International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Comparative Effect of Pilates and Feldenkrais Intervention on Functional Balance and Quality of Life in Ambulatory Geriatric Population: A Randomized Controlled Study

Gopal Nambi S[1], Parth S. Trivedi[2], Shirin M. Momin[2], Shreya Patel[2], Divyesh P. Pancholi[2]

[1]Principal, [2]IInd Year MPT Students,
C.U. Shah Physiotherapy College, Surendranagar, Gujarat, India.

Corresponding Author: Gopal Nambi S

Received: 15/01//2014 *Revised: 06/02/2014* *Accepted: 10/02/2014*

ABSTRACT

Background: Approximately 35%-40% of adults who are above 65 fall at least once in a year. The reasons for it may be declines in sensory and motor function and integration leading to poor balance and falls. Therefore, preventive measures for falls and falls-related injuries in elderly individuals are of critical importance. Therefore the purpose of the study is to compare the effectiveness of two approaches such as Pilates intervention (PI) and Feldenkrais Intervention (FI) in improving functional balance and quality of life (QOL) in ambulatory geriatrics.
Material & Methodology: Total 60 Ambulatory geriatrics subjects were selected and randomly allocated into three groups (Pilates intervention-PI; Feldenkrais intervention-FI and Control).Each group had 20 subjects in it. All the groups completed 6 weeks of intervention. Functional reach test (FRT), Timed up and go test (TUG), Dynamic gait index (DGI) for functional balance and RAND-36 for Quality of life is measured at baseline and After 6 weeks of training.
Results: The 6 weeks of PI & FI protocol resulted in significant improvement of functional balance (FRT, TUG & DGI: p=0.000) and QOL (RAND-36: p=0.000) in elderly individuals which was not evident in the control group. However PI was found to be more clinically effective compared to FI in all outcome scores.
Conclusions: Both Pilates and Feldenkrais are effective in improving functional balance and decreasing propensity to fall in ambulatory geriatrics thereby improving QOL. However, Pilates Intervention was found to be superior to Feldenkrais Intervention to improve functional QOL among ambulatory geriatrics.
***Key Words**: Pilates training; Feldenkrais; Geriatric; Physical activity; Rehabilitation.*

INTRODUCTION

There is increased number of older adults among the world population during the last few decades which may be due to socio-economic developments and better medical services. This is considered to be one of the most positive developments but there are a number of serious health related problems in elderly. Out of them falls and falls related injuries are one of the most common health issues in the elderly population. [1,2] Approximately 35%-40% of adults who are above 65 fall at least once in a year. [3] The reasons for it may be declines in sensory (vision, vestibular, proprio-ception), motor (strength, coordination,

endurance) function and integration (response time, multi-task ability) leading to poor balance and falls. [4] Numerous factors like environmental, physical and behavioral risk factors for falls have been identified. Falls &Falls-related injuries often lead to restricted mobility and functional decline leading to disability and affecting quality of life (QOL) in elderly individuals which is the crucial point for loss of independence and often have serious consequences in elderly individuals. Therefore, preventive measures for falls and falls-related injuries in elderly individuals are of critical importance. [5]

Earlier studies have shown that conventional balance exercise which includes strength; flexibility and balance training have improved functional ability in addition to reducing risk of falls. [6-8] However, due to low exercise participation rate of elderly individuals in these programmes shows that many of them aren't attracted towards these programmes, probably due to fear of falling issue. Therefore, there is continuous need to develop an intervention that can attract the elderly individuals and can also improve balance and mobility as well as reduce fall and fall related injuries. [9-12]

Recently, Pilates intervention which combines of strength, flexibility and movement co-ordination along with rhythmic respiratory training is becoming popular. Several previous studies have shown beneficial effects of Pilates in improving balance and postural stability in elderly population. [13-15] Also, in near past elderly individuals have shown keen interest in mind-body interventions. One of the options for the same is Feldenkrais method which is mind-body exercise that integrates gentle movements that are to be carried out in quiet and non-competitive environment. In Feldenkrais two major techniques are used, awareness through movement and functional integration both of the approaches focuses on mind-body relationships. [16-18] However, till date there are no studies have compared the effectiveness of PI and FI program in improving functional balance and QOL in the elderly individuals.

