The Effect of Brain Gym on Cognitive Function Among Elderly Residents in a Nursing Home

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ABSTRACT

Background: Cognitive decline is common among older adults and may reduce independence in daily activities. Non-pharmacological interventions such as brain gym exercises are considered potential strategies to maintain cognitive function.

Objective: This study aimed to examine the effect of brain gym on cognitive function among elderly residents at Bhakti Luhur Nursing Home, Sidoarjo.

Methods: A pre-experimental one-group pretest–posttest design was employed. A total of 36 elderly residents were selected using purposive sampling. Cognitive function was measured using the Mini Mental State Examination (MMSE). Data were analyzed using the Paired Sample t-test.

Results: The mean MMSE score increased from 22.00 (moderate cognitive impairment) before the intervention to 23.77 after the intervention. The analysis showed a statistically significant difference between pretest and posttest scores ($p < 0.001$).

Conclusion: Brain gym was associated with improved cognitive function among elderly residents. Regular implementation of brain gym exercises may support cognitive health in older adults.

Keywords:
Brain Gym; Cognitive Function; Nursing Home; Mini Mental State Examination; MMSE

INTRODUCTION

The aging process is a natural and inevitable stage of life that is often accompanied by physiological and cognitive changes (Lemoine, 2020; Lu et al., 2023). Cognitive decline is commonly experienced by older adults and may affect memory, attention, language ability, and executive functioning. As individuals age, degenerative changes in the nervous system occur, including neuronal loss in areas such as the dentate gyrus, which contributes to memory impairment and reduced cognitive processing speed (Iskusnykh et al., 2024). These changes can decrease independence in daily activities and increase reliance on caregivers.

According to the World Health Organization, approximately 47 million people worldwide are currently living with cognitive impairment, with around 10 million new cases reported annually. This number is projected to reach 115 million by 2050 (WHO, 2023). Data from Alzheimer's Disease International indicate that about 9.5 million people in Southeast Asia were estimated to experience cognitive decline in 2019, and this figure continues to increase in line with population aging (World Alzheimer Report, 2019; World Alzheimer Report, 2023). In Indonesia, approximately 27.9% (4.2 million individuals) are estimated to experience cognitive decline (Bestari, 2023). At the regional level, the Sidoarjo District Health Office reported that 15% of elderly individuals experienced cognitive impairment (Tarik, 2018).

Cognitive decline in older adults may manifest as memory disturbances, impaired abstract thinking, difficulties in communication, altered perception, and reduced concentration, all of which may interfere with daily functioning (Montine et al., 2021). Several

risk factors contribute to the development of dementia, including advanced age, genetic predisposition, depression, excessive alcohol consumption, and hypertension (Afconneri et al., 2024).

Various strategies have been implemented to prevent or slow cognitive deterioration. Pharmacological interventions, such as donepezil and galantamine, are commonly used; however, non-pharmacological approaches are increasingly emphasized due to their safety and accessibility. Physical activity is known to stimulate brain function and promote the production of Brain-Derived Neurotrophic Factor (BDNF), a protein essential for maintaining neuronal health. Low levels of BDNF are associated with an increased risk of dementia (Afconneri et al., 2024).

One non-pharmacological intervention that can be easily implemented among older adults is brain gym, a structured movement-based exercise aimed at stimulating coordination between brain hemispheres and improving cognitive performance. Structured Brain Gym interventions have been investigated as non-pharmacological approaches to enhance cognitive function in older adults. A recent systematic review reported promising, although varied, effects of Brain Gym on cognitive performance among elderly populations (Varela et al., 2023). Several quasi-experimental studies have also demonstrated improvements in cognitive scores following Brain Gym training (Carvalho et al., 2021; Suminar & Sari, 2023). However, evidence regarding the implementation of structured brain gym programs among institutionalized elderly populations in Indonesia remains limited. Therefore, this study was conducted to examine the effect of brain gym exercises on cognitive function among elderly residents at Bhakti Luhur Nursing Home, Sidoarjo.

