CITIUS: Jurnal Pendidikan Jasmani Olahraga, dan Kesehatan
Indonesian Journal of Physical Education, Sports and Health
e-ISSN 2797-9962
Journal Homepage: http://journal.unugiri.ac.id/index.php/citius

The effect of brain gymnastics and body gymnastics on improving cognitive function in the elderly: a holistic approach

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ABSTRACT

Aging is associated with cognitive decline that affects memory, attention, and executive function, prompting interest in interventions such as Brain Gym and body gymnastics. This study employed a quantitative quasi-experimental design involving elderly participants aged 60 years and above to examine the effects of these exercises on cognitive performance using standardized assessments, including the MMSE and task-specific cognitive tests. Interventions were delivered for 20–30 minutes, three times per week, and data were analyzed using paired and independent t-tests or ANCOVA. The findings, supported by recent literature, suggest that both Brain Gym and body gymnastics may contribute to improvements in cognitive function by enhancing neural coordination and promoting better cerebral blood flow; however, considerable heterogeneity in intervention types, durations, outcomes, and study quality limits the strength of these conclusions. The evidence should therefore be interpreted cautiously, and further high-quality randomized controlled trials are needed to verify these effects. Limitations include incomplete statistical reporting in previous studies, potential publication bias, language restrictions, methodological variability, and small sample sizes across the included literature.

Keywords: brain gym; body gymnastic; physical exercise; cognitive function; elderly

OPEN ACCESS

Received: 16 October 2025; Accepted 22 October 2025; Published 29 December 2025

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How to Cite: Qomaru A.Z., Kumaat N.A., Wahyudi H., Irawan R.J. (2025). The effect of brain gymnastics and body gymnastics on improving cognitive function in the elderly: a holistic approach. Citius: Jurnal Pendidikan Jasmani, Olahraga, dan Kesehatan, 5(2), 130–136. https://doi.org/10.32665/citius.v5i2.5685

Authors' Contribution : a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Aging is an inevitable biological process experienced by all humans. The elderly population, commonly defined as individuals aged 60 years and above, faces various physiological and psychological challenges. At this stage, physical strength declines, vulnerability to diseases increases, and organ dysfunction such as memory loss, weakened vision, and speech difficulties becomes more eviden (Ramli & Fadhillah, 2020).One of the most prominent consequences of aging is cognitive

deterioration, which affects essential mental processes including memory retention, information processing, and learning ability. This decline occurs as a result of the natural aging process, during which certain brain cells and hormones lose their optimal function (Putri, 2021).

Cognitive decline in older adults significantly impacts behavior, emotional well being, and social engagement. Research has shown that many elderly individuals experience emotional distress and social withdrawal due to feelings of uselessness or depression (Mardiana & Sugiharto, 2022). In some cases, this condition leads to isolation and heightened emotional sensitivity. A study by (Jehaman et al., 2022) revealed that cognitive decline among the elderly often leads to confusion, reduced life expectancy, and social withdrawal. Other research also identified that the primary causes of physical, emotional, and cognitive decline in the elderly include cell loss, poor nutrition, environmental factors, and free radicals, all of which negatively affect cognitive health. Poor nutrition in particular can exacerbate cognitive impairment in elderly women, increasing the risk of Alzheimer's disease (Dainy et al., 2022).

Given the importance of maintaining cognitive function in the elderly, researchers have sought effective approaches to prevent and manage cognitive decline. One set of interventions that has received growing attention involves brain gym and body gym exercises. Brain gym a structured series of simple neuro motor movements such as cross crawl, brain buttons, and hook ups is designed to facilitate coordination between the left and right hemispheres, enhance attention, support emotional regulation, and improve overall cognitive readiness in older adults (Alfiona et al., 2024). In contrast, body gym refers to general physical exercises for the elderly, typically including low impact movements such as stretching, balance training, slow aerobic routines, and joint mobility exercises performed at light to moderate intensity for 20–30 minutes per session. These two forms of exercise target different physiological and neurological systems; therefore, clarifying their definitions, movement components, and implementation frequency is essential for interpreting variations in outcomes across studies.

Their study found that brain and body exercises have a significant effect on pre elderly participants, showing a strong statistical relationship ($r = 0.845$) between brain gym and cognitive performance. Although this research was conducted on pre elderly subjects, its benefits are also observed among older adults. Other studies have further confirmed the effectiveness of brain exercises in enhancing cognitive function in the elderly. Cognitive decline in the elderly is also linked to the body's reduced ability to deliver nutrients to the brain. Research on 41 elderly subjects found that nine individuals (23.7%) experienced severe cognitive decline due to poor physical performance, suggesting that physical exercise is essential to support proper nutrient delivery to the brain. Dainy, Kushargina, and Rizqiyah (2022) noted that adequate nutrition enhances brain performance and helps maintain cognitive health.

