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Effectiveness of Combined Physical – Cognitive Training on Balance among Geriatric Population

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Abstract

Introduction: Each year, almost one-third of the elderly fall, and the likelihood of falling increases with age. Combining physical and cognitive training may be an effective intervention for fall risk reduction and cognitive enhancement. Physical and cognitive interventions, such as exercise and cognitive training, may be used to address the decline in cognitive function as well as the presence of some physical fall-related risk factors, such as decreased balance control, muscle weakness, and a slow gait, which predispose older adults to fall. Physical and cognitive abilities training can help to prevent or slow the onset of age- related cognitive decline. **Aim:** To Determine the Effectiveness of Combined Physical- Cognitive training on Balance among Geriatric population.
Objective: To find out the effectiveness of combined physical – cognitive training on balance and cognitive function among geriatric population using Berg Balance Scale and Mini Mental State Examination.
Methodology: This study is a quasi-experimental study. The study was conducted with sample size of 15 participants. The participants were selected from SCPT out-patient and SMCH hospital, according to the inclusion and exclusion criteria. The detailed procedure was explained to the participants and a written informed consent form was obtained. All the 15 subjects were assessed with Berg Balance Scale and Mini Mental State Examination as a pretest and the same test was performed for post-test at the end of 4 weeks following the intervention protocol. All the 15 subjects received the combined training of physical and cognitive training for 60 mins, 3 sessions in a week, continued for 4 weeks.
Results and Conclusion: Combined physical cognitive training is more effective on improving balance and cognitive function in geriatric population than using of a single treatment protocol.

Keywords

Geriatric population, balance, berg balance scale (BBS), MMS, combined physical-cognitive training

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Introduction

Every year, almost one-third of older people living in communities over the age of 65 fall, and with age, the likelihood of falling increases. Falls can result in loss of power, illness, poor life status, and death in elder adults due to physical injuries and psychological impact. Physical and cognitive impairments associated with a major underlying factor in drops among the elderly is age. Falls in older people are associated with impaired balance, weaker muscles in the lower body, a slower response time, and problems with vision and proprioception. Losses in mental ability, such as executive mechanism, concentration, recall, learning and memory ability, and information processing, as opposed to just physical issues, are linked to a higher risk of falling and a higher rate of falling. Physical activity, particularly that which incorporates a balance component, has regularly been shown to be an effective fall prevention approach for older persons in comprehensive studies and hypothesis.

Previous research by Phirom et al. (2020) has shown that combining physical and cognitive training improves physical and/or cognitive function significantly. Furthermore, a few studies have demonstrated that in comparison to each type of exercise alone, combining physical and mental training enhances both neurocognitive ability and indicates that the combined training has combinational action (Pinto ji et al., 2016). Aging is an unavoidable part of everyone's journey in life. According to Statistics Portugal, the senior population aged 65 and more climbed during the 2001 and 2011 censuses and is predicted to climb to at least 32% by 2050. The ability to sustain the body position on its support base, whether fixed or mobile, with minimal changes is characterized as balance. In reality, ageing has an impact on the central nervous system, resulting in structural and functional alterations at the cortical, spinal, and peripheral levels. Postural control, including balance, is facilitated by cortical and spinal systems. As a result, all changes to the central nervous system as a result of ageing have an impact on cognition and balance.

A previous study by Rogge et al. (2017) stated that the physical exercise programs have been recommended to improve cognition among a wide range of psychological interventions such as cognitive education programs and specific nutrition. Physical activity has been demonstrated to increase cognitive performance, including executive skills, processing speed, and memory, over the course of many months. A study by Lauenroth et al. (2016) stated that performing two tasks at the same time is common in daily activities (dual tasking). They are challenging to complete because of their complexity and high demand on physical and cognitive abilities, which makes them particularly challenging for elderly people and people with brain disorders. Training in practical physical and/or cognitive abilities seems to enhance one's physical and mental capabilities.

A study by Cesari et al. (2002) stated that if these two therapies are combined, the brain's synaptic plasticity alterations might be more obvious. Physical activity and cognitive stimulation were found to have a complimentary effect on neurogenesis in an animal study. In humans, a combination of physical and cognitive training improved brain functional plasticity. Aside from improved cognitive efficiency, the gyrus region of the medial temporal cortex of the brain had improved cerebral blood supply because of combination treatment. Nonlinguistic spatial information processing is handled by this part of the brain. Similarly, the immediate and long-term advantages of continuous strength training with double and number of co activities for community-

dwelling middle - aged and older people with a high risk of falling relate to mobility, dynamic balance, and anxiety about falling. In older people with Mild Cognitive Impairment, mental findings from double combination with cognitive and physical training were much better than those from patient information or an instructional control group. In a systematic evaluation, older people either with or without cognitive decline, mixing physical activity and brain training therapy increased cognitive skills and physical function.