Thus, the purpose of this study was to determine whether PI and FI programme specially designed for the elderly individuals have a difference in their effectiveness in improving functional balance and QOL. The result of this study would implicate a better exercise program for the elderly population and ultimately leading the older adults to age gracefully and enjoy a fall free exceptional quality of life.

METHODOLOGY

Participants: Total 160 participants were recruited into the study from five different old-age homes near Surendranagar, Gujarat. Out of 90 subjects willing to participate in the physical therapy program, 60 subjects were recruited for the study that fulfilled the inclusion and exclusion criteria. The subjects were included if, 1) age between 65 - 74 years both males and females ; 2) able to walk at least 30 feet with or without an assistive device and without physical assistance; 3) not practicing in any sports or physical therapy sessions; 4) willingness to do physical exercise thrice a week with regular attendance; 5) have fallen at least once within previous year; 6) fear of fall scoring >23 in 16 item falls efficacy scale international questionnaire; 7) Mini-Mental Status Examination score of 24; and 8) no affirmative responses to the PAR-Q instrument for inactive older adults. [11] The participants were excluded if they have acute medical problems, surgical treatment during the last year, history of fall related fracture, presence of artificial prosthesis or any other disease that contraindicated the exercise program. All the participants provided their demographic details (*Table 3*)

and written informed consent prior to collection of baseline data.

Design: Randomized controlled design was used. After institutional ethical approval, all the participants completed detailed assessment.Priortoparticipationinthisstudyto tal160 participants from different old-age homes were recruited into the study, out of them90 were willing to participate into the study. Out of 90, 60 participants were selected for the study as 20 participants weren't fulfilling the inclusion criteria and rest 10 participants were randomly excluded from the study using random number table method. So, total 60participants were selected for the study. Prior to participation participants were instructed and explained about the intervention procedure. Pre participation evaluation form consisted of general demographic details of participant, general examination which included FRT, TUG, DGI and Rand-36 scores at the baseline.

The selection and allocation of participants was done by using random number table sampling method. A total 60 subjects were selected for study and assigned in to three groups randomly (N=20) either in to Group A (PI), Group B (FI) or Group C (Control). Participants who were found suitable for the participation were requested to sign consent form. Initial physical therapy evaluation was done according to American/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons. [19]

Outcome measures:

- FRT- Functional balance [20]
- Timed up and go test (TUG) [21]
- Dynamic gait index (DGI) [22]
- RAND-36 [23]

Intervention:

Group A (PI) received Pilates exercises which is shown in Table: 1 focusing on lower limb strength, flexibility and co-ordination. Pilates exercise were held in small groups of three or less subjects and lasted for about 45-60 minutes. Exercises were done in sitting as well as in standing position which also challenges balance in its correct execution. All exercises were done for 10 repetitions with a rest period of two minutes before commencing the next exercise. Exercise was progressed in terms of repetitions or advanced method at the earliest opportunity. Group B (FI) received Feldenkrais intervention of awareness through movement in total 5 sessions which focused on somatic re-education. Description of the procedure is given in below table 2. Group C (Control) received intervention in the form of 5 minutes warm up followed by 12 minutes of walking at their comfortable pace and concluded with a 5 minutes cool down. All the groups received the above mentioned interventions thrice weekly for a period of 6 weeks.

Table 1: Description of Pilates Intervention	
Hundred with head down	Spine twist (performed in kneeling)
Shoulder bridge (initially without ball, then progressed with ball)	Ball leg lift (performed by sitting on the ball)
Single leg circles (performed in supine)	Standing side splits (using the ball)
Alternate toe tap	Ball wall squat
Leg pull front (beginner)	Tandem walking

Table 2: Description of Feldenkrais Intervention	
Lesson-1	Whole body turning
Lesson-2	Transferring weight
Lesson-3	Activating flexors in sitting
Lesson-4	Standing as balancing
Lesson-5	Walking along a line

Statistical analysis:

Analyses were done using SPSS-16. Descriptive analysis was used to calculate mean and standard deviation. Normality of distribution was verified using Kolmogorov-

Smirnov test and found to have normal distribution in all data. Comparison between groups was done using ANOVA and intra group comparison was done by using student's t-test. The level of significance was set at 95%.

