Original Article

Effectiveness of balance training on quality of life in osteoporotic women

Irum Yaqoob, Shakir Ullah Khan

Rehabilitation Departments, Riphah College of Rehabilitation Sciences, Riphah International University, Rawalpindi and Khyber Medical University, Peshawar, Pakistan

Objectives: The aim of randomized control trial was to assess the effects of balance training on quality of life of osteoporotic females.

Methodology: The trial included three groups with 19 subjects in total. Group I was given individual balance training, Group II was given circuit training for balance and the Group III balance training using Wii fit plus. The duration of the study was 6 weeks with exercise protocol for 30 minutes/day, 3 days a week for 6 weeks. The inclusion criteria for the study was females aged between 45-75 years having Bone Mineral Density (BMD)< -2.5 and Potential faller (2 or more falls in 1 years). The base line measurements were done using BMD and Osteoporosis Quality of life questionnaire (Qualeffo-41) was used to document the quality of life. Data was again taken after 6 weeks of intervention that included Qualeffo-41 and was analyzed on SPSS version 20.

Results: There was no statistically significant improvement in quality of life between three groups (P=0.52). However, pre and post intervention analysis showed improved results after 6 weeks of balance training in all groups. The mean difference of pre and post analysis of each group and Individual task specific intervention group participants showed the most improvements in quality of life.

Conclusion: Although the results were not significant but pre and post measures of three groups showed improvements with most improvements in Individual task specific intervention. (Rawal Med J 201;43:328-331).

Keywords: Balance, falls, group circuit training, Individual Task specific, osteoporosis, quality of life, Wii Fit Plus.

INTRODUCTION

Osteoporosis due to micro architectural deterioration of its tissue, leading to bone weakness and increased fracture risk.[1] It is a debilitating disease that can remain hidden for years and typically the first recognizable clinical sign of low bone mineral density (BMD) is fracture most commonly seen in spine, wrist or hip. Other problems includes spinal deformities (loss of vertebral height, kyphosis), prolonged and severe pain, decreased functioning along with impaired mobility, restricted independence in Activities of Daily Living (ADL,s), difficulty in Instrumental Activities of Daily Living (IADL,s) and difficulty sleeping.[2] All these lead to decreased life's quality, especially after menopause.[3-5]

Many factors influence the quality of life including physical, psychological, social and environmental factors such as age, health status, level of physical activity, number children living with family, income, marital satisfaction and home conditions.[6,7] Physical activity is important in improving quality of life in elderly.[8] Balance training improves physical activity as well as psychological well-being of osteoporotic people. It is also helpful in the improvement of social interactions, decrease in symptoms like pain and decrease risk of fall and fractures.[9] Physical activity along with vitamin D helps maintain bone mineral density.[10] Vitamin D3 has impact on bones and causes calcium absorption into the bones.[11]

Although literature showed effectiveness of balance training programs but limited literature was found to compare traditional task specific training, circuit training and Wii fit plus. This study introduced new technology such as Wii fit plus using virtual reality that is not commonly used for balance training in Pakistan. The purpose of the study was to determine

the effectiveness of balance training on quality of life of osteoporotic women and to determine which balance training contributes more towards improving quality of life.

METHODOLOGY

This randomized control trial was conducted at Railway Research & Rehabilitation Center (RRRC), Rawalpindi, Pakistan from February to July 2016. Females aged between 45-75 years, BMD through calcaneal ultrasound scan showing osteoporosis (< -2.5), potential faller (2 or more falls in 1 years) were included in the study. Females who were not fit for prolonged physical activity (females who had debilitating chronic illness were excluded from the study. Initially, 27 participants were screened, among them 9 were excluded from the study (Fig. 1). Remaining 19 participants were randomized into 3 groups through lottery method i.e. Individual Task specific group (7 participants), circuit training and Wii fit plus groups (6 participants each). Ethical letter was taken from ethics review committee of Riphah International University and Informed consent was taken from all the participants before the start of study.

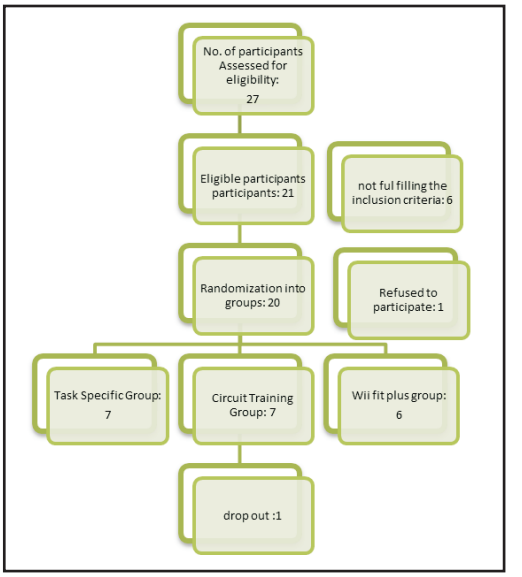


Fig. 1. CONSORT flow sheet.

The duration of intervention was six weeks; details of interventions of the all groups are shown in Table 1. A therapist was present for the supervision of participant during their session to prevent any fall. BMD was taken at baseline for the diagnosis of osteoporosis and osteoporosis quality of life questionnaire (Qualeffo-41Questionnaires) was used.

Table 1. Detailed Intervention used in three groups.