METHODS

This study employed a pre-experimental design using a one-group pretest–posttest approach to examine the effect of brain gym exercises on cognitive function among older adults. The study was conducted at Bhakti Luhur Nursing Home, Sidoarjo, from January 11 to January 25, 2025. The population consisted of 50 elderly residents living in the nursing home. A total of 36 participants were selected using purposive sampling based on the following inclusion criteria: elderly individuals aged 60 years and above, able to communicate verbally, and willing to participate in the study. Participants with severe hearing impairment or severe cognitive impairment that prevented effective communication were excluded. The independent variable in this study was brain gym exercise, while the dependent variable was cognitive function. The brain gym intervention was conducted in structured sessions over a two-week period. Each session lasted approximately 20–30 minutes and was carried out under the supervision of the researchers. Cognitive function was measured using the Mini Mental State Examination (MMSE), a standardized instrument consisting of 30 items assessing orientation, registration, attention and calculation, recall, and language abilities. The MMSE score ranges from 0 to 30, with lower scores indicating poorer cognitive function. Data were collected before the intervention (pretest) and after the intervention (posttest). Prior to hypothesis testing, data normality was assessed. Statistical analysis was performed using the Paired Sample t-test to determine differences in cognitive function before and after the intervention, with a significance level set at $p < 0.05$. This study received ethical approval from the Health Research Ethics Committee of the Health Polytechnic of the Ministry of Health Surabaya (Approval Number: EA/3236/KEPK-Poltekkes_Sby/V/2025). Written informed consent was obtained from all participants, and confidentiality as well as participant safety were ensured throughout the study.

RESULTS

Respondent Characteristics

The demographic characteristics of elderly residents at Bhakti Luhur Nursing Home, Sidoarjo, based on age and educational level are presented in Table 1.

Table 1. Characteristics of Elderly Residents at Bhakti Luhur Nursing Home, Sidoarjo (n = 36)

Characteristics	n	%
Age		
60–69 years	20	56
≥70 years	16	44
Education		
Elementary School	13	36
Junior High School	11	30
Senior High School	12	33

Most participants were aged 60–69 years (56%, n = 20), while 44% (n = 16) were aged 70 years and above. In terms of educational background, the largest proportion had completed elementary school (36%, n = 13).

Distribution of Cognitive Function Before and After Brain Gym Intervention

Table 2. Distribution of Cognitive Function Before and After Brain Gym Intervention (n = 36)

Cognitive Function	Pretest n (%)	Posttest n (%)
Normal	13 (36%)	19 (53%)
Moderate Impairment	18 (50%)	12 (33%)
Severe Impairment	5 (14%)	5 (14%)

The distribution of cognitive function before and after the brain gym intervention is presented in Table 2. Prior to the intervention, the majority of participants (50%, n = 18) experienced moderate cognitive impairment. After the intervention, the proportion of participants categorized as having normal cognitive function increased from 36% to 53%, while moderate impairment decreased from 50% to 33%. The proportion of severe impairment remained unchanged (14%).

Effect of Brain Gym on Cognitive Function

The comparison of MMSE scores before and after the intervention is presented in Table 4.

Table 4. Comparison of Cognitive Function Before and After Brain Gym Intervention (Paired Sample t-test)

Variable	Mean (Pretest)	Mean (Posttest)	Mean Difference	% Change	p-value
Cognitive Function	22.00	23.77	1.77	8.05%	<0.001

The mean MMSE score increased from 22.00 before the intervention to 23.77 after the intervention, with a mean difference of 1.77 points (8.05% increase). The Paired Sample t-test indicated a statistically significant difference between pretest and posttest scores ($p < 0.001$).

DISCUSSION

The findings of this study showed that prior to the brain gym intervention, the majority of elderly participants experienced moderate cognitive impairment. Most participants were aged 60–69 years and had elementary-level education. Several elderly individuals reported that they rarely engaged in activities aimed at stimulating memory, which may have contributed to frequent forgetfulness and reduced mental alertness. These findings indicate that limited cognitive stimulation may be associated with declining cognitive performance among institutionalized elderly individuals.

