ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 08 | August - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF THE EFFECTS OF OBSTACLE GAIT TRAINING AND BALANCE TRAINING ON QUALITY OF LIFE AND FALL RISK IN THE ELDERLY POPULATION

Physiotherapy

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ABSTRACT

Background: Due to the rapid aging of the world's population, falls in older ages have become a major public issue. Falls are associated with reduced Quality of life (QoL) and can have psychological consequences. The Obstacle Gait Training (OGT) program contributes to the reorganization of the nervous system by affecting the visual, vestibular and somatosensory abilities that are responsible for balance. In addition, performing tasks repeatedly on diverse and unstable surfaces helps patients to maintain psychological stability. Balance training stimulates vestibular, neuromuscular and proprioceptive systems which then send signals to specific brain . **Aim:** To compare the effects of OGT and balance training .on quality of life and fall risk in the elderly population. **Methodology:** 36 elderly people aged 65-74 years participated in this study. These subjects were randomly assigned to one of the two groups: Group A (n=18) underwent an OGT program and Group B (n=18) underwent balance training. Both groups exercised for 45 minutes a day, 5 days a week for 6 weeks. The SF-36 and Four Square Step Test (FSST) were used as outcome measures to assess standing balance before and after the procedure. **Results and Discussion:** statistical analysis was performed on the group using paired t-test, which showed a significant improvement post-exercise protocol in both groups. Therefore, when comparing the groups, the result shows that group A is more significant than group B. This shows that OGT program is better than balance training. **Conclusion:** Therefore, OGT is more effective than balance training in improving fall risk and quality of life in the elderly.

KEYWORDS

Obstacle Gait Training, Balance training, SF-36, FSST

INTRODUCTION

The ageing of population is a victory for humanity, but also a challenge for society. According to Indian criteria, age above 60 years is considered old age. With the rapid aging of the world's population, falls in older ages have become a major public health issue. Falls are the second leading cause of mortality worldwide, with 60% occurring in Southeast Asia. In 2005, falls accounted for 3.2 percent of unintentional deaths in India[1]. The prevalence of falls in India ranges from 14% to 53%.[2]. Falling is associated with reduction in quality of life and can have psychological consequences: fear of falling and loss of self-confidence which can lead to activity limitation, resulting in reduced physical function and social interaction[3]. The oldest part of the population, those aged 70 and over, are particularly prone to falls and their consequences.

A fall is an event that results in a person accidentally resting on the ground or floor or some other lower level[4]. It can be described in terms of three stages. The first stage is the initiating event that moves the body's center of mass off the base of support. Initial events include external factors such as environmental hazards; inherent factors such as unstable joints, muscle weakness and unreliable postural reflexes. The second stage of a fall involves a failure of system for maintaining upright posture to detect and correct the change in time to prevent a fall. The third stage is the impact of the body on the surface of the environment, usually the floor or ground, which leads to the transfer of forces to the tissue and organ. These extensions affect the extent of damage and injury caused by a fall[5].

Different treatment methods have been used to improve the walking and balance ability of stroke patients. Exercise using tasks effectively improves balance and mobility. The Prevention of Falls Network Europe (ProFaNE) has developed a taxonomy that classifies the types of exercise: i) gait, balance and functional (task) exercise; ii) strength/resistance (including power); iii) flexibility; iv) three.dimensional exercise (e.g. Tai Chi, Qigong, dance); v) general physical activity; vi) endurance and vii) other types of exercises. Different forms of exercise affected falls in different ways.

Overcoming obstacles while walking challenges stability and forces a rearrangement of the walking pattern. To successfully navigate over an obstacle, three processes must be carried out: 1) detect an obstacle in the environment 2) process of relevant information related to the obstacle and 3) perform an appropriate and timely motor response[6,7]. The obstacle gait training (OGT) contributes to the reorganization of the nervous system by affecting the visual, vestibular and somatosensory abilities that are responsible for balance[8]. In addition, repeated performance of tasks on versatile and unstable surfaces should help patients to maintain psychological stability. To successfully overcome an obstacle crossing with both limbs and walking aids, a person must change the kinetic, kinematic and spatiotemporal parameters of their movements together with the size of the obstacles on the floor, i.e increase the step length (wide obstacles) or use a flexor strategy to increase foot clearance (in case of high obstacles) with a smaller support during a one standing step.

