to changes in the balance scales and fear of falling scales are examined. In analyzation interconnected with the BBS, the scores are reliable indicating the functional balance among the individuals. A true change is observed with 95% confident level. In relation to FES-I, the responsiveness includes 4 choices- not at all concerned to very concerned. FES-I tool gains sketched validity in scrutinizing the level of concern in falling. Totally, the 14 items for BBS and 16 items for FES-I are reproduced in Table 3 and 4 respectively. The protruded results of 16 item FES-I scale vividly proves upgradation in the range of scores from low to moderate, confirming the otago with balancing exercise an eminent exercising program to bring down the fall risks with a t-value of 99.96% confidence level.

RESULTS

The results obtained after studying the comparison between group A and B based on the BBS was graphically presented in Fig. 1 and 2 respectively and the relative study based on FES-I was illustrated in Fig. 3 and 4 respectively. The outcome proved balancing exercise along with otago exercise program to be productive in minimizing the fall rate and in increasing the balance strength. A 4 point score is valid for the FES-I 16 point Scale and for BBS scale, 5 point score is calculated. The 4 point FES-I scores 1, 2, 3 and 4 entitles never concerned severity, not oftenly concerned, fairly concerned and severely concerned respectively. The

questionnaires coupled with the falls were specifically noted by the trainers and highly authentic range from low to moderate is observed with a 99.96% confidence level. Clumsing the results of both scale studies, the otago cum balance exercise program is optimistically efficacious in constructing balance strength and limiting of fall fear.

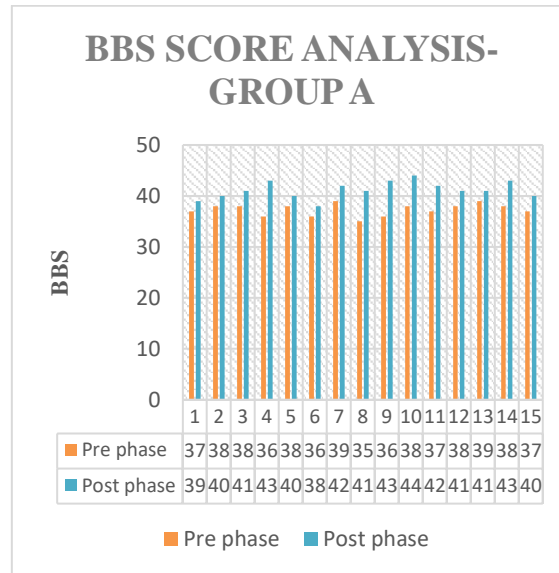


Figure 1: BBS scores of group A

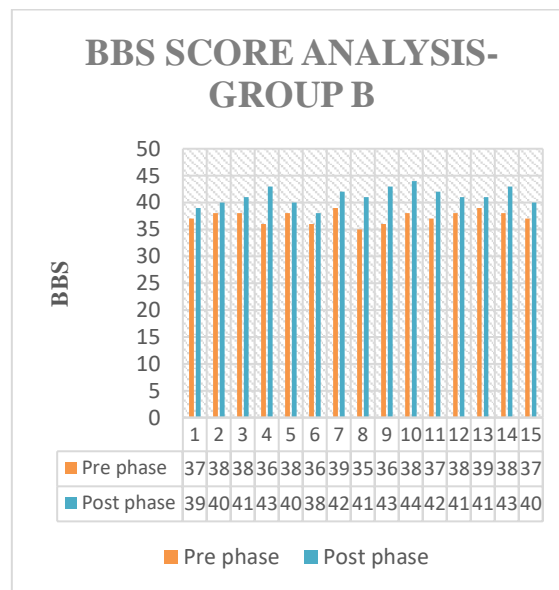


Figure 2: BBS scores of group B

In the course time of pre and post phase trial for group A, the BBS study was done and the outcome shows the values to be 37.13 and 46 respectively, outshowing the pronounced effect of otago cum balance exercise program, depicted in Fig 1. In contrast to this, group B displays the BBS score to be 37.33 and 41.2 at pre and post phase, encompassing the low effect of conventional balancing exercise, enclosed in Fig. 2. The statistical measures of BBS study for both groups are listed in Table 1 and 2.

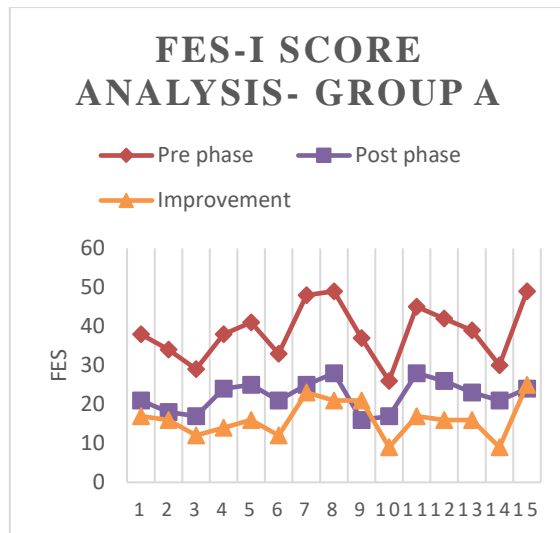


Figure 3: FES scores of group A.

