

Compare the Effectiveness of Pilates and Conventional Balance Training in Young Old Geriatric Population

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Abstract

Background and objective: Frequent falls among elderly is one of the most commonly identified problems. Balance, poor gait, lower limb muscle weakness, slowed reaction time have been identified as independent risk factors for falls in elderly. Exercise programs targeted to improve these deficits might result in decrease of falls and related injuries. Present study was undertaken to study the effectiveness of pilates and conventional balance training in young old geriatric. *Method:* Institutional ethical clearance was obtained. 40 young old geriatric subjects with age group between 65 –74years were included in the study after the fulfilment of inclusion and exclusion criteria. Informed consent was obtained from all the subjects. The subjects were then randomly divided into two groups by envelope method, Group A received pilates and Group B received conventional balance training. Treatment was carried out for 30 minutes for three sessions per week for five weeks. Subjects were assessed for balance and mobility using Tinetti performance oriented mobility assessment (POMA) and timed up and go test (TUG) before starting the treatment and after four weeks. *Results:* The results showed that both the conventional balance training and Pilates showed statistically significant ($p < 0.001$) improvement in balance in young old geriatrics. *Conclusion:* The present study concluded that both Pilates program and conventional balance training equally improved the balance in elderly subjects so that both the therapies can be incorporated in the balance training.

Keywords: Balance; Geriatric; TUG; POMA; Pilates.

Introduction

“Balance is the ability to maintain the body’s centre of mass over its base of support.” It is achieved and maintained by a complex set of sensorimotor control systems that include sensory input from vision (sight), vestibular system (motion, equilibrium, spatial orientation) and the proprioception (touch); integration of that sensory input and motor output to the eye and body muscles. Injury, illness, or the aging process can affect one or more of these components [1].

Balance problems like postural instability and falls are common among the elderly and this is reverberated

by the fact that over five million subject’s visits as out patients per year and an estimated 28% and 35% of individuals over 65 years fall yearly and 1/5th of them required medical attention. The number of fallers increases to over 40% for those 75 and older. A history of falling is also a strong predictor of morbidity among the elderly [1].

Balance disorders in the geriatric population are often due to multifactorial causes. Weakness in the core stabilizing muscles, altered muscle activation pattern, loss of proprioception, and an inability to control normal postural sway can all result in decreased balance in the elderly.

A decrease in physiological reserves as we age, limits the ability to react quickly to perturbations. Studies have shown that elderly subjects who fall, demonstrate impaired functioning in sensory-motor factors accountable for balance or postural stability. Inactive lifestyle and physiological changes related to aging, featured by senile sarcopenia and

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progressive decline in muscle strength, joint range of motion, sensory system and reaction time lead to reduced physical performance and increased risk of fall [2]. Any of the above components are affected in balance in geriatric or it can be a combination. While there is not a solitary solution to postural control problems, there is evidence that the most effective treatment strategies for balance disorders consist of a multimodality approach including a re-evaluation of medications, manual therapy, exercise, and behavioural modification programs. There are many physical therapy interventions given for the treatment of such cases such as; conventional balance training program, Pilates, Tai chi, resistance training programme and many more [3].

Pilates, is a physical fitness system developed in the early 20th century by German-born Joseph Pilates. Pilates has become a popular exercise intervention that combines strength, endurance, flexibility and coordination training and, with the projected benefits of improved muscular control of the deeper abdominal muscles i.e. transverses abdominis, lumbar multifidus, respiratory and pelvic diaphragm, it may provide an effective method of improving postural stability. Pilates intervention has been shown to be useful in improving postural stability in neurologically intact elderly people [4].

Conventional balance training which include training the strength and endurance, maximizing flexibility and postural control have been proved to be effective in improving functional ability in addition to reducing risk of falls in elderly individuals [5].

The paucity of a study on the comparative analysis of Pilate Training Vs Conventional Balance Training in improving balance in the elderly was the driving force behind this particular study. Hence the need was there to study Pilates Training in great detail and a comparative study against Conventional Balance Training methods was required to explore more benefits in the understanding of new and innovative ways to improve balance in the elderly.

