

Effectiveness of Chair Aerobics and Frenkel's Exercise in Geriatric Population on Balance and Coordination—Randomized Control Trial

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Abstract

Background: Balance and coordination issues create irreparable problems in the elderly. The pervasiveness of falls is more established in elderly. The main aim of this study was to find out effectiveness of chair aerobics and Frenkel's exercise on balance and coordination in the elderly. The growing evidence proves that exercise promotes healthy ageing, since aerobic exercise has been found to maintain motor units and mitochondrial function, it specifically enhances cardiovascular fitness. Moreover, it was discovered to prevent muscular atrophy and enhance health-related quality of life. Chair aerobics is a form of exercise performed while seated and talking about Frenkel's exercise, its principle is to activate the mechanisms that control balance and multi-joint coordination. In this study we have combined Frenkel's exercise along with chair aerobics for balance and coordination.

Method: This method was a randomised controlled trial. Study was carried out in group of patients, (n=30) conventional group and controlled group. Patients in controlled group performed chair aerobics and Frenkel's exercise whereas the conventional group performed the routine exercises for 3 months. All patients were assessed with Romberg's test and finger to nose test pre and post intervention.

Results: At the end of 3 months rehabilitation treatment, statistically significant differences were observed. Both groups showed improvement but controlled group showed much more and statistically significant improvement.

Conclusion: Chair aerobics and Frenkel's exercise is found to be effective on balance and coordination in geriatric population.

Keywords: Balance; Coordination; Chair aerobics; Frenkel's exercise; Elderly

Introduction

Aging is a natural and gradual process that refers to the biological, psychological, and social changes that occur in individuals as they grow older. A higher level of stress, mitochondrial dysfunction, abnormal inflammatory processes, decreased hormone production, and a decreased metabolic rate that can result in catabolism and organ degeneration are just a few of the physiological changes that contribute to longitudinal processes associated with ageing. These mechanisms cause a gradual loss of strength, skeletal muscle mass, nerve extensions and reduces proprioception^[1]. Higher physical activity can reduce the risk of falling between 30% to 50%^[2]. You've fallen off your balance at least once in your life, perhaps as a child you didn't watch where you were going, or as a young adult you tripped over something. Balance problems become more prevalent as you get older, and your gait alters. Not having a proper stride while walking can cause you to lose your equilibrium. About one-third of people with age more than 65 years old have at least one episode of fall each year. Preventing falls and preserving the balance in the elderly and limiting its catastrophic dangers is one of the most urgent issues in many nations. Maintaining standing, sitting or other positions needs integration of all systems: Central

nervous, sensory and musculoskeletal. Your body changes as you get older, increasing your risk for certain medical disorders. Bimanual and multi-joint movement coordination is impaired in older persons^[3]. As an example, when elderly persons move their shoulder and elbow joints simultaneously as opposed to single joint activities, the movements become slower and less efficient.

The ability of elderly persons to enhance their physical health through exercise is an area of research that is expanding. Healthy ageing without physical activity cannot be imagined. According to studies, elderly people are able to tolerate aerobic exercise. Co-ordination is a combination of optimizing intramuscular and inter-muscular cooperation skills using external and internal feedback mechanisms. Problems of coordination are increasing due to age which in turn reduces the reaction time. As the age increases there is slower reaction time.

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A study looked at how an eight-week Frenkel exercise programme affected the elder men's coordination and balance. The findings indicated that the Frenkel exercise programme was successful in enhancing the elderly men's coordination and balance. This study led to the conclusion that Frenkel exercises looked to be a useful exercise approach to enhance coordination and balance, lower the risk of falls, and lower the cost of associated medical care ^[4].

The loss of strength, mobility, balance, and endurance that results from sedentary behaviour in elderly citizens has been shown to be mitigated by aerobic exercise; these abilities are necessary for seniors to safely do daily tasks. Recent studies have also shown a positive correlation between exercise and improvements in balance, strength, and flexibility ^[5-8]. As the aging population continues to grow, maintaining functional independence and reducing the risk of falls become paramount. Balance and coordination are crucial aspects of physical well-being that can significantly impact the daily lives of older adults. Chair aerobics, a form of exercise performed while seated, has emerged as an effective method to improve balance and coordination in the elderly population. Chair aerobics has emerged as a valuable tool for enhancing balance and coordination in the elderly population. Through its focus on strengthening lower body muscles, enhancing proprioception, training postural control, and promoting coordination, chair aerobics offers a safe and effective exercise option for older individuals. Furthermore, the psychological and social benefits derived from chair aerobics contribute to a holistic approach to improving overall well-being in the aging population. The main advantage of chair aerobics is its accessibility. It can be done by people of all fitness levels and ages, including seniors, individuals with disabilities, or those recovering from injuries. It offers a safe and effective way to improve overall fitness and maintain an active lifestyle. Incorporating chair aerobics into the lives of older adults can empower them to maintain functional independence, reduce the risk of falls, and enhance their overall quality of life. Participating in group-based chair aerobics can provide opportunities for socialization and a sense of community, which can have positive effects on mental and emotional health. Engaging in physical activity, even in a seated position, releases endorphins, which are natural mood boosters. Physical abilities such as balance and coordination are crucial for preserving independence and lowering the risk of falls in the elderly. Frenkel's exercises, a kind of recurrent motor training, have shown promise in enhancing balance and coordination in elderly people. Recurrent motor training techniques have showed promise in improving balance and coordination in elderly adults. These exercises provide a beneficial strategy to address balance and coordination deficits in older people by focusing on coordination abilities, boosting motor learning, and including cognitive-motor integration. Frenkel's exercises could also be used in rehabilitation to aid in functional recovery and the treatment of neurological disorders. By including Frenkel's exercises into care plans, Physiotherapists can help geriatric population maintain or regain functional independence, reduce fall risk, and improve overall well-being. Both chair aerobics and Frenkel's exercises involve a range of motion, stretching, and gentle movements. By regularly practicing these exercises, individuals can maintain or improve joint flexibility, muscle