The estimated FES-I values at pre and post intervention is compared between 2 sets, which strongly declares the scores of set A at post intervention, decreased to 22.27 from 38.53, showcasing dwindling in fall rate and it is sketched in Figure 3.

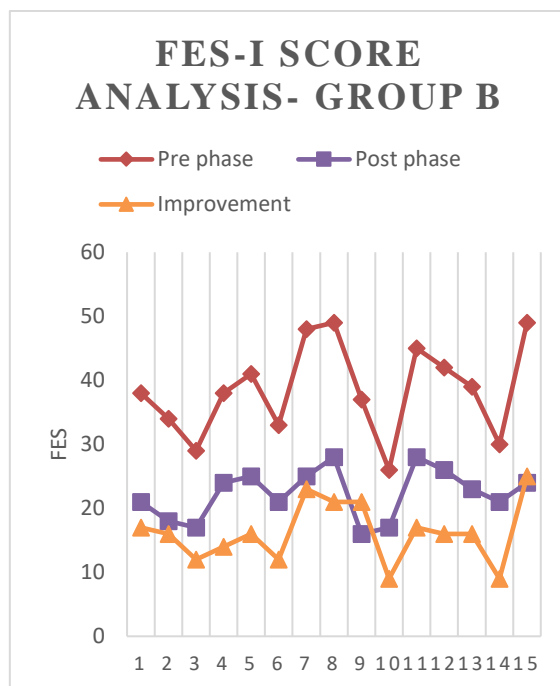


Figure 4: FES scores of group B

The results for group B is depicted in Figure 4, which conveys the assembled scores of pre and post intervention phases, manifesting the values to be 37.2 and 30. In connection with the FES-I scale, the statistical measures are calculated and are listed in Table 2. Minimum error level is chosen to be the ideal output.

Table 1: Estimated Statistical Measures for group B& group A based on BBS score

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre	Group A	15	37.13	1.41	0.36
	Group B	15	37.33	1.17	0.30
Post	Group A	15	46	1.36	0.35
	Group B	15	41.2	1.66	0.43

Table 2: Estimated Statistical Measures for group B & group A based on FES-I Score

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre	Group A	15	38.53	7.29	1.88
	Group B	15	37.2	5.10	1.31
Post	Group A	15	22.27	3.95	1.02
	Group B	15	30	4.38	1.13

The numerous items choosen for BBS and Fall rate analysisis portrayed in table 3.

Table 3: FES-I and BBS Items

FES-I Items	BBS Items
House cleaning	Sitting position to standing position
Dressing themselves	Standing unwarranted
Self meal preparation	Sitting unwarranted
Showering without assistance	Standing point to sitting point
Shopping	Shifting things
Trying to sit/get up from chair	Closure of eyes while standing
Reaching up/down stair	Standing with both footkept together
Normal walk in neighbourhood	Leaping ahead with arms stretched
Raising for things above the head/bending down on the ground	Redeeming objects from down
Accepting a call within the time	Turning back
Walk on Wet/icy surface	360 degreeturning
Visit to friends house	Placing foot over stool alternatively
Walking in a crowdy place	Standing with one foot infront
Uneven surface walking	Standing on one foot
Slope up/down movements	
Attending social functions	

DISCUSSION

Population of high age group are in alarming hike due to the modern treatments and as the proportion raises, numerous health and multifarious illness exists that projects the scarcity of self-assurance. Falls, the dominant cause of mortality in older people causes loss of

independence andso, fall preventing interventions are a necessary requirement to be fulfilled. It creates emotional, psychological, physical and social disturbances too.

The main purpose of the study is to find how much potent is the combined form of otago exercise program with balancing exercise. The hypothesised sets were analysed to be significant with high confidence levels. The BBS and FES-I score report theoretically related the importance of otago exercise in day today life. Review studies predicted the protective effect on physical activity on practical limitations as age increases.

Otago exercise program cum balancing exercise minimizes the risk of falls and maintains the postural balance within 1 month among the older common dwelling inhabitants in Hyderabad. The added trials are executed in high rated standard level with calculated statistical measures. The exercise program is initiated with a pre intervention phase study with 15 individuals per group. Impressive results are obtained after the post intervention phase. The otago exercise paradigm along with the conventional balancing exercise, favours a suitable rectifier to surpass the falling risk and sustaining the posture control, thereby depleting the muscular ailments and accidental damages. Logically, in collation with balancing exercise, combined form of otago exercise with balance exercise is more validated and powerful.

CONCLUSION

Extension in life expectancy gains importance in broad understanding and attainment of life's quality. The global indicator for the quality of life in adult age is assumed to be the proper balance and independent physical activity. Reduction in disease risk and physical activities are constantly related. In due course, one of the basic warning factor for unbalanced falling is fear. To eradicate the fall risk and enhancing strength, a set of 60-65 years old people are subjected to follow otago exercise program clumshed with balancing exercise. The experimental analysis is performed with the aid of BBS and FES-I tools. The response is predicted by 14-point BBS and 16-point FES-I scores. Improvised test participants results fortifies the promising posture regulation accompanied by reduced fall risk in comparison with the control set of participants, who had been subjected to balancing exercises alone. Finally, the findings reinforces the role of otago program with balancing exercise to be self-efficacy, both in gaining muscular strength and reducing the fear of fall. Thus undertaking otago exercise program besides balancing exercise upshots the diminished effects of balancing exercise by acquiring balance, fitness, strength and well-being.

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