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The Effect of Combination Therapy of Brain Gymnastics and Elderly Gymnastics on Improving Cognitive Function in the Elderly

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Abstract

Background: The increasing prevalence of elderly individuals experiencing a decline in cognitive function impacts their daily activities and increases their dependency on others. The study aimed to determine the effect of combined brain exercise and elderly exercise therapy on improving cognitive function in older people at Sudagaran Banyumas Social Service Home for the Elderly**. Method:** This quantitative study utilized a Quasi-Experimental design with a pretest-posttest control group approach. The sample consisted of 30 elderly individuals, selected using total sampling techniques. The instrument used was the Mini-Mental State Examination (MMSE). Data analysis was conducted using the Mann-Whitney test. **Result:** The results revealed that most respondents were female, with 11 women (73.3%) in the intervention group and eight women (53.3%) in the control group. The average age of respondents was between 60-69 years, with ten individuals (66.7%) in the intervention group and six individuals (40.0%) in the control group. Most respondents were in elementary school education, with seven individuals (46.7%) in the intervention group and six individuals (40.0%) in the control group having no formal education. The MMSE scores of older people who received the intervention revealed a significant increase, from an average score of 18.67 to 20.73. **Conclusion:** Indicating a substantial effect of combined brain exercise and elderly exercise therapy on improving cognitive function in older people. Older people are expected to regularly engage in activities to enhance cognitive function further.

Keywords: cognitive function, elderly, brain exercise, elderly exercise

INTRODUCTION

Aging is a natural process, everyone experiences three different stages of life, namely, infancy, adulthood, and old age [1]. Indonesia is among the top five countries in Southeast Asia with the largest percentage of elderly population at 5.9% [2]. Since 2021, Indonesia has entered an aging population structure, where around 1 in 10 residents are elderly.. According to information released by the Ministry of Health of the Republic of Indonesia in 2020, the elderly population in the country has increased to 28.8 million people, or 11.75% of the total population. Yogyakarta, East Java, Bali, West Sumatra, North Sulawesi, and Central Java are the six provinces with the highest percentage of elderly population (15.05%). Based on data from [3] the total number of elderly people in Banyumas Regency is 192,268 elderly people. This number will be divided into three categories: young elderly (60–69 years old) totaling 110,187 elderly people, middle elderly (70–79 years old), and old elderly (80 years and over), totaling 46,106 elderly people.

As the number of elderly increases, problems resulting from the aging process also increase. Among them are problems with the elderly's nervous, digestive, cardiovascular, and urinary systems. The nervous system can malfunction in the elderly, especially when their motor and sensory perception abilities deteriorate and their cognitive functions are impaired [4]. estimated 65.6 million elderly people worldwide suffer from cognitive impairment. There are 121 million elderly people in Indonesia who have poor cognitive function, with 5.8% of men and 9.5% of women affected. According to research, 5% of the elderly population experiences cognitive decline at the age of 65, and this number increases to 20% at the age of 85 or older. Elderly people often forget things quickly, with 30% of them experiencing memory problems at the age of 50–59, 35%–39% at the age of 65, and 85% at the age of 85 [5].

Cognitive function is the skills used in problem solving, thinking, remembering, and learning. Central nervous system changes associated with aging are a source of cognitive decline in older adults. This can lead to dependence on others and an inability to remember one's identity and perform daily tasks (Pragholapati et al., 2021). Therefore, interventions are needed to improve the cognitive function of the elderly. Some therapies that can be done include elderly gymnastics which have a significant effect on the cognitive value of the elderly [7]. Another journal stated that exercise can improve cerebrovascular function, cognition, and neuroplasticity through brain areas related to executive function and memory in adults aged 50 years or older, regardless of their health status [8]. In addition to elderly gymnastics, brain gymnastics can also reduce boredom and can assess gross motor skills, fine motor skills, language, cognitive and socialization according to age level. The aim of this brain gymnastics is to slow down dementia and eliminate stress [9].