coordination, and range of motion, leading to increased mobility and reduced stiffness. Regular participation can improve muscular strength, endurance, flexibility and balance.

The aim of this study was to examine the effect of chair aerobics and Frenkel's exercise in geriatric population on balance and coordination.

Methodology

The study was carried out in Krishna Vishwa Vidyapeeth, deemed to be University, Karad. An approval for the study was obtained from the protocol committee and ethical committee of Krishna Vishwa Vidyapeeth Deemed to be university. This was a randomised controlled trial. Patients were given enough information about the research before taking their permission, which was obtained in a ethical manner. Patients who agreed to take part in the study were separated from the general population in order to protect their anonymity, and then balance and coordination was assessed using Romberg's test and finger to nose test, respectively, before being randomly assigned to either controlled group or conventional group.

Inclusion criteria was patients with balance and coordination impairment according to Romberg's test and Finger To Nose Test (FNT), elderly patients from 60-75 yr old, patient who is able to walk without assistive device, general physical health such that the elderly has the ability to exercise for 30 minutes with two rest periods of 5 minutes, ability to communicate with the therapist and those who are willing to participate in the study.

Exclusion criteria were patients who are unable to walk independently, patients who have visual deficiency, patients who have auditory deficiency, patients who have unstable cardiovascular disease and refusal to participate.

Interpretation-The study initially enrolled 30 patients (n=30) that were equally split into conventional group (n=15) and controlled group(n=15) after informed consent was obtained. The study was conducted for duration of 3 months.

A controlled intervention was administered to one group while a conventional intervention was offered to another. Chair aerobics and Frenkel exercises was performed by the controlled group, while routine exercises were performed by conventional group under the guidance of the therapist.

In the first week the duration of each session was decided to be 10 minutes and then increased by 5 minutes per week so that the duration will be till 30 minutes. After 10 minutes of practice in each session, the patients were allowed 5 minutes to rest. Before exercises, the exercise was demonstrated by the therapist to ensure the correctness of the exercises performed by the patients.

Frenkel's exercises are a system of exercises consisting of slow, repeated movements. They increase in difficulty over time. Frenkel's exercises are used to bring back the rhythmic, smooth and coordinated movements.

Frenkel's exercises for lower limb

- In Lying
 - a. Lying (Head raised); Hip abduction and adduction

- b. Lying (Head raised); One Hip and knee flexion and Extension
- c. Lying (Head raised); One Leg raising to place Heel on the specific mark
- d. Lying (Head raised); Hip and Knee flexion and extension, abduction and adduction
 - In Sitting
 - a. Sitting; One Leg stretching, to side heel to a position indicated by a mark on the floor.
 - b. Sitting; Alternate Leg stretching and lifting to place Heel or Toe on specified mark.
 - c. Stride sitting; Change to standing and then sit down again.
 - In standing
 - a. Stride standing; Transference of weight from Foot to Foot.
 - b. Stride standing: Walking sideways placing feet on marks on the floor.
 - c. Standing; Walking placing Feet on marks.
 - d. Standing: Turn around.
 - e. Standing: Walking and changing direction to avoid obstacles.
 - In progression
 - a. Make alteration in speed, range and complexity
 - b. Quick movements, less control
 - c. Slow movement, high control`
 - d. Simple movements build up to form complex movements e.g., walking

Chair aerobics is a form of exercise that involves performing aerobic movements while seated on a chair. It is designed to provide a low-impact workout that is suitable for individuals with limited mobility or those who have difficulty standing for extended periods. Chair aerobics typically incorporates a variety of movements such as

1. Toe Raises-Strengthens thighs
2. Heel raises-Strengthens calf muscles

3. Leg raises-Strengthens quadriceps, can use weights
4. Knee raises-Strengthens hip flexors
5. Hip abduction-Strengthens outer hip muscles, can use TheraBand for resistance
6. For upper back-Sit sturdy on a chair, hold TheraBand between hands, bring elbows back to squeeze shoulder blades back
7. Chair squat-Sit on edge of chair, cross hands across chest, lean forward and stand; sit back again and repeat it.
8. Marching

Pre and post examination was done by the outcome measures before and after the intervention program. Statistical analysis and interpretation were done for each individual to evaluate the effectiveness of subjects in it that is the treatment.