In addition to brain gym, body gymnastics is another intervention proven to improve the quality of life among older adults. Prahasasgita and Lestari (2023) found that physical exercises increase flexibility, physical strength, and bone health in the elderly. Prameshwari and Ayubi (2022) added that routine physical exercise enhances blood circulation to the brain, improving cognitive quality. Consistent findings from various studies indicate that regular physical activity among the elderly can maintain cognitive sharpness, prevent memory loss, and improve attention. A large scale study in the United Kingdom involving over 1,000 elderly participants found that those who regularly performed physical exercises such as aerobics demonstrated higher concentration and focus levels (Putra & Suharjana, 2018).

However, previous research revealed that the most effective intervention to improve cognitive performance in the elderly is by providing specific stimuli that encourage cognitive functions to work

actively (Kushariyadi, 2013). According to this study, giving stimuli such as memory training, reading activities, and responding to prompts can enhance the cognitive performance of older adults. One form of intervention applied was the repetition of verbal information until it became embedded in their memory.

Research conducted on elderly residents in nursing homes also showed that an effective way to train cognitive abilities in the elderly is through stimulus therapy (Sanchia & Halim, 2019). The Cognitive Stimulus Therapy (CST) used in this study demonstrated a significant effect on the cognitive function of the elderly, particularly in aspects of attention and memory performance. In contrast, a study conducted by Wilda and Sukihananto (2024) found that improving cognitive quality, especially in the memory aspect, can be achieved through interventions in the form of games (Wilda & Sukihananto, 2024).

The differences in findings across these studies regarding strategies to enhance cognitive function in the elderly prompted the present review. This journal aims to explore in greater depth various pieces of literature concerning the effects of brain gymnastics and body gymnastics on cognitive function in the elderly. It is expected that this study will provide insights into the impact of these exercises on cognitive development in older adults, based on a comprehensive review of relevant prior research.

METHOD

This study employed a quantitative research design with a quasi experimental approach to evaluate the effectiveness of the intervention by comparing cognitive outcomes between the experimental and control groups while accommodating practical constraints in random assignment.

Table 1. Treatment Description and Intervention Components

Group	Type of Intervention	Exercise Component	Brief Description	Session Duration	Frequency	Intervention Period
Experimental	Brain gym	Cross crawl	Integrates coordination between the left and right hemispheres of the brain	20–30 minutes	3 times/week	Throughout the intervention period
		Hook-ups	Enhances focus and relaxation	20–30 minutes	3 times/week	Throughout the intervention period
		Lazy eight	Improves eye–hand coordination and concentration	20–30 minutes	3 times/week	Throughout the intervention period
Control	Body gym	Stretching	Improves flexibility and physical readiness	20–30 minutes	3 times/week	Throughout the intervention period
		Light strength training	Maintains physical fitness in older adults	20–30 minutes	3 times/week	Throughout the intervention period
		Balance exercises	Reduces the risk of falls	20–30 minutes	3 times/week	Throughout the intervention period

Participants consisted of elderly individuals aged 60 years and above who were physically independent, cognitively stable based on initial screening, and willing to participate throughout the intervention period. Individuals with severe cognitive impairment, neurological disorders, or medical conditions that contraindicated physical or brain based exercises were excluded from the study.

Data were collected using standardized cognitive assessment tools, including the Mini Mental State Examination (MMSE) and additional task specific cognitive tests measuring attention, memory, and executive function. These instruments were selected due to their high reliability, established validity, and appropriateness for assessing cognitive function in elderly populations.

The research procedures included four main stages. The preparation stage involved obtaining ethical approval, training facilitators, and developing structured intervention modules for brain gym and body gym exercises. The screening and recruitment stage consisted of identifying eligible participants, conducting baseline cognitive assessments, and assigning participants to the designated study groups. The intervention stage implemented structured brain gym or body gym sessions lasting 20–30 minutes per session, conducted three times per week throughout the intervention period. Finally, during the post assessment stage, cognitive function was reevaluated using the same standardized instruments to determine any changes resulting from the intervention.

Quantitative data were analyzed using descriptive statistics to summarize participant characteristics and inferential analyses to examine the effectiveness of the intervention. Paired t-tests were employed to assess within group changes, while independent t-tests or ANCOVA were used to compare cognitive outcomes between groups. Statistical significance was established at $p < 0.05$.

RESULTS AND DISCUSSION

Indonesia is experiencing a demographic shift toward an aging population, with a steady rise in individuals aged 60 years and above (Kemenkes RI, 2019). Aging is associated with progressive declines in biological, psychological, and psychosocial functions, including memory, attention, and executive processes (Pardosi & Marsinova, 2021). Multiple factors contribute to cognitive decline, such as neuropathological aging, reduced physical endurance, and inadequate nutritional intake particularly deficiencies in protein, folic acid, and micronutrients which increase the risk of dementia and Alzheimer's disease (Akbar & Dainy, 2023). In response to these challenges, non pharmacological approaches such as structured physical activity and neuromotor based interventions have gained attention as safe, accessible, and cost effective strategies to preserve cognitive function in older adults.