RESULTS

The groups were homogenous at baseline (*Table 3*) in their demographic details and outcome scores with p-value >0.05; FRT (*p=0.606*), TUG (*p=0.910*), DGI (*p=0.759*) and RAND-36 (*p=0.677*). Comparison between groups for baseline scores was done using post hoc Tukey test.

Pre and post intervention intra group comparison *(Table 4)*was done using paired t-test which shows highly significant difference in PI group as well as in CBT group in all the outcome scores (*FRT, TUG, DGI& RAND-36 with p=0.000*) but no significant difference in the control group for FRT(*p=0.085*) and RAND-36 scores (*p=0.096*), but shows some significant difference in the TUG (*p=0.022*) and DGI scores (*p=0.042*). Post hoc analysis of the post intervention scores shows highly significant difference (*p=0.000*) between the intervention groups and the control group (Figure 1).

Table 3: Baseline Data

Variables	PI (N*=20)	FI (N*=20)	Control (N*=20)	P-value
Age (Y)*	70.8±2.8	70.4±2.8	69.35±3.0	0.303
Height (cm) *	168.3±7.7	170.1±6.8	167.7±7.4	0.582
Weight (kg) *	78.8±4.6	74.7±4.9	76.2±4.2	0.868
BMI*	25.4±3.4	24.4±3.2	25.6±2.8	0.579
Male/Female	12/8	14/6	11/9	0.605
FRT (cm)	28.3±3.4	28.4±3.6	28.4±2.6	0.606
TUG (sec)	16.4±1.1	16.2±1.2	16.4±1.1	0.910
DGI	18.2±0.8	18.4±0.8	18.4±0.8	0.759
RAND-36	63.8±3.4	63.4±2.8	63.9±3.2	0.677

Y=year; cm=centimetre; kg=kilogram; BMI=body mass index; N=number

Table 4: Intra group comparison

Variable	Pilates (Mean±SD)			Feldenkrais (Mean±SD)			Control (Mean±SD)		
	Pre	Post	p-value	Pre	Post	p-value	Pre	Post	p-value
FRT	28.3±3.4	40.2±3.4	0.000	28.4±3.6	36.7±2.7	0.000	28.4±2.6	29.6±4.7	0.855
TUG	16.4±1.1	14.9±0.9		16.2±1.2	15.0±1.0		16.4±1.1	16.1±1.0	0.022
DGI	18.2±0.8	22.0±0.8		18.4±0.8	19.8±0.8		18.4±0.8	17.7±0.7	0.042
RAND36	63.8±3.4	85.6±2.4		63.4±2.8	76.8±2.8		63.9±3.2	63.4±3.1	0.096

DISCUSSION

This study provides the controlled evaluation of the effects of 6 weeks of PI and FI on the variables functional balance and QOL in ambulatory geriatric population. The overall finding of this study shows that Pilates intervention as well as FI program leads to significant improvement in functional balance and QOL, however participation in PI lead to clinically greater improvements compared to FI & Control condition of usual activity. This study also adds to the existing literature regarding the importance and benefits of exercise intervention in improving balance in geriatric population. The improvement in functional balance with the experimental intervention (PI as well as FI) was consistent with the results of previous studies. [5-10] It was also found that participants with poor balance scores at baseline are likely to respond more positively after the

intervention which is also in accordance to previous study. [6]