Methodology

Considering the eligibility and rejection criterion, a total of 15 subjects were chosen and the subjects were explained about treatment safety and simplicity of the procedure and written consent was obtained. Subjects willing to participate were randomly allocated into a single group. The Berg Balance Scale and the Mini Mental Status Examination scale were used to evaluate every subject as pretest measurement and the subjects were undergone combined physical -cognitive training for 60 mins, 3 sessions in a week, continued for 4 weeks of duration. Initially, the exercise training started with warm- up for 5-10 mins including aerobic and basic workouts for extensibility, followed by 60 mins of combined physical -cognitive training with multiple exercise components and the subjects ended the training with cool -down for 5-10 mins, including aerobic and general flexibility exercises. The subjects performed the exercises such as executive function training while walk, sit -to -stand training with orientation, step-ups with focus training, moving in various directions with recall training, and standing marked achieving with executive mechanism programme. All these exercises were performed for 1-3 sets with 10-12 repetitions with a progression of each exercise by increasing speed while walking, by increasing step length and step height. Rest periods were given for the subjects whenever necessary during the exercise training. The Berg balancing scale and the Mini mental state evaluation scale were used to evaluate everyone, as posttest measurement after the end of 4 weeks of intervention.

Table 1. Pretest and Post test values of Berg Balance Scale

CPCT GROUP		Mean	Standard deviation	t value	p value
Berg Balance Scale	Pre test	29.20	5.32	10.8152	< 0.0001
	Post test	46.67	3.29		

Table 2. Pre test and Post test values of Mini Mental State Examination Scale

CPCT GROUP		Mean	Standard deviation	t value	p value
Mini Mental State Examination Scale	Pre test	20.20	1.66	13.2509	< 0.0001
	Post test	27.40	1.30		

Results and Discussion

Statistical analysis of quantitative data showed statistically significant differences in the post test values of the experimental group (CPCT). The Berg Balance Scale post-test mean value in the experimental group (CPCT) was 46.67 (+3.29), while it was 29.20 (+5.32) in the pretest. This indicates that the experimental group (CPCT) post-test's Berg Balance Scale results showed a considerable increase, with a *p* value of 0.0001 (Table 1).

The Experimental group's (CPCT) Mini Mental State Examination Scale post-test mean value was 27.40 (+1.30), whereas the experimental group's (CPCT) pre-test mean value was 20.20 (+1.66). This indicates that the experimental group (CPCT) post-test's Mini Mental state Examination Scale results showed a considerable increase, with a p value 0.0001 (Table 1).

Statistical analysis of the Berg Balance Scale and Mini Mental State Examination post-test results revealed statistically significant differences. As a result, the post test results for the group who underwent combined physical and cognitive training demonstrated quantitative progression.

The current research's goal is to determine its efficacy of improved stability and memory in the elderly population by physical-cognitive training. This study is demonstrated with duration of 4 weeks. Before and after intervention, the outcomes were evaluated using the Berg Balance Scale and Mini Mental State Examination Scale. There was a substantial difference between the pre- and the post-test values when the outcomes were compared in the combined physical-cognitive training group. In Experimental Group (CPCT) pre-intervention mean of Berg Balance Scale was 29.20 (+5.32) and Mini Mental State Examination Scale was 20.20 (+1.66). After treating the subject with combined physical- cognitive training, the post-intervention mean value of Berg Balance Scale increased to 46.67(+3.29) and Mini Mental State Examination was 27.40(+1.30), which showed the statistically significant difference between the outcome measures. Based on statistical analysis, the experimental group (CPCT) showed improvement in Berg Balance Scale and Mini Mental State Examination. A study by Phirom et al. (2020) conducted a pseudo-randomized assessor-blind controlled trial with a total sample size of 40 participants, who were randomly allocated into intervention and control group with 20 participants in each group. Participants in the intervention group received interactive game-based training program, with simultaneous activity of cognitive and physical functioning for 60 mins per session were as, participants in the control group received educational material covering enhancement and fall prevention strategies. This study found that a collaborative physical mental game-based training regimen could enhance executive function and commitment, minimize fall management aims to reduce physical fall risk factors like speed processing and body sway, and enhance global cognitive performance by enhancing with double outcome. A study by Fraser et al. (2017) indicated that facilitating physically inactive older individuals to take part in a regular exercise program may have obtainable advantages to both gait and balance that may prevent or minimize fall risk and mental impairment in the aging population. It also targeted the age-associated changes in neural and brain function.

A study by Shimada et al. (2018) concluded that the efficiency of aged people with cognitive impairment, specifically the amnestic kind, is increased or sustained by combined physical and mental activity. A study by Lauenroth et al. (2016) concluded that the effects of joined

exercise and cognitive training on memory are effective. A study by Gavelin et al. (2021) concluded that it is beneficial to enhance both cognitive and cardiovascular health in elderly age by delivering mixed cognitive and training either synchronously or asynchronously. Both elderly individuals with MCI and mentally healthy older folks showed these advantages. Future research need to be conducted with a bigger sample size to increase the validity and reliability and promote prediction of the findings to the total society older population.

Conclusion

In this research, it was found that a combination of physical and cognitive training resulted in greater improvement in both balance and cognitive function among older adults. The clinical message is that incorporating both physical and cognitive exercises in training programs can have significant benefits for the overall health and well-being of the elderly population.

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