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Efficacy of Pilates versus pressure biofeedback on dynamic balance and QoL among elderly individuals: A comparative study

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Abstract

Fear of falling in elderly is a major cause of loss of independence, which has an effect on the physical function in elderly individuals. Impaired balance is another important public health problem for older adults, because fear of fall might have devastating consequences, such as an increase in mortality. QOL of older adults has become an important issue, because of demographic changes resulting from the ageing of the population. The aim was to compare the effects of Pilates and pressure biofeedback on dynamic balance, and QoL in elderly individual. The sample consisted of 62 elderly people of age between 65 years to 75 years (mean = 71.96, SD± 5.92) were taken in the study. The group A subjects were asked to perform Pilates and group B performed pressure biofeedback exercises programme. Both the groups received conventional therapy. Dynamic balance was assessed using the POMA scale and QoL was assessed by using WHOQOL-BREEF. Pre and post test scoring of POMA and WHOQOL-BREEF was conducted for the Group A and Group B after 6 weeks. Analysis was done using SPSS Software version 18. Descriptive analysis was used to calculate mean and standard deviation. Paired t test was used for inter group analysis. Independent t test was used for intra group analysis for all the dependent variables. The level of significance was set at 95%. The results of this study shows that both Pilates as well as pressure biofeedback program leads to significant improvement in dynamic balance and QoL in elderly individuals. However Pilates shows greater benefits compared to Pressure biofeedback intervention for all variables.

Keywords: Pilates, dynamic balance, POMA, elderly individuals

Introduction

The number of persons above the age of 60 years is fast growing, especially in India. India as the second most populous country in the world has 76.6 million people at or over the age of 60, constituting above 7.7% of total population. Falls are one of the major problems in the elderly and are considered one of the "Geriatric Giants". Recurrent falls are an important cause of morbidity and mortality in the elderly and are a marker of poor physical and cognitive status [1].

For this reason preventive measures for falls are of critical importance [2] Balance, poor gait, lower limb muscle weakness, slowed reaction time and decreased proprioception have been identified as independent risk factors for falls in elderly [3, 4].

Falls may occur due to deficits in balance [3] muscle strength, reaction time and flexibility. Exercise programs targeted to improve these deficits might result in decrease of falls and related injuries [5].

Previous studies have shown that that factors underlying for the falling of elderly include a history of failure, lower limb muscle weakness, balance and an abnormal gait, decreased muscle strength, older age, being female and psychological factors (depression) [5].

However, some forms of physical exercise that provide progressive resistance training have been under-investigated [6, 7]. Exercise interventions aimed at reducing falls in the elderly rest on the assumption that falling in the elderly is related to poor control of balance and that balance can be improved by practice and exercise [8] An improvement in balance control with regular exercise is a good strategy with which to successfully reduce the incidence of falls in this population [9, 10].

Pilates is an exercise system by the late Joseph Pilates in the 1920s as method of rehabilitation [10]. He designed an exercise program with the objective of increasing muscle strength, endurance, and flexibility while maintaining spine stabilization Exercises or movements were done on a mat and on an exercise ball or in standing position while emphasizing on spinal and pelvic alignment, maintaining core contraction and the rhythm of respiration [11-13].

Biofeedback has been shown to be a useful tool to improve balance in a number of different populations, including healthy young adults [14-16], healthy older adults [4], frail older adults [8], stroke patients [16], unilateral vestibular loss (UVL) patients [17-19], and bilateral peripheral vestibular loss (BVL) patients [19]. The Stabilizer is a simple device which registers changing pressure in an air filled pressure cell. This allows body movement, especially spinal movement, to be detected during exercise. The unit consists of a combined gauge/inflation bulb connected to a pressure cell. The Stabilizer is used to monitor and provide feedback on body movement during exercise [20-22].

Aims and Objectives

The aim was to compare the effects of Pilates and pressure biofeedback on dynamic balance, and QoL in elderly individual.

Several studies have been conducted showing beneficial effects of Pilates intervention in improving balance and postural stability in elderly population. However, till date less prospective studies are found making the comparison between the effectiveness of Pilates and Pressure biofeedback on dynamic balance and QoL among elderlies.

Null hypothesis H0 states that, there is no difference on dynamic balance and QoL between two groups. and Alternative hypothesis H1 states that, there is difference on dynamic balance and QoL between two groups.

Methodology

The Study design was experimental study. Population included elderly individual of 65 to 75 years of age, participating in free camp organized by senior citizen organization committee, Surat. Sampling technique was Purposive sampling. Study duration was 6 months. Sample size was 62. Study Setting was in Senior citizen organization committee, Surat.