This result is consistent with (Jenkins, Tree and Tales, (2021), who reported that cognitive decline in older adults is often characterized by difficulties in thinking, reduced confidence, and persistent pessimism when facing problems. Cognitive impairment is also associated with decreased intellectual capacity, reduced neural transmission efficiency, and diminished ability to learn and recall information, which in more severe cases may progress to dementia. Furthermore, educational level appears to influence cognitive status. As noted by Lövdén et al., (2020) and Zhong et al., (2024) elderly individuals with lower educational attainment are more likely to experience cognitive impairment, as education contributes to lifelong intellectual stimulation and cognitive reserve.

Following the two-week brain gym intervention consisting of six sessions, there was an increase in the mean MMSE score and a higher proportion of participants categorized as having normal cognitive function. Although severe impairment remained unchanged, the reduction in moderate impairment suggests a positive shift in cognitive performance. The findings of this study are consistent with previous quasi-experimental research reporting improvements in MMSE scores after Brain Gym interventions (Suminar & Sari, 2023). Furthermore, a systematic review by Varela et al. (2023) highlighted that movement-based cognitive stimulation, including Brain Gym, may contribute to enhanced cognitive performance in older adults.

The improvement observed in this study may be explained by the physiological effects of structured physical movement. Brain gym exercises are believed to stimulate blood circulation and oxygen delivery to the brain, enhance neural coordination, and promote brain-body integration (Basso et al., 2021; Thakre et al., 2024). Previous studies Agusman Motuho Mendrofa, (2020) & Cano-Estrada et al., (2022) have reported that brain gym contributes to improved memory, concentration, and communication abilities among older adults. The stimulation of bilateral brain activity, including lateralization, focusing, and concentration dimensions, may support cognitive processing and memory recall (Güntürkün et al., 2020; Salillas et al.,

2023).

Age and educational background may also influence the extent of cognitive improvement. Participants aged 60–69 years appeared to show better responsiveness to the intervention compared to those aged 70 years and above, possibly due to relatively better physical condition and neural plasticity. Similarly, although elderly individuals with lower educational attainment demonstrated greater baseline cognitive impairment, they still exhibited measurable improvement following the intervention. This finding supports the notion that higher education may provide a protective effect against cognitive decline, while cognitive stimulation activities such as brain gym may help compensate for reduced cognitive reserve.

Implications

The findings of this study suggest that brain gym exercises may serve as a practical and accessible non-pharmacological intervention to support cognitive health among elderly individuals in nursing home settings. Regular implementation of structured brain gym sessions can be incorporated into routine elderly care programs to help maintain cognitive function, improve mental alertness, and enhance overall well-being. For nursing practice, these findings highlight the importance of integrating simple movement-based cognitive stimulation activities into holistic geriatric care. Nurses and caregivers play a key role in facilitating consistent cognitive stimulation interventions, particularly for elderly individuals with moderate cognitive impairment. Given the growing evidence supporting movement-based cognitive stimulation programs (Varela et al., 2023), Brain Gym may serve as a feasible intervention in institutional elderly care settings.

Limitations and Recommendations

This study has several limitations that should be considered when interpreting the findings. First, the use of a one-group pretest–posttest design without a control group limits the ability to establish causal relationships between brain gym and cognitive improvement. Second, the relatively short duration of the intervention and the use of purposive sampling may restrict the generalizability of the results. Additionally, potential confounding factors such as physical health status, medication use, and social interaction were not controlled.

Future research is recommended to employ randomized controlled trial designs with larger sample sizes and longer intervention periods to strengthen the evidence regarding the effectiveness of brain gym exercises. Further studies may also explore the combined effects of cognitive stimulation and other lifestyle interventions, such as nutritional support or social engagement programs, in improving cognitive outcomes among older adults.

CONCLUSIONS

Brain gym exercises were associated with improvements in cognitive function among elderly residents at Bhakti Luhur Nursing Home. Following the intervention, participants demonstrated better cognitive performance compared to baseline assessment. These findings indicate that structured movement-based cognitive stimulation may support cognitive health in institutionalized older adults. Incorporating brain gym into routine elderly care programs may help maintain cognitive function and promote active aging.

Authors' Contributions

All authors collaborate with each other in a series of research, article writing and also the improvement process.

Data Availability

All data utilized in this study, including raw data, analyzed datasets, and supporting documents, are available from the corresponding author upon reasonable request.

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