Task specific group	Circuit balance training	WII Fit Plus
Static Balance 1. Eye open for 2 minutes 2. Eye close for 2 minutes 3. 1-leg stance, attempt to maintain the balance for 2 minutes **Dynamic Balance** 1.1- leg stance, attempt to keep the balance while move the non-supporting leg for 2 minutes 2.1- leg stance, attempt to catch the balls for 2 minutes. 3.1- leg stance, attempt to keep the balance while move the non-supporting \ leg for 2 minutes 4.1- leg stance, attempt to catch the balls for 2 minutes. 5. Forward stepping 10 steps 6. Backward stepping 10 steps 7. Sideways stepping 10 steps 8. Figure of eight walk 9. Walk zigzag around the cone 10. Move 10 feet distance with holding glass of water 11. Move 10 feet distance with holding glass of water and putting water from one glass to another.	1. Step up and down on a step for 2 minutes including 1minute with each lower. 2. Putting cones or cups from floor to table for 2 minutes. 3. bouncing the ball on the floor or on the wall for 2 minutes 4. Quiet standing on floor with feet closed together for 2 minutes. 5. Standing on foam with eye open for 2 minutes 6. Dual tasking (holding glass of water and moving a distance covered in 2 minutes with obstacles. 7. Taking a14 inches ball from one basket and throwing in the other in 2 minutes. 8. Taking a 14 inches' ball from one basket and throwing in the other baskets at different angles in 2 minutes	**Week 1:** soccer heading and ski jump for 15 minutes each **Week 2:** Ski jump and perfect 10 for 15 minutes each **Week 3:** perfect 10 and table tilt for 15 minutes each. **Week 4:** table tilt and snow ball fight for 15 minutes each. **Week 5:** Snow ball fight, ski slalom for 15 minutes each. **Week 6:** ski slalom and obstacle course for 15 minutes each.

Qualeffo-41, a 41-item Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41) was developed to measure the quality of life in patients with osteoporosis. It consists of 41 questions grouped into five domains: pain, physical function, social function, general health perception, and mental function. Higher score in the questionnaire means poorer is the quality of life.[12] Data were analyzed using SPSS version 20.

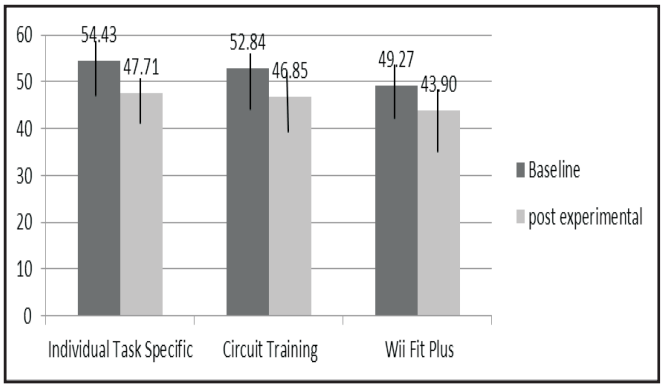
RESULTS

Mean age of 19 participants was 59.1±9.38 years (range 45-75). The post intervention data indicates that the results were not statistically significant after 6 weeks of balance training (Table 2).

Table 2. Kruskal Wallis H test for Qualeffo-41.

Variable	Median±iq	Task group mean rank (MR)	CT group (MR)	WII FIT Plus (MR)	P
QUALEFFO-41 PRE	49.70±11.63	11.29	9.17	9.33	0.74
QUALEFFO-41 POST	45.00±10.40	11.71	9.83	8.17	0.52

Fig. 2. Bar chart showing pre and post measures of Qualeffo-41 of three groups.



Balance training improved the quality of life of the participants after 6 weeks of intervention. The mean difference of Individual task specific intervention before and after intervention is 6.72, for circuit training it is 5.99 and for Wii fit plus it is 5.37 (Fig. 2).

DISCUSSION

Many studies on cost effectiveness of exercise training have showed improved physical activity and hence reduce health care cost.[13] Our study analysis using non-parametric test showed statistically non-significant results between groups. According to the study by Franco et al non-significant results for quality of life on three balance training groups were found.[14]

Although the results were not statistically significant but clinically improvements were observed and patients were able to perform exercises better. In order to confirm the improvements, the mean scores of the groups showed improvement in quality of life scores in post intervention as compared to baseline of 3 groups in the study.

As shown in Fig. 2, intervention score of quality of life (QoL) was 54.43 and after intervention improved to 47.71. Same was reported in a study showing balance training as effective regimen at improving quality of life after osteoporosis in elderly using traditional task specific exercises.[15] Similarly, studies related to circuit training[16,17] also support the current study showing improved results after 6 weeks of intervention i.e. from 52.84 to 46.85. The mean score of current study pre and post intervention was 49.27 to 43.90. The literature related to Wii fit plus suggests that it improves the quality of life through balance training in osteoporotic females after intervention.[18]

The study had certain limitations. The sample size was very small due to the less availability of participants having balance problems in our setup. Dropout along with the participant not accepting to participate in the study was another cause of small sample size. The study results might also be affected by short time period, as it might take longer time for quality of life before showing improvements.

CONCLUSION

Although the results analyzed didn't showed statistically significant improvement in quality of life using different balance training programs, across the groups, the mean scores were improved in all three groups.

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Conception and design: IY, SUK
Collection and assembly of data: IY
Analysis and interpretation of the data: SUK
Drafting of the article: IY
Critical revision of the article for important intellectual content: SUK
Statistical expertise: IY
Final approval and guarantor of the article: IY, SUK
Corresponding author email: Irum Yaqoob: irum.yaqoob@riphah.edu.pk
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