Inclusion criteria: Volunteers were considered for inclusion in the study if they met the following criteria: 65 -75 years of age. Willingness to do physical exercise with regular attendance. Able to do daily activities by themselves. Able to walk at least 30 feet with or without an assistive device. POMA scoring between 19 to 24.

Exclusion criteria included any somatosensory disorder that affects balance, recent fracture within 6 months, low back pain, abdominal surgery within 6 months, any known cardiovascular and psychosomatic disorder which limits physical daily activities.

Materials and tools used for the study included Pilates Mat, Exercise ball, pressure biofeedback machine, Clipbord with Poma sheet, Clipbord with Whoqol Breef sheet, Sphygmomanometer, Sthethoscope.

Outcome measures: Dynamic balance was measured using Poma scale, QoL Score by Whoqol Breef Scale.

Procedure: Ethical clearance was taken from institutional

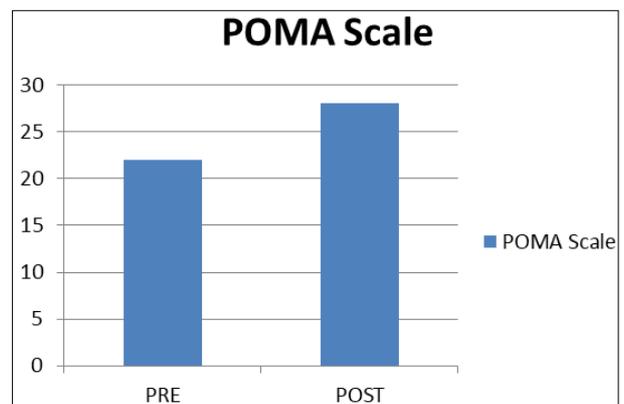
ethical committee. The confidentiality of the patients were maintained. Subjects was preliminary screened based on the inclusion and exclusion criteria. They were allocated in to two groups using Quasi randomization. Group A received Pilates training and Group B received core stability exercise using pressure biofeedback. On the first day of first week, pre test measurements of Dynamic Balance and QoL was taken by using Poma and Whoqol Breef scale respectively.

Group A: Pilates Training, in this group all subjects undergone pilates exercise training plus conventional therapy by certified pilates trainer. Exercises included Hundred (with head down) Shoulder bridge, Single leg circles, Alternate toe tap, Standing side splits, Ball wall squat, Tandem walking, Ball leg lift.

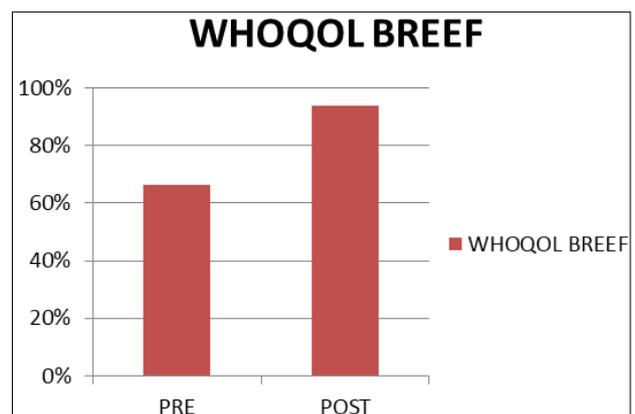
Group B: The three-chamber pressure cell of the Stabilizer was placed between the part of the body and floor. It was inflated till it molds between the body part and the supporting surface. A pressure of 40 mmHg was maintained as the resting pressure of the inflated cell. Changes in body weight on the cell on any of the three compartments will register a pressure change on the gauge. The Stabilizer biofeedback training was given for 6 days a week for eight weeks. This maneuver was repeated for all the muscles responsible for lumbar spinal stability.

All the activities were performed in three sets of 10 repetitions each. Each training session comprises of 45 mins for both the groups. Both the group received Conventional training.

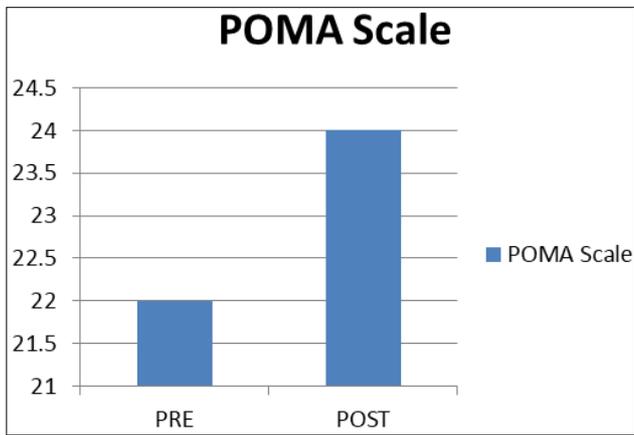
Pre and post intervention within group was done using paired t test which shows highly significant difference in both groups in all the outcome scores. Comparison between groups was done using independent t test which shows significant differences in both groups for all variables.



