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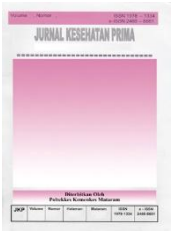

# The Effect of Integrating Brain Vitalization Exercises to Low Impact Aerobic Exercises on Cognitive Improvement of the Elderly

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## Abstract

Cognitive function in the elderly refers to conscious mental activities such as thinking, remembering, learning, and using language. Cognitive impairments can affect daily activities, independence, and social relationships. The purpose of this study was to discover how integrating brain vitalisation exercises into low-impact aerobic exercise affected the cognitive development of older adults (65–75 years old). Pretest and posttest were administered to two groups in a quasi-experimental setting. Purposive sampling was used to choose a total of 26 participants, who were then split into two groups: 13 senior citizens in the Low Impact Aerobic Exercise group and another 13 in the group that mixed low impact aerobics with brain vitalisation exercises. The GPCOG tool was used to test cognitive function. The findings indicated that both groups had made significant progress ($p<0.05$), although there was no statistically significant difference between them ($p>0.05$). While brain vitalisation exercises did not significantly improve cognitive performance, low impact aerobic exercise did. Nonetheless, this type of exercise is recommended as a complementary activity to support cognitive health.

**Keywords: Elderly Exercise; Brain Vitalization; Cognitive Assessment**

## INTRODUCTION

As people age naturally, their body's tissues' ability to repair themselves and carry out their normal function's declines. According to Johansson (2015), this has a major impact, particularly on cognitive function, which encompasses executive function, memory, attention, and problem-solving. According to the Indonesian Ministry of Health, 32.4% of older adults suffer from cognitive decline, which makes it difficult for many of them to maintain their standard of living. In Indonesia, 11.75% of people are above 60, according to BPS (2023). WHO (2022) estimates that 10–12% of Indonesians are elderly, highlighting a significant ageing problem for maintaining their well-being and independence.

The challenge of supporting this group is increasing. Being physically active is one strategy to lower the risk of cognitive deterioration. According to research, older adults can retain improved cognitive performance by engaging in both cognitive and physical activities (Northey et al., 2019; Ngandu et al., 2020). It has been demonstrated that physical activity, including low impact aerobic exercise, can effectively prevent or reduce the deterioration of organ function and lower the chance of developing chronic illnesses

(Rinaningsih et al., 2022; Baker et al., 2019). Through processes linked to enhanced cerebral blood flow and neuroplasticity, physical activity has also been demonstrated to decrease cognitive decline (Erickson et al., 2021).

Research shows that both aerobic exercise and cognitive stimulation programs support brain function independently. However, research on the combination of aerobic exercise and brain vitalisation is still lacking, especially in Indonesia. Although previous research has looked at the benefits of either brain vitalisation or aerobic exercise separately (Wiratma et al., 2021), there aren't many studies that specifically assess how combining the two therapies affects cognitive function in older persons. Exercise in conjunction with cognitive training therapies has been proposed as a more effective way to improve executive function and memory (Bherer et al., 2021). Therefore, this study aims to close this information gap by examining the advantages of combining low impact aerobics with brain vitalisation exercises in older adults.

Engaging in physical activity has been shown to slow cognitive loss. Studies indicate that cognitive stimulation programs and aerobic exercise both help to sustain brain function on their own. However, there is still not much study, particularly in Indonesia, on the combination of aerobic exercise and brain vitalisation. While earlier studies have examined the advantages of aerobic exercise or brain vitalisation independently, there are currently few studies that specifically evaluate the impact of combining the two therapies on older adults' cognitive function. Thus, by investigating the benefits of combining low impact aerobics with brain vitalisation activities in older people, this study wants to fill this knowledge divide or gap.

## METHOD

This study employed a quasi-experimental design with a two-group pre-test posttest approach. The research involved two groups: the intervention group, which received a combined exercise program (brain vitalization exercises integrated with low-impact aerobic exercise) for eight weeks with a frequency of three sessions per week; and the control group, which received only low-impact aerobic exercise. The study was conducted in RW 11 Ciomas Permai Housing, located in Ciapus Village, Ciomas District, Bogor Regency. The research took place from November 2024 to April 2025, starting with the preparation of the research proposal, followed by data collection from January to February 2025. The study population consisted of 26 elderly individuals residing in RW 11 Ciomas Permai. Sampling was performed using a purposive sampling technique, selecting participants based on predetermined inclusion and exclusion criteria.