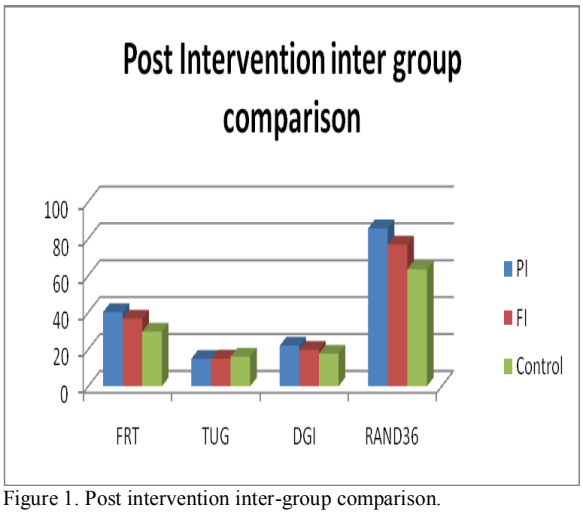

Figure 1. Post intervention inter-group comparison.

Although there was less significant difference in Pilates groups compared to Feldenkrais group, participants in PI group showed greater improvement in some key balance variables. One factor which might have contributed to more improvement in the PI 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. Pilates also heightens concentration, relieves tension and improves mood, as it actively engages the body and mind which may have a positive impact in QOL. Attendance and adherence is also an important factor that influences the effectiveness of PI. Also, Feldenkrais intervention which is proved as an effective way to improve balance and mobility, offers an alternative method to help offset age related declines in mobility and reduce the risk of falling among community dwelling older adults. This maybe because Feldenkrais method of balance exercises are based on the principles of motor relearning and postural control retraining exercises. Thus, Feldenkrais methods of balance exercises are better in improving the balance in older adults. [24] In this study, participants attended nearly all of the exercise sessions in the PI group. The study not only proves the effectiveness of Pilates and FI but also provides evidence to the importance of physical activity in the elderly population. One of the findings in the study is that, a regular 12 minutes of walking intervention in the control group also lead to significant improvements in some gait parameters as seen the TUG ($p=0.022$) as well as the DGI scores ($p=0.042$).

The study has certain limitations too. As it was done only in institutionalized elderly individuals, the results could not be generalized to community dwelling elderly individuals who has increased risk of falls. Moreover it was not possible to blind participants to the intervention, so the belief that Pilates training is of benefit may have been contributed due to the social interaction during group therapy that resulted in positive impact on outcomes. There is also practical difficulty in a non-research set-up while delivering the interventions at different old age homes. Further controlled comparative studies are recommended in community dwelling old elderly (75+ years) individuals and those with pathological conditions (e.g. Stroke, Parkinsonism etc.) who are at higher risk of falls and falls related injuries.

CONCLUSION

The results of this study concluded that both Pilates as well as Feldenkrais intervention leads to significant improvement in functional balance and quality of life in elderly individuals who are bound to old age home. However, Pilate's intervention is found to have greater benefits compared to Feldenkrais intervention. 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.