During ADL, people are prone to changes in both dynamic and static balance. The ability to manage these changes is a complex challenge for the neuromuscular control system, which must cope with rapid environmental changes and depends on the ability to anticipate or respond to these changes to successfully locomotion and prevent fall[9]. Balance training stimulates the vestibular, neuromuscular and proprioceptive systems which then send signals to specific brain regions that form connections between the vestibular nuclei and the cerebellum, the hippocampus and the prefrontal and parietal cortices; it can affect cognitive functions such as spatial functioning, navigation and memory.

Numerous methods of evaluating quality of life and mobility in elderly subjects are available.SF-36 or short form health survey is a 36 item patient reported survey of patient health. It measures eight scales: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH)[10]. The responses to question within each dimension scores ranging from 0 (“poor health”) to 100 (“good health”). The lower the score the more disability and vice versa. The four square step test (FSST) was validated in healthy older adults to provide a measure of dynamic standing balance and mobility and participant's fall risk. It access the ability of the subject to step over low object forward, sideways and backward[11].

Aims And Objectives

- To examine the effect of obstacle gait training on quality of life and fall risk in elderly population.
- To examine the effect of balance training on quality of life and fall risk in elderly population.
- To compare the effect of between obstacle gait training and balance training in improving quality of life and fall risk in elderly population.

MATERIALS AND METHODS

- Study design- Comparative study
- Study site –

- Kanivu Snehatheeram, Kappad
- Poor Home Society, West hill
- Study population- Elderly people with age between 60 and 74 years
- Study duration- February to April 2023
- Sample size- 36

Inclusion Criteria:
- Age : 65-74
- Both male and female
- Able to walk 10m without support
- Lower limb joints with functional range of motion
- FSST score above 9 seconds
- Stable medication usage

Exclusion Criteria:
- Neurological conditions
- Orthopaedic conditions that limits functional range of motion
- Unstable BP and severe cardiac condition.
- Uncorrected visual deficit
- Non cooperative patients
- Persons who use artificial prosthesis and external device for walking
- Persons who use psychotic drugs and other drugs which affects balance.

Procedure

Ethical approval was obtained and 36 participants meeting inclusion criteria were divided into Group A (n=18) and Group B (n=18). Informed consent and demographic data was collected. Group A received Obstacle Gait Training and Group B received Balance training. Treatment given for 5 days a week for 6 weeks. Pre-treatment assessments were conducted on day 1 and post treatment assessments at the end of week 6 using FSST and SF-36.

Obstacle Gait Training
- Treatment given for 5 repetition 30 min/day.
- Rise from a armless chair
- Walk through the mat that placed in between two colour tape(61cm apart) placed parallel
- And stepping over three shoe box placed 2 m difference, later subject were asked to walk around corner cones without touching them.
- And then turn around and come back to chair.
- During training participant were instructed to walk continuously over every obstacle at their self-determined walking speed.

Balance Training

Mainly three balance exercises:
- Walking combined with head turning: Continue for the length of hallway or about 20 feet. Repeat 3 times.
- Heel to toe walking: Continue for 5-20 steps.
- Balancing on a balance disc: 30 seconds

RESULTS

The result demonstrate a statistically significant improvement in physical function and pain component of SF-36 scale after both interventions. In Group A the mean difference of physical function pre-test and post-test value is 1.5 which is statistically significant. And mean difference of pre-test and post-test on pain is 7.4 which is statistically significant.

Table – 1: Pre and post-*treatment comparison of SF-36*

Group A				
		mean	SD	P value
Physical function	Pre	50.3	10.4	0.015
	post	52.2	8.9	
pain	pre	67.2	26.8	0.025
	post	76.5	20.4	
Group B				
Physical function	Pre	46.7	13.3	0.014
	Post	47.8	12.9	
pain	Pre	61.8	39.2	0.018
	post	67.2	35.1	

Table 1 shows the comparison of SF-36 between pre-test and post-test of Group A and Group B. The Independent sample "t" test was used to compare quality of life and fall risk between groups. There was no difference ($p > 0.05$) in quality of life between groups during pre-test as well as post-test.