Statistical analysis

The formula for calculating sample size for the study is,

$$n=4pq/l^2$$

$$n=30$$

Results

InStat software was used to access the data. The mean and standard deviation of all parameters were calculated. We also found the T value and P value.

Interpretation: The below Table 1 shows comparison between conventional group and controlled group for outcome measures Romberg's test and finger to nose test before and after treatment.

Interpretation: The below Table 2 shows comparison of outcome measures Romberg's test and finger to nose test within controlled group.

Interpretation: The below Table 3 shows comparison of outcome measures within Conventional group.

In this study, after analysing data, we found that there is significant difference between conventional group and controlled group after treatment. Chair aerobics and Frenkel's exercise has improved balance and coordination in geriatric population

Table 1: Outcome measure-based data analysis.

		Pre-intervention			
Group	Outcome measure	Mean ± SD	T value	P value	
Controlled group	Romberg's test	4.13 ± 1.05	15.13	<0.0001***	
Controlled group	Finger to nose test	5.24 ± 0.83	24.43	<0.0001***	
Conventional group	Romberg's test	3.68 ± 1.07	13.21	<0.0001***	
Conventional group	Finger to nose test	9.61 ± 2.21	16.78	<0.0001***	
		Post intervention			
Group	Outcome measure	Mean ± SD	T value	P value	
Controlled group	Romberg's test	5.24 ± 0.83	24.43	<0.0001***	
Controlled group	Finger to nose test	8.76 ± 1.77	19.16	<0.0001***	
Conventional group	Romberg's test	4.42 ± 0.75	22.81	<0.0001***	
Conventional group	Finger to nose test	9.24 ± 2.11	16.96	<0.0001***	

Table 2: Comparison of outcome measures within controlled group.

Outcome measure	Controlled group		T value	P value
	Pre-intervention Mean \pm SD	Post intervention Mean \pm SD		
Romberg's test	4.13 \pm 1.05	5.24 \pm 0.83	3.2	0.0034**
Finger to nose test	5.24 \pm 0.83	8.76 \pm 1.77	6.96	<0.0001***

Note: **very significant, ***extremely significant

Table 3: Comparison of outcome measures within Conventional group.

Outcome measure	Conventional group		T Value	P Value
	Pre-intervention mean \pm SD	Post intervention mean \pm SD		
Romberg's test	3.68 \pm 1.07	4.42 \pm 0.75	2.18	0.0371*
Finger to nose test	9.61 \pm 2.21	9.24 \pm 2.11	2.37	0.0327*

Note: *Significant

Discussion

The aim of this study was to find the effectiveness of Frenkel's exercise and chair aerobics in geriatric population on balance and coordination for which two groups were made, one was the controlled group and the other was conventional group. The patients in controlled group were given chair aerobics and Frenkel's exercise whereas conventional group was given routine exercises. The results showed that both groups' balance and coordination was improved but the controlled groups' balance and coordination was significantly improved as p value for controlled group was extremely significant. Both chair aerobics and Frenkel's exercises can be beneficial for improving balance and coordination, especially for elderly. Chair aerobics provide core stability. Many chair aerobics routines involve engaging the core muscles, including the abdominals and back muscles. A strong core helps maintain proper posture and stability, which are crucial for balance and coordination. Chair aerobics often incorporate various arm and leg movements, such as arm raises, leg lifts, and marching in place. These movements engage multiple muscle groups simultaneously, improving coordination and proprioception (awareness of body position in space). Certain chair aerobics exercises involve shifting weight from one side to another or forward and backward. This weight shifting challenges balance and trains the body to maintain stability during movements. Talking about Frenkel's exercises, they focus on enhancing proprioception, which is the body's ability to sense its position and movement in space. Frenkel's exercises frequently target specific joints, such as the ankles, knees, and hips, to improve joint stability. Strengthening the muscles around these joints can enhance balance and coordination by providing a stable foundation for movements. Some Frenkel's exercises involve coordinating eye movements with head and body movements. This integration of visual input and physical motion can improve balance and coordination by training the brain to process sensory information and adjust body position accordingly.

Conclusion

The current mini-review points to the advantages of a

combination of chair aerobics and Frenkel's exercise on balance and coordination among older adults. Based on the above literature, it is suggested that older adults be exposed to a program that includes such a combination for 3-4 sessions each week, for periods of at least 12 weeks, as a tool for quality-of-life improvement. Physical therapists must include such combination exercises in a program for older adults gradually, allowing for the proper adjustment of the patients while ensuring their safety. Additionally, it should progressively reach higher levels of challenges in the form of more complex exercises involving both motor and cognitive tasks (dual-and multi-task activities).

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