Materials and Methods

Ethical approval for this study was obtained from the institutional ethical committee. Using convenience sampling participants were recruited from the tertiary care hospital Belagavi, Karnataka. The inclusion criteria were as follows; Elderly Individuals in the age group of 65- 74 years, able to walk at least for 30 feet with or without an assisting device and not participating in any sports or physical therapy

session. Acute medical problems such as fever, bronchitis etc, history of fracture, ligament injury etc, history of any neurological condition and vestibular disorder were excluded. The written consent was obtained from all the subjects who fulfilled inclusion and exclusion criteria after explaining the purpose of the study. The subjects were randomly allocated into two groups by envelope method, Group A received pilates and Group B received conventional balance training.

Outcome Measures

Tinetti Performance Oriented Mobility Assessment (POMA) is a task- oriented test that measures an older adult's gait and balance abilities by an ordinal scale of 0 (most impairment) to 2 (independence). The assessment takes 10 - 15 minutes to complete. It is composed of a 9-item gait portion (POMA-G) and 7-item balance portion (POMA-B) [6]. Excellent test retest reliability for POMA balance and POMA gait (ICC= 0.72-0.86) was reported in elderly subjects [7].

Timed Up and GO Test (TUG) is designed to measure gait performance and balance; it was originally developed as clinical measure of balance in elderly patients. The intra-rater reliability is excellent (Pearson's $r = 0.979$) and inter-rater reliability is excellent (Pearson's $r = 0.973$) [8].

Intervention

Group A (Pilates Training)

Group A participants were given the pilates training which included Hundred, Shoulder bridge, Single leg circles, Alternate toe tap, Leg pull front, Spine twist, Ball leg lift, Standing side splits: Performed in standing on one leg with the other leg placed on exercise ball & performing side splits by rolling the ball away and close to the stance leg, Ball wall squat, Tandem walking and heel to toe walking in a straight line.

Group B (Conventional Balance Training)

Group B participants were given conventional balance training. The exercises included Flexibility of muscles such as calf, hamstring, quadriceps, hip flexors & hip adductors (15 sec hold and 5 repetition) strength exercises such as curl ups, spinal extensors hip abductors (side hip extensors, hamstring and quadriceps all movements are given for 10 repetitions. Postural control included stepping in all direction, reaching to limits of stability in different position (kneeling, half kneeling, standing: on hard surface

and foam surface), step up and down, tandem standing and walking, single limb standing (eyes open and closed). Walking for 12 minutes at self-selected comfortable pace on a level surface to improve endurance.

Both the Groups received the intervention for thirty minutes per session for three sessions per week for

five weeks. The subjects were assessed with POMA and TUG before starting the intervention and after five weeks.