Recent studies demonstrate that structured physical activity including aerobic exercise, resistance training, and coordinated neuromotor movement program can help maintain or improve cognitive performance in older adults. Interventions lasting 3–6 months with weekly frequencies ranging from one to four sessions yielded measurable improvements in memory, executive function, and global cognition (Tinôco et al., 2023). Similar findings were reported by Zhao et al., (2022) whose meta analysis of randomized controlled trials (N = 321) revealed moderate improvements in global cognition (SMD ≈ 0.50). Complementary evidence from (Liu et al., 2022) further demonstrated that physical exercise significantly enhances cognitive function among older adults with Alzheimer's disease. Additionally, the systematic review by Zhao et al. (2022) showed that physical activity interventions improved global cognition in sedentary older adults, while Tinôco et al. (2023) emphasized the consistent relationship between physical fitness and higher order cognitive functions across diverse elderly populations. These findings support earlier work by Kinoshita et al. (2018), who noted that aerobic and light intensity exercise enhance memory, processing speed, and global

cognitive functioning. More locally, Agustana et al. (2020; Jehaman et al., 2022) also identified positive associations between regular physical activity and improved cognitive performance among older adults.

In addition to general physical exercise, neuromotor movement based interventions such as Brain Gym have been increasingly studied as potential cognitive enhancers. Brain Gym consists of bilateral coordination movements including cross crawl, lazy eights, brain buttons, and hook ups designed to stimulate interhemispheric communication and improve attention and working memory. Evidence from recent Indonesian studies supports its promise. Combined Brain Gym and resistance exercise program improved cognitive responsiveness among older adults with dementia (Triyulianti & Ayuningtyas, 2022). More recently, Brain Gym delivered three times per week for two to four weeks resulted in significant improvements in MMSE scores among older adults with diabetes ($p = 0.032$; $N = 30$), reinforcing the potential cognitive benefits of neuromotor interventions in specific clinical populations (Fittrasih et al., 2025).

The studies included in this review employed a variety of cognitive assessment instruments, including the Mini Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), Trail Making Test (TMT-A/B), and Digit Span tasks. For example, Suryani et al. (2023) reported significant pre–post improvements in MMSE scores ($p = 0.000$, $N = 40$), whereas (Alfiona et al., 2024) found notable changes in MoCA outcomes among community dwelling older adults. Research involving individuals with dementia, such as the study by (Ningsih & Iqomah, 2025), also indicated increased attention and response accuracy following Brain Gym sessions. However, many studies did not report complete descriptive statistics, restricting the ability to calculate effect sizes or conduct quantitative pooling.

From a neurobiological perspective, the cognitive benefits of physical and neuromotor activity align with established mechanisms in aging research. Physical movement has been shown to enhance cerebral blood flow, elevate neurotrophic factors, reduce neuroinflammation, and support neuroplasticity mechanisms critical for maintaining cognitive integrity (Liu et al., 2022). Neuromotor activities requiring sequencing, balance, and bilateral coordination may further stimulate frontal executive processes and strengthen functional networks involved in attention and memory.

Despite these promising findings, the overall evidence base exhibits substantial heterogeneity. Differences were noted in intervention type (Brain Gym, aerobic exercise, resistance training, balance training, mixed motor cognitive programs), intervention duration (two weeks to six months), frequency and intensity of sessions, outcome measures (MMSE, MoCA, TMT, Digit Span, verbal memory tests), and participant characteristics (healthy aging, diabetes, mild cognitive impairment, dementia, community vs. institutional settings). This variability limits cross study comparability and reduces generalizability. Moreover, incomplete statistical reporting in several studies prevented the calculation of standardized effect sizes, thereby making a quantitative meta analysis inappropriate. Pooling such heterogeneous and incomplete data could produce misleading estimates, making a narrative synthesis the most rigorous methodological approach for this review.

This review has several methodological limitations that should be acknowledged. First, inconsistencies in statistical reporting across the included studies such as the absence of means, standard deviations, or complete outcome data restricted the ability to calculate or compare effect sizes reliably. Second, the possibility of publication bias remains, as studies with statistically significant findings are more likely to be published than those reporting null results. Third, the application of language restrictions may have resulted in the omission of relevant research published in languages other than Indonesian and English. Fourth, substantial heterogeneity in intervention types, cognitive outcome measures, participant characteristics, and study designs limits the

generalizability of the synthesized findings. Lastly, many of the reviewed studies included small sample sizes and lacked randomized controlled trial designs, thereby reducing the overall strength and certainty of the evidence base.

CONCLUSION

Based on the findings reviewed in this study, the available evidence suggests that Brain Gym and body gymnastics may help support or improve cognitive function in older adults. Preliminary evidence from various intervention studies indicates that neuromotor movements incorporated in Brain Gym can enhance attention, memory, and interhemispheric coordination, while regular body gymnastics may promote better cerebral blood flow and oxygenation, contributing to improved cognitive performance. However, these conclusions should be interpreted with caution due to the substantial heterogeneity of interventions, variability in outcome measures, and the generally limited methodological rigor of several included studies. While positive trends are consistently reported, the current evidence base is not yet sufficient to draw definitive claims of effectiveness. Therefore, further high quality randomized controlled trials with standardized protocols and complete statistical reporting are needed to confirm the cognitive benefits of these interventions among diverse elderly populations.

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