METHOD

This study is a quantitative study using a Quasi Experiment research design with a pretest posttest approach with a control group. The sampling technique in this study used the total sampling method with inclusion and exclusion criteria, namely elderly who can read and write, elderly who have mild and severe cognitive function scores, elderly who can communicate well, are able to be respondents and elderly who do not suffer from physical mobility disorders or elderly with mental disorders. The number of samples that meet the criteria is 30 people. Which is divided into 2 groups, namely 15 people in the intervention group from the Sudagaran Banyumas Elderly Social Service Center and 15 people in the control group from the Catur Nugraha Suro Elderly Center. The research instrument used The Mini-Mental State Examination (MMSE). Data analysis used the *Mann Whitney* test. With 8 interventions for 4 weeks.

RESULTS AND DISCUSSION

Based on table 1, it can be concluded that the majority of respondents in this study were women, namely 11 elderly people or 73.3% for the intervention group and 8 elderly people or 53.3% for the control group. For the education category, it can be concluded that most respondents have elementary school education, namely 7 elderly people or 46.7% for the intervention group and

did not attend school, namely 6 elderly people or 40% for the control group. For the age category, it can be concluded that the respondents in this study were dominated by elderly people aged 60 to 69 years, namely 10 elderly people or 66.7% for the intervention group and 6 elderly people or 40.0% in the control group.

Table 1. Respondent Characteristic

Respondents' characteristic	Intervention group (n=15)		Control group (n=15)	
	n	%	n	%
Gender				
Male	4	26,7	7	46,7
Female	11	73,3	8	53,3
Age				
60-69 years	10	66,7	6	40,0
70-79 years	2	13,3	5	33,3
80-95 years	3	20,0	4	26,7
Education				
No school	6	40,0	6	40,0
Elementary school	7	46,7	5	33,3
Junior high school			2	13,3
High school	2	13,3	2	13,3

Table 2. MMSE scores before and after intervention

Variables	Intervention group		Control group	
	Pre	Post	Pre	Post
Mean ± DS	18,67±1,589	20,73±1,438	15,13±3,642	15,13±3,642
Min - max	16-21	13-18	10-21	10-21

Based on table 2 it can be described that the mean cognitive function based on measurements using MMSE before the combination of brain gymnastics and elderly gymnastics therapy in the intervention group was 18.67 ± 1.589 and after the intervention was 20.73 ± 1.438. While in the control group, the mean result was 15.13 ± 3.642 and the post-test value was 15.13 ± 3.642.

Table 3. Results of the effect of combination therapy

Variables	z	p	r
Differences in MMSE before and after intervention	-3,819	0,001	-0,99

Based on the results in table 3 using the Mann Whitney test, there is a significant difference in the MMSE score between before and after the intervention of combination therapy of brain gymnastics and elderly gymnastics with statistical notation z = -3.819, the p-value is 0.001 <0.05 and r = 0.99. Calculation of the effect (effect zize) according to roshental (1992) r = z / (√n) where r = effect size, z = calculated z value, n = number of samples. The value of r = -0.99 was obtained. According to Choen (1988-1992) r = 0.10 (small effect), r = 0.30 (moderate effect) and r = 50 (large effect). So the result r = -0.99. In this study, it can be concluded that the intervention of combination therapy of brain gymnastics and elderly gymnastics has a major influence in improving the cognitive function of the elderly.

Based on the results of the study of 30 respondents who experienced mild to severe cognitive decline, it was found that the majority of respondents who experienced cognitive decline were women, as many as 11 people or 73.3% and 8 elderly people or 53.3% of the control group. While male respondents tend to have better cognitive function results. A more detailed analysis in this case can be seen from the MMSE score where in terms of memory, male respondents are better able to remember the orientation of time, place, date, month, address, this can also be influenced by the role of the serotonin hormone which affects memory function, low serotonin levels result in weakness in storing [10]. Neurotransmitters in the hormone serotonin are directly and indirectly involved in the memory storage process, while the amount of serotonin hormone in men is greater than in women, this is what influences the differences in cognitive function in men and women [11].