Results

Statistical analysis for the present study was done

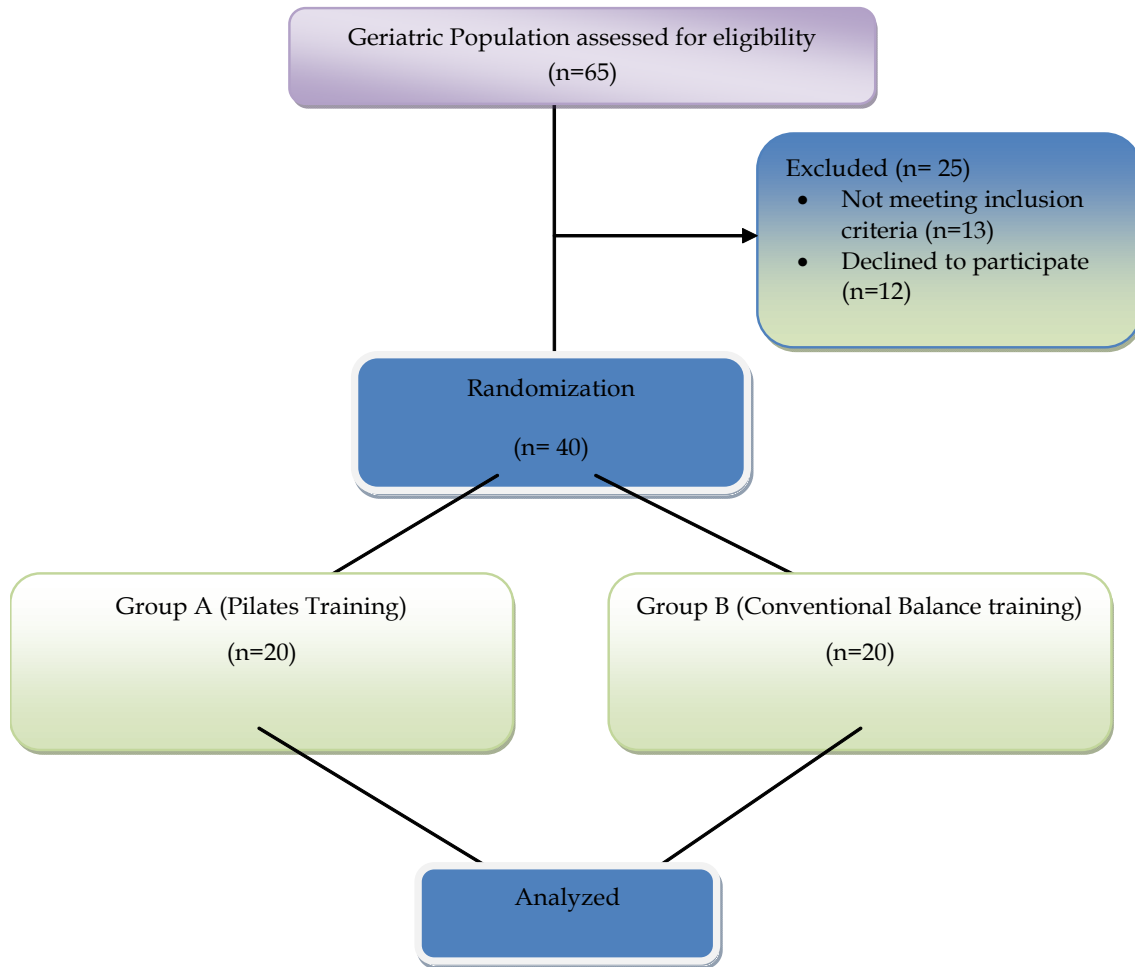


Fig. 1: Flow Chart of the study

manually as well as using statistical package of social sciences (SPSS) version 21 so as to verify the results obtained. For this purpose data was entered into the Microsoft Excel Sheet, tabulated and subjected to statistical analysis. Mean, standard deviation, and test of significance that is paired and unpaired t Test, were used. Subjects demographic data i.e. age, sex, BMI, height, weight distribution were analyzed using t-test. Comparison of the pre intervention and post intervention outcome measures such as POMA and TUG within the group and between the groups was done by using Paired t-test.

Participant Characteristic

In the present study there were 20 participants in Group A which included 7 males and 13 females and mean age of the participants was 68.70 ± 2.64 years and there were 20 participants in Group B which included 9 males and 11 females and mean age of the participants was 69.05 ± 3.10 years. The difference in mean age of Group A and Group B was statistically not significant ($p = 0.7029$).

The mean Body weight of the participants in Group A was 64.55 ± 7.04 kgs and mean height was 169.34 ± 8.44 cms and Group B mean weight was 66.35 ± 6.73 kgs and mean height was 171.5 ± 7.87 cms.

The difference in mean weight ($p= 0.4136$) and difference in mean height of participants ($p= 0.4886$) in Group A and Group B was not statistically significant. The mean BMI of the participants in Group A was 22.57 ± 2.58 and Group B was 22.81 ± 2.39 . The difference in mean BMI between participants of Group A and Group B was statistically not significant ($p= 0.7656$). On comparing the age, body weight, and BMI between Group A and Group B by paired t-test,

showed no significance difference at 5% level of significance which suggests that demographically the participants in each group was homogeneity to each other (Figure 2).

Outcome Measure

A comparison of pre- and post- treatment revealed a statistically significant difference in the score of TUG