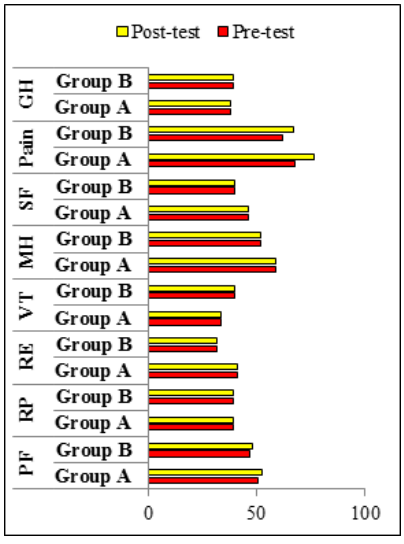

Figure 1: *comparison of pre-test and post-test values of sf-36 of both groups*

Table – 2: Pre and post-*treatment comparison of FSST*

	mean	SD	P value
Group A			
Pre	20.2	4.9	<0.001
post	16.7	4.8	
Group B			
Pre	20.3	4.8	<0.001
Post	17.6	4.4	

Table 2 displays the comparison of pre-test and post-test of FSST between Group A and Group B. The Independent sample "t" test was used to compare fall risk between groups. There was no difference ($p > 0.05$) in fall risk between groups during pre-test as well as post-test.

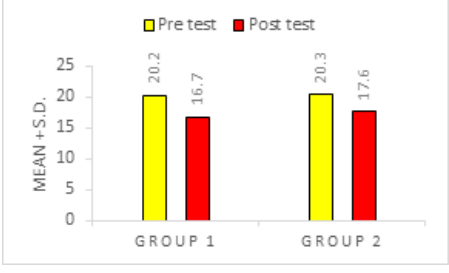

Figure 2: *comparison of pre-test and post-test values of FSST of both groups*

Mean difference of pre-test and post-test values of Group A and Group B of FSST were 3.5 and 2.6 respectively. Both are statistically significant.

Hence, Group A values in comparing to Group B, the results shows Group A is more significant than Group B.

CONCLUSION

The study was conducted in an effort to compare the effect of OGT and balance training in improving fall risk and Quality of life in elderly people. 36 subjects were selected and assigned into two groups, one group received obstacle gait training and the other group received balance training.

The study was pre-test and post-test experimental design. The results were analyzed using 't' test. The results show significant improvement in Group A (obstacle gait training) than Group B (balance training).

From this study, it may be concluded that obstacle gait training is more significant than balance training in improving fall risk and quality of life in elderly population.

DISCUSSION:

The study was done on 36 subjects of age between 65 and 74. They were divided into two groups with equal population. The present study demonstrated that 6 weeks of obstacle gait training (OGT) and balance training can safely improve the risk of fall and quality of life in older subjects. The result has shown more significant improvement in FSST in obstacle gait training compared to balance training groups.

Cheng sj et.al (2022) said that Fall/injuries are common in older age group creating a considerable social and economic burden due to increasing medical expenses and loss of Quality of life (QOL).

In this study, subjects in Group A, received obstacle gait training for 3 days in a week for total six weeks. After 6 weeks, Group A showed improvement in FSST and physical function and pain components of SF-36 compared to Group B. No change had occurred in other components of SF-36. A study done by Said et al. (2001) reported that modified obstacle crossing reduced the risk of top due to toe contact for stroke patient[12]. 24 inpatients with stroke able to walk 10m unassisted; also, 22 healthy subjects. The findings of previous studies agree the result of present studies that obstacle gait training (OGT) on land are significantly improves balance function and walking speed.

Similar to Group A, Group B also showed significant change in FSST and SF-36. Balance training can improve postural stability in elderly people. They are effective in improving physical abilities such as strength and balance characterized by the integration capacity of the sensorimotor system, the balance exercise helps to promote postural control[13].

Limitation of the study were as follows: first, the small sample size limits the generalizability of the study finding. Based on the results of statistical analysis, it suggested that in future study should be modifies to accommodate the following changes to establish the efficacy of the result a large sample is required for valid results and also this study was done age between 65 and 80. The study compared the effects of 6 weeks intervention only; thus, owing to the lack of follow-up, it is unknown how long the training effects lasted.

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