REFERENCES

1. Hornbrook MC, Stevens VJ, Wingfield DJ, Hollis JF, Greenlick MR, Ory MG. Preventing falls among community-dwelling older persons: Results from a randomized trial. *Gerontologist.* 1994 Feb; 34(1):16-23.
2. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med*. 1988 Dec 29;319(26):1701-7.
3. Hausdorff JM, Rios DA, Edelberg HK. Gait variability and fall risk in community-living older adults: A 1-year prospective study. Arch Phys Med Rehabil 2001;82:1050-1056.
4. Woollacott MH. Systems contributing to balance disorders inolder adults. *J Gerontol A Biol Sci Med Sci.* 2000 Aug;55(8):M424-8.
5. Magaziner J, Simonsick EM, Kashner TM, Hebel JR, Kenzora JE.Predictors of functional recovery one year following hospital discharge for hip fracture: a prospective study.*J Gerontol*. 1990 May;45(3):M101-7.
6. Hauer K, Rost B, Rütschle K, Opitz H, Specht N et al. Exercise training for rehabilitation and secondary prevention of falls in geriatric patients witha history of injurious falls. *J Am Geriatr Soc*. 2001 Jan;49(1):10-20.
7. Gusi N, Carmelo Adsuar J, Corzo H, Del Pozo-Cruz B, Olivares PR, Parraca JA.Balance training reduces fear of falling and improves dynamic balance and isometric strength in institutionalised older people. A randomized trial. *J Physiother*. 2012;58(2):97-104.
8. Means KM, Rodell DE, O'Sullivan PS. Balance, mobility, and falls among community-dwelling elderly persons: Effects of a rehabilitation exercise program.*Am J Phys Med Rehabil*. 2005 Apr;84(4):238-50.
9. Forkan R, Pumper B, Smyth N, et al. Exercise adherence following physical therapy intervention in older adults with impaired balance. Phys Ther 2006;86:401-410.
10. Lees FD, Clarkr PG, Nigg CR, Newman P. Barriers to exercise behaviour among older adults: A focus-group study. J Aging Phys Act 2005;13:23-33.
11. Bertera EM, Bertera RL. Fear of falling and activity avoidance in a national sample of older adults in the United States. Health Soc Work 2008;33:54-62.
12. Deshpande N, Metter EJ, Bandinelli S, et al. Psychological, physical and sensory correlates of fear of falling and consequent activity restriction in the elderly: The InCHIANTI study. Am J Phys Med Rehabil 2008;87:354-362.
13. Kaesler D. S., Mellifont R. B., Swete, Kelly P., Taaffe D. R. A novel balance exercise program for postural stability in older adults a pilot study. *Journal of Bodywork and Movement Therapy*. 2007; 11(1), 37-43.
14. Irez GB, OzdemirRA ,Evin R, Irez SG, Korkusuz F, Integrating Pilates exercise into an exercise program for 65+ year-old women to reduce falls. *J Sports Sci Med.* 2011; 10:105-111
15. Cardinal BJ. Assessing the Physical Activity Readiness ofInactive Older Adults. *Adapt Phys Act Quart*. 1997; 14:65-73.
16. Cress ME.Assessing physical performance in older adults.In:Poon LW, Chodzko-Zajk W, Tomporowski PD, eds. Active Living, Cognitive Functioning and Aging.Vol 1. Champaign II; Human Kinetics, 2006:113-132.
17. Luskin FM, Newell KA, Griffith M, et al. A review of mindébody therapies in the treatment of musculoskeletal disorders with implications for the elderly. Altern Ther Health Med 2000;6:46-56.

18. Taylor-Piliae RE, Haskell WL, Stotts NA, Froelicher ES. Improvement in balance, strength and flexibility after 12 weeks of Tai chi exercise in ethnic Chinese adults with cardiovascular disease risk factors. Altern Ther Health Med 2006;12:50-58.
19. Panel on Prevention of falls in Older Persons, American Geriatrics Society and British Geriatrics Society. Summary of the Updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. J Am Geriatr Soc. 2011 Jan;59(1):148-57.
20. Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. *J Gerontol*. 1990 Nov;45(6):M192-7.
21. Podsiadlo D, Richardson S. The timed "Up and Go": a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc*. 1991 Feb;39(2):142-8.
22. Herman T, Inbar-Borovsky N, Brozgol M, Giladi N, Hausdorff JM. The Dynamic Gait Index in Healthy Older Adults: The Role of Stair Climbing, Fear of Falling and Gender. *Gait Posture. 2009 Feb;29(2):237-41.*
23. Hays RD, Morales LS. The RAND-36 measures of health-related qualityoflife. *AnnMed.2001Jul;33(5):350-7.*
24. Ullmann, G., Williams, H. G., Hussey, J., Durstine, J. L., &McClenaghan, B. A. Effects of Feldenkrais Exercises on Balance, Mobility, Balance Confidence, and Gait Performance in Community-Dwelling Adults Age 65 and Older. J Altern Complement Med 2010; 16(1):97-105.

How to cite this article: Gopal NS, Trivedi PS, Momin SM et. al. Comparative effect of pilates and feldenkrais intervention on functional balance and quality of life in ambulatory geriatric population: a randomized controlled study. Int J Health Sci Res. 2014;4(3):71-77.

****