In addition to hormonal factors, other factors also affect the cognitive function of the elderly, such as environmental factors and habit factors. Judging from the social interaction of male respondents, they interact more often with their environment, while female respondents are more often in their rooms. In addition, male respondents also do sports more routinely, this is in line with research. In addition to hormonal factors, other factors also affect the cognitive function of the elderly, such as environmental factors and habit factors. Judging from the social interaction of male respondents, they interact more often with their environment, while female respondents are more often in their rooms. In addition, male respondents also do sports more routinely, this is in line with research which states that interacting with friends, participating in hobby groups, and sports groups is associated with better cognitive function among both men and women [12].

Based on the results of the study on the age of respondents, it can also be concluded that the respondents in this study were dominated by elderly people aged 60 to 69 years, namely 16 people or 53.3% who on average experienced mild cognitive decline, namely between MMSE scores of 18-22, while at the age of 70 to 79 years there were 7 people or 23.3%, at the age of 80 to 95 years there were 7 people or 23.3% who experienced severe cognitive function with MMSE scores <18. This can be attributed to the speed of processing in the central nervous system which decreases with age. This change is experienced by almost everyone who reaches the age of 70 years. At the age of 65-75 years there is a decline in some abilities with wide variations in individual differences, at the age of 80 years there is a significant decline in abilities [13].

Based on the results of the study regarding the level of education, the majority of respondents who experienced a decline in cognitive function were respondents who had a low level of education, namely elementary school, as many as 12 people or 40% and 12 respondents who had not received an education or 40%, while the percentage of respondents with a higher level of education rarely experienced a decline in cognitive function. Early life education may have lifelong effects on cognitive function as well as indirect effects through increased cognitive reserve. The cross-lagged effects of social engagement on cognitive function are significant and vice versa. Future research could explore other cognitive reserves across the lifespan and the underlying mechanisms for achieving healthy cognitive aging [14]. We can see from the MMSE scores that in all aspects such as memory, registration, calculation and language, respondents with a high level of education are mostly able to answer better than respondents with a low level of education.

In this study, the mean MMSE score of cognitive function based on measurements using MMSE before the combination of brain gymnastics and elderly gymnastics therapy in the intervention group was 18.67 ± 1.589, with a minimum value of 16 and a maximum value of 21. The MMSE results showed that most respondents were quite weak in the calculation and orientation sections. Meanwhile, after the intervention, the MMSE score increased to 20.73 ± 1.438 with a minimum value of 18 and a maximum value of 23. While in the control group, the mean result was 15.13 ± 3.642 with a minimum value of 10 and a maximum value of 21. This is influenced by the physiological processes that occur in the elderly, namely complex conditions and related to changes that occur at the structural, functional and molecular levels [15].

From the results of data analysis of 15 respondents who received intervention using the Mann Whitney test, the asymp. Sig. (2-tailed) or p Value was obtained as 0.000 <0.05 which means Ha is accepted, where brain gymnastics therapy and elderly gymnastics can have a major influence on improving the cognitive function of the elderly. Decreased cognitive function can be prevented by providing brain stimulus to improve the cognitive function of the elderly. One of the stimuli that can be given is providing brain gymnastics to the elderly regularly which can have a good impact on improving the cognitive function of the elderly (Fitriyono, 2023). Brain gymnastics stimulates restorative activity to the corpus callosum, providing two-way neural connections between cortical areas in two parts of the brain, including the hippocampus and amygdala [16].

In addition to brain gymnastics, elderly gymnastics is also one of the interventions that can be used to reduce the possibility of cognitive decline in the elderly. Movements that involve most of the body's muscles according to daily movements can have a significant impact [17]. In the research [18]. A 6-month 2-times-a-week exercise program for older adults with cognitive impairment can improve frontal lobe cognitive functions such as attention, delayed recall, and verbal fluency, but not immediate recall. A systematic review found that physical activity improves cognitive functions, especially delayed recall, in healthy older adults.

CONCLUSION

The average respondent aged 60-69 years was mostly female and had low education, the majority experienced a decline in cognitive function. The mean or average measurement of cognitive function using MMSE in the intervention group was 18.67 ± 1.589 and after the intervention was 20.73 ± 1.438. While in the control group, the mean result was 15.13 ± 3.64. There is an effect of combination therapy of brain gymnastics and elderