INJ INTERNATIONAL NEUROUROLOGY JOURNAL

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 prevalence of falls is higher among the elderly. The primary goal of this study was to find out the effects of chair aerobics and Frenkel's exercise on geriatric balance and coordination. The growing evidence proves that exercise promotes healthy ageing, since aerobic exercise has been found to maintain motor units and mitochondrial activity, it specifically enhances cardiovascular fitness. Moreover, it has been shown to prevent muscle atrophy and improve 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.

Key words: 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. Abnormal inflammatory processes, mitochondrial dysfunction, higher level of stress, decreased hormone production and a lower metabolic rate, which can lead to catabolism and organ deterioration, are just a few of the physiological changes that contribute to the longitudinal processes associated with ageing. (1) These mechanisms cause a gradual loss of strength, skeletal muscle mass, nerve extensions and reduces proprioception. (2) Increased physical exercise can lower the chance of falling by 30% to 50%. %. 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. Every year, around one-third of people over the age of 65 experience at least one episode of fall. Preventing falls and maintaining balance in the elderly, as well as reducing their devastating consequences, is one of the greatest concerns in various nations. (3) All systems—central nervous, sensory, and musculoskeletal—need to work together to maintain standing, sitting, or other positions. 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. 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.

ISSN:2093-4777 | E-ISSN:2093-6931
DOI: 10.5123/inj.2023.4.inj30
Vol. 27 Iss. 4 (2023)

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. Coordination is the process of optimizing intramuscular and intermuscular coordination abilities via the use of external and internal feedback systems. Coordination problems are becoming more common as people grow older, which affects reaction time. The reaction time slows down as one gets older. In one research, the coordination and balance of elderly men were examined after an eight-week Frenkel exercise regimen. The findings indicated that the Frenkel exercise programme was successful in enhancing the elderly men's coordination and balance. This study concluded that Frenkel's exercises appeared to be a helpful exercise technique for improving coordination and balance, reducing the risk of falls, and lowering the cost of accompanied medical treatment. (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. (5) Recent studies (6-8) have also shown a positive correlation between exercise and improvements in balance, strength, and flexibility. Maintaining functional independence and decreasing the risk of falls become increasingly important as the ageing population grows. Balance and coordination are crucial aspects of physical well-being that can significantly impact the daily lives of older adults. Chair aerobics, which involves exercising while seated, has proven to be an effective way to help elderly individuals with balance and coordination. 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. In order to maintain independence and reduce the risk of falls in the elderly, physical skills like balance and coordination are essential.

Frenkel's exercises, is 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 purpose of this study was to examine the effect of chair aerobics and Frenkel's exercises on balance and coordination in the elderly population.

Methodology

The research was carried out at Krishna Vishwa Vidyapeeth, deemed to be university, Karad. The protocol committee and ethics committee of Krishna Vishwa Vidyapeeth, deemed to be university approved the study. This was a randomised controlled trial. Patients were given enough information about the research before taking their permission, which was obtained in an 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 60-75yr old, patient who is able to walk without assistive device,

ability to interact with the therapist, overall physical health sufficient for the elderly to exercise for 30 minutes with two 5-minute breaks, and willingness to participate in the research.

Exclusion criteria was 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.

The time of each session was set to be 10 minutes in the first week, and then raised by 5 minutes every week until it reached 30 minutes. Each session, the patients were given 5 minutes to relax after 10 minutes of practice. The therapist showed the exercise prior to the patients performing it to verify that the exercises were executed correctly.

Frenkel's exercises are a set of slow, repetitive motions. They get more challenging over time. Frenkel's exercises are designed to restore rhythmic, smooth, and coordinated movement.

Frenkel's lower limb exercises:
•In lying
a) Lying with the head lifted; Hip abduction and adduction
b) Lying with the head lifted; and one hip and knee extended
c) Lying with the head lifted; and extending one leg to position the heel on the designated spot
d) Lying with your head lifted; while performing hip and knee flexion and extension, abduction and adduction
• While sitting,
a) While sitting; stretch one leg to the side, bringing the heel to a spot where a mark has been made on the floor.
b) While seated; alternately stretch and lift each leg until the heel or toe touches the designated mark.
c)Stride sitting; Stand up from a seated position, then return to a seated position.

• In standing-
a) Stride standing; weight transfer from foot to foot.
b) Stride standing; stepping sideways with feet on floor markings.
c)Standing; and walking with feet on markers.
d)Standing; turn around.
f) Standing; walking and turning to avoid obstacles.

In progression-
Change the speed, range, and difficulty as you advance.
Less control, quick motions
Slow movement, excellent control
Simple movements combine to generate complex movements, such as 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 sample size for the investigation is calculated using the formula,

$n = 4pq/l^2$

$n = 30$

Results

The data was accessed using the inStat software. All parameters' means and standard deviations was derived. The T value and P value was also found.

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***

***extremely significant

Interpretation: the above table shows comparison between conventional group and controlled group for outcome measures Romberg's test and finger to nose test before and after treatment.

Table 2: Comparison of outcome measures within controlled group

CONTROLLED GROUP				
OUTCOME MEASURE	**PRE-INTERVENTION MEAN±SD**	**POST INTERVENTION MEAN±SD**	**T VALUE**	**P VALUE**

ISSN:2093-4777 | E-ISSN:2093-6931
DOI: 10.5123/inj.2023.4.inj30
Vol. 27 Iss. 4 (2023)

ROMBERG'S TEST	4.13±1.05	5.24±0.83	3.20	0.0034**
FINGER TO NOSE TEST	5.24±0.83	8.76±1.77	6.96	<0.0001***

**very significant
***extremely significant

Interpretation: the above table shows comparison of outcome measures Romberg's test and finger to nose test within controlled group.

Table 3: Comparison of outcome measures within Conventional group

CONVENTIONAL GROUP				
OUTCOME MEASURE	**PRE-INTERVENTION MEAN±SD**	**POST INTERVENTION MEAN±SD**	**T VALUE**	**P VALUE**
ROMBERG'S TEST	3.68±1.07	4.42±0.75	2.18	0.0371*
FINGER TO NOSE TEST	9.61±2.21	9.24±2.11	2.37	0.0327*

*Significant

Interpretation: The table above compares the outcome measures within the Conventional group.
In this study, after analysing data, we discovered a substantial difference between the conventional group and the controlled group following the intervention. Chair aerobics and Frenkel's exercise has improved balance and coordination in geriatric population.

Discussion

The purpose of this study was to evaluate the efficacy of chair aerobics and Frenkel's exercises 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 findings indicated that both groups' balance and coordination 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 emphasise improving proprioception, the body's capacity to perceive its location and motion in space. To increase joint stability, Frenkel's exercises usually focus on certain joints, such as the ankles, knees, and hips. 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.

Limitations

The present study was conducted at a single institution, therefore generalisation of the study maybe limited. Another limitation of the study was less sample size.

Conclusion

The current mini-review highlights the benefits of chair aerobics and Frenkel's exercise on balance and coordination in senior citizens. As a method for enhancing quality of life, it is advised that older persons be

exposed to a programme that contains such a mixture for three to four sessions each week for a minimum of 12 weeks based on the above-mentioned studies. Such combination exercises must be gradually included by physical therapists into a treatment plan for elderly patients in order to allow for the patients' adequate adjustment while assuring their safety. Additionally, it should gradually increase in difficulty as it incorporates trickier exercises that need both physical and cognitive skills (also known as dual- and multi-task activities).

SOURCE OF FUNDING – Self
CONFLICT OF INTEREST- None

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