Inclusion Participants were selected based on the following criteria Elderly individuals age between 60-75 years, residing permanently in the research area, in stable health condition with normal vital signs (normal blood pressure, heart rate, and saturation),, had not participated in any low-impact aerobic exercise program aimed at improving cognition on the previous month on the following criteria willing to participate for the entire duration of the study and provided written informed consent. Exclusion participant was categorized if they unable to communicate effectively, unable to mobilize independently, suffering from musculoskeletal disorders, diagnosed with serious or chronic medical conditions. After data collection, all data were processed and analyzed systematically to test the research hypothesis. Statistical analysis included participant characteristic to describe each variable, and to determine the effect of adding the

intervention on cognitive function. Shapiro-wilk test was applied to assess data normality, as the sample size was less than or equal to 50.

Respondents provided a statement of willingness and consent to participate without coercion from the beginning to the end of the study. Their participation was voluntary and without coercion, as stated in written informed consent. Furthermore, at the end of each meeting or intervention, respondents were required to sign their attendance by initialing the attendance sheet provided by the researcher.

This research has met all requirements and received ethical clearance from the ethics committee of Respati University Yogyakarta on December 23, 2024, under the registration number 005.3/FIKES/PL/1/2024. Brain vitalization exercise is carried out three times a week, with the training intensity targeted to reach 70% of the maximum heart rate (220 - age). Each session lasts for 20–30 minutes and focuses on cognitive exercises designed to stimulate brain function (Prihastuti, 2009; Rohana, 2011).

**Table 1 Movements of Brain Vitalization Exercises**

| Session | Movements Name | Movements |
|---|---|---|
| Warming up | Prayer |  |
| | Hope |  |
| | Butterfly flap |  |
| | Jasmine Garland Sequence |  |
| Core Movements 1 | Tracing Step |  |
| | Certain Step |  |

| | | |
|---|---|---|
| | Victory |  |
| | Cheerfullness |  |

| | | |
|---|---|---|
| Break | Touching Rainbow |  |
| | Affection |  |
| Core Movements 2 | Reaching Hopes |  |
| | Looking at sky |  |
| | Following Footsteps |  |
| | Hero's Flap |  |
| Cooling | Whistle |  |
| | Smiling |  |
| | Raising and Lowering Eyebrows |  |
| | Open and Shut Eyes |  |
| | Offerimg |  |

## RESULT AND DISCUSSION

The result of analysis is using by two categories, such as univariate for characteristics like age, gender and last education and bivariate for the data of this research using indepent t-test. This research was conducted from January 2025 to February 2025 in RW 11 Ciomas Permai Housing located in Ciomas Permai, Ciapus Village, Ciomas District, Bogor Regency. This research was conducted for 4 weeks, with each week carried out 3 times a week for a total of 24 meetings in this study. Before data collection, the researcher explained the purpose and objectives of the study. The research sample amounted to 26 people who were determined using purposive sampling technique in accordance with the inclusion and exclusion criteria of the study.

**Table 2 Respondent frequency distribution**

| Characteristic | Group | N | % |
|---|---|---|---|
| Intervention | Low-Aerobics with Brain vitalization | 13 | 50,0 |
| | Low-Aerobics Only | 13 | 50.0 |
| Age | Young old (65-69 age) | 15 | 57,69 |
| | Midlle old (70- 75 age) | 11 | 42,31 |
| Gender | Man | 0 | 00,0 |
| | Woman | 26 | 100 |
| Knowledge | Good | 16 | 61,5 |
| | Enough | 7 | 26,9 |
| | Not enough | 3 | 11,5 |
| Attitude | Negative | 37 | 57,8 |
| | Positive | 27 | 42,2 |

Table 2 shows that in this study, 26 respondents were divided into two groups, namely 13 Low-aerobics with brain vitalization as the case group and 13 Low-aerobics only as the control group. Young old age (65-69 years), namely 15 people (57.69%), and Middle old age (70-75 years), namely 11 people (42.31%). Respondents who's based on the gender of the respondent, the researcher got a female sample of 32 people (100%). Those who have good knowledge are 16 people (61.5%), those who have sufficient knowledge are 7 people (26.9%), then those who have less knowledge are 3 people (11.5%).

**Table 3**
**Distribution of Respondents Group Low-Aerobics with Brain Vitalization**

| Category | Mean±SD | Score range | 95%CI |
|---|---|---|---|
| Pre-test | 10 | 4-8 | 5.20-6.49 |
| Post-test | 11 | 6-9 | 7.11-8.43 |
| Difference | 2 | 0-4 | 1.16-2.68 |

Based on the Table 3, it shows that the majority of respondents who are in group Low-aerobics with brain vitalization were experiencing a notable improvement with as many as 13 respondents and the score difference between pre-test and post-test shows that respondents have a significant improvement in this Group.

**Table 4**
**Distribution of Respondents Group Low-Aerobics Only**

| Category | Mean±SD | Score range | 95%CI |
|---|---|---|---|
| Pre-test | 17 | 22,7 | 100,0 |
| Post-test | 6 | 45,5 | 100.0 |
| Difference | 23 | 100,0 | 100,0 |

Based on table 4 above shows that most of the respondents who is group with Low-aerobics only, as many as 13 people showed improvement too, but Slightly lower than the other Group.