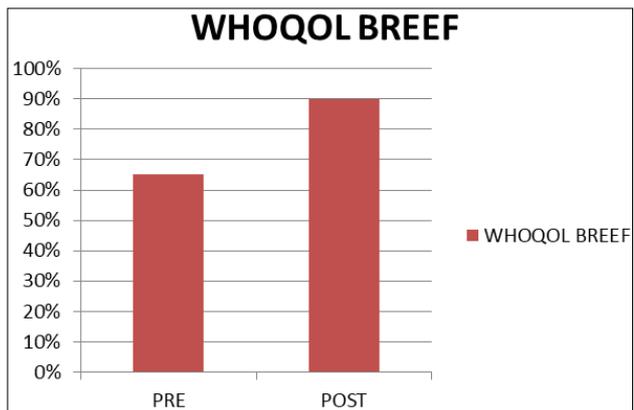
Graph A: Pre and post comparison of Dynamic balance for group A



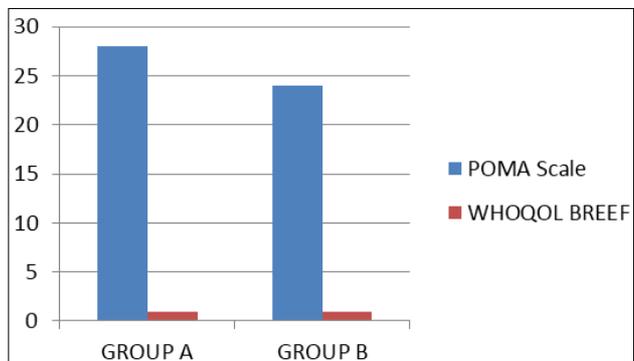
Graph B: Pre and post comparison of QoL for group A



Graph C: Pre and post comparison of Dynamic balance for group B



Graph D: Pre and post comparison of QoL for group B



Graph E: Comparison of post result of dynamic balance and QoL for group A and B

Discussion

This study showed that Pilates using patients improved significantly on all outcome measures in elderly individuals. In the group B, although improvements were observed in all outcomes, they were less than those in pilates group.

The positive effects of Pilates exercise was observed by many studies. Bird *et al.* (2012) studied the effects of Pilates-based exercise on dynamic balance in older adults in residential communities (aged >60y) and found that participation in the Pilates component of the study led to improved static and dynamic balance, although no significant differences were found between the pre test scores of the Pilates and exercise groups.

In the present study, the number of falls decreased in both groups participating in exercise program. Ata *et al* (2013) also studied a group of 35 older adults (61-87 years) who participated in 8 exercise program. A comparison of pre Timed Up and Go (TUG), Forward Re number of falls, fear of

falling and perceptions of Pilates indicate that participants had a positive perception of the Pilates program and that their fear of falling following the program. In line with these findings, the study found that fear of falling decreased after exercise among the Pilates group along with the was found to have a positive effect on dynamic balance and QoL, indicating that remaining physically active will help to decrease falls and maintain independence among the elderly.

There are limited number of studies about elderly people for proprioception. So this present study supports that Pilates exercises can improve proprioception in elderly individuals, compared to conventional exercise programme.

This study provides the controlled evaluation of the effects of 8 weeks of Pilates and Conventional exercise programme on dynamic balance, fear of fall and proprioception in elderly individuals.

Conclusion

The results of this study shows that both Pilates as well as core stability training program using pressure biofeedback leads to significant improvement in fear of fall, dynamic balance and QoL in elderly individuals. However, Pilates intervention is found to have greater benefits compared to the core stability training program using pressure biofeedback intervention on all outcome variables. Thus Pilates can be incorporated with other physical exercises aimed to improve functional outcome and QOL in the elderly individuals who can help them to age gracefully and enjoy a healthy quality of life.

Limitations of the study

It was done only on small sample size, the results could not be generalized to the entire elderly population who has increased risk of falls. It was not possible to blind participants to the intervention. There was also practical difficulty while delivering the interventions at different old age homes which may not be feasible in a non-research set-up. The total study duration was short. Along with this we failed to take follow up of the interventions.

Scope for further studies

Future research with large sample size may be conducted to determine the effectiveness of the exercise programme between pilates and core stability training program using pressure biofeedback. Further controlled comparative studies with blinding of the samples and follow up are recommended in community dwelling old elderly individuals.

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