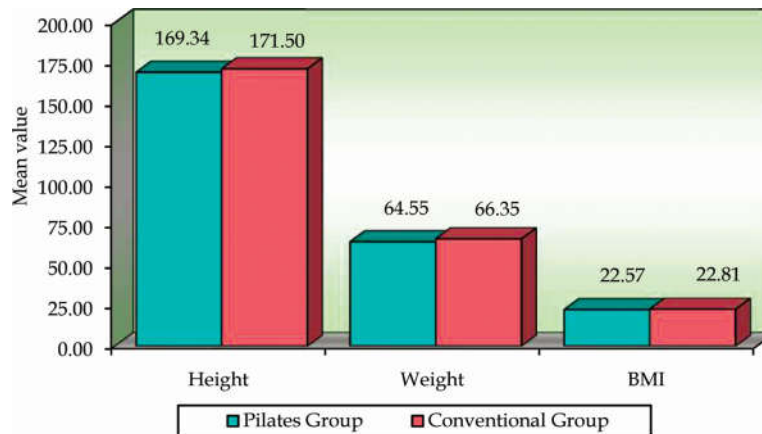


Fig. 2: Demographic characteristics

Table 1: Comparison of the pre and post treatment variables within the two Groups

GROUPS	POMA				TUG			
	Pre test	Post test	difference	p-value	Pre test	Post test	difference	p-value
Group A	19.46±2.53	3.32±1.49	3.00	0.0001*	49.44±14.31	25.94±9.64	23.50	0.0001*
Group B	6.19±1.85	4.14±1.40	2.06	0.0001*	52.16±5.03	36.84±6.51	15.32	0.0001*

Table 2: Comparison of the pre and post treatment variables between the two Groups

Variables	TUG			POMA		
	Group A	Group B	p-value	Group A	Group B	p-value
Pre test	19.07±2.53	19.46±3.03	0.6614	21.65±2.70	20.85±2.39	0.3274
Post test	18.68±2.44	18.15±2.94	0.5383	24.30±2.18	23.20±2.14	0.1157
Difference	0.92±0.51	0.78±0.60	0.4319	2.65±1.35	2.35±2.18	0.6041

and POMA in both the groups ($p < 0.001$) (Table 1).

Between the groups analysis showed no statistically significant difference (Table 2).

Discussion

In our study the female participants were slightly more which is in accordance to the studies that have mentioned that falls by elderly women occur more often than by elderly men [9].

The overall finding shows that Pilates intervention as well as Conventional Balance Training program leads to significant improvement in functional balance, however participation in PI lead clinically greater improvements compared to CBT.

There are scarce studies on Pilates with old people to improve stability therefore the results of the present study are difficult to compare with others. A similar chain of exercises called "calisthenics body balance training" was used with elderly subjects for five months [10], resulting in significant improvements in static balance and gait pattern. Other authors

studied the effects of an eight-week exercise program that was inspired by the Pilates Method in subjects of the same age group and obtained good results for static but not for dynamic balance [11]. In a study done on the effect of a 10 week pilates programme on the elderly had shown improvement with the body balance in these subjects [12]. When submitting healthy mid-aged adults to a Pilates program for 12 weeks, no improvements were detected with regard to body balance [13], which may be explained by the fact that these subjects do not yet have balance deficits and therefore did not further benefit from the Pilates program. On the other hand, that finding, together with those of the present study, clearly demonstrates that Pilate's exercises are very useful to improve body balance at the age group between 65 to 74 years. When considering the mechanisms resulting in the improvement of body balance after Pilates exercise, strengthening of the trunk and pelvic muscles in the sense of the "powerhouse" is certainly an important measure to stabilize posture and gait pattern, with the concomitant effect on maintaining equilibrium [12]. Only looking at muscle strengthening, however, appears an oversimplified mechanistic approach, as the functioning of other systems might also be positively influenced by the Pilates exercises.

In conventional balance training the improvement in proprioception and strength of the muscles around the joints of lower limbs must have further enhanced the improvement in balance and reduction in falls. Since impairments of proprioception have been described for the elderly [14, 15], and are held at least in part responsible for the increased risk of falls, exercises in the conventional balance training aimed at stimulating the kinaesthetic sense in these subjects.

One factor that might have contributed to more clinical improvement in the Pilates group was the pattern of exercise. The exercises include maintaining a stable posture while concentrating in the rhythm of respiration thereby providing a multi task intervention with increased awareness of kinaesthesia, proprioception and movement co-ordination. Both the groups shown significant improvement in balance, it can be contributed to the idea of both working on the postural stability by activating the core muscles.

Limitation

A long term follow up could not be assessed in this study.

Conclusion

The present study concluded that both Pilates

program and Conventional balance training equally improved the balance in elderly subjects so that both the therapies can be incorporated in the balance training.

Future Scope

A further comparison on long term and short term follow can be done.

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