Table 4 shows results of independent t-test of two group. Normality and homogeneity tests were met the Shapiro-Wilk test indicated that all cognitive score variables in both groups pre-test, post-test, and difference had p-values greater than 0.05, confirming normal distribution. Based on the results of the *Paired Sample T- Test* analysis, there was a significant increase in cognitive function after the intervention in both groups ($p < 0.05$). Respondents of both groups showed statistically significant improvements in cognitive scores after intervention.

Based on Table 4 the group low-aerobics with brain vitalization mean score between pre-test and post-test (1.92 ± 1.256). Group low-aerobics only mean score between pre-test and post-test (1.54 ± 0.78).

**Table 5 Results of bivariate analysis independent t-test between the group low aerobic with brain vitalization, and group with low-aerobics only to compare the difference in the improvement of the two groups Cognitive**

| Category | Group 1(Mean ± SD) | Group 2(Mean ±SD) | ΔMean | *t-value* |
|---|---|---|---|---|
| Pre-test | 5.58 ± 1.07 | 5.54 ± 0.88 | 0.04 | 0.803 |
| Post-test | 7.77 ± 1.09 | 7.08 ± 1.04 | 0.69 | 1.657 |
| Difference | 1.92 ± 1.256 | 1.54 ± 0.78 | 0.38 | 0.939 |

Independent t-test showed no significant difference between the mean difference of the two groups ($p = 0.357$), although the Aerobic Low Impact & Brain Vitalization Gymnastics group had a greater mean value. Combined interventions have the potential to have a greater positive impact, emphasizing the importance of physical activity for cognitive health of the elderly. Low impact aerobic exercise had an effect on cognitive improvement in both groups. Addition of brain vitalization exercises to low impact aerobic exercise does not have a major effect in significantly improving cognitive of the elderly. This may be because low impact aerobic exercise itself is quite effective in improving cognitive function, as evidenced by the research of (Zheng et al., 2024) Nevertheless, brain vitalization exercises still have benefits in improving cognitive aspects such as memory, attention, and thinking ability, as shown by Wayan Wiratma et.al (Wayan Wiratma et al., 2021). The results of the study were not statistically significant because both exercises have the same movement principles and goals, namely improving cerebrocardiovascular fluency which affects cognitive function. Both exercises stimulate proprioceptive, but the difference lies in intensity and duration. Low impact aerobics has a higher intensity with a duration of 20 minutes, while brain vitalization exercises are slower and more relaxed with a duration of 10 minutes. This statement supports the argument that the addition of brain vitalization exercises to low impact aerobic exercise has an effect compared to low impact aerobic exercise alone (Pangestuti et al., 2025)

The addition of brain vitalization exercises may have less effect due to the absence of male samples. Yang et al (Yang et al., 2025) states that where the percentage of memory decline is more experienced by women than men, this is due to hormonal roles. In addition, differences in social and cultural

characteristics between men and women may influence participation and outcomes from gymnastics interventions, where women may be more involved in social activities that support mental and physical health. Research shows women excel in verbal memory, but are more susceptible to memory decline due to hormonal fluctuations during perimenopause (Yang et al., 2025) According to Liu et al (Liu et al., 2025) the percentage of memory decline is more experienced by women than men, this is due to hormonal roles. In addition, differences in social and cultural characteristics between men and women can affect participation and outcomes from gymnastics interventions, where women may be more involved in social activities that support mental and physical health. The decline in cognitive function is largely due to damage to neural networks. Men excel in spatial memory with higher brain network (Liu et al., 2025) The gender imbalance of the sample may affect the results and lack of statistical significance.

The intervention in this study was conducted over 8 weeks, with 3 meetings per week (24 meetings in total, including pre-test and post-test). Regular physical activity during this period improves the fitness of the elderly, allowing the body to adapt to the intervention. These triggers increased muscle contraction, cardiac output and fat burning, there by increasing blood flow to the brain and potentially improving cognitive function. Improved cognitive function is particularly important for older adults aged 65-75 years. Poor cognitive function can negatively impact physical ability, independence, daily activities and social relationships. This condition, if it continues, can significantly reduce the quality of life of the elderly (Kong et al., 2024)

## CONCLUSION

Based on the results of the research and statistical tests conducted, it can be concluded that both intervention groups those who received low-impact aerobic exercise alone and those who received a combination of low impact aerobics and brain vitalization exercises showed significant improvements in cognitive function. However, the addition of brain vitalization exercises did not result in a statically significant enhancement compared to aerobic exercises only. Although the mean post-test score was slightly higher in the combination group, the difference was not meaningful in statistical terms. Therefore, it can be concluded that low-impact aerobic exercise alone is effective in improving cognitive function in the elderly aged 65-75 years, and the addition of brain vitalization exercises does not provide a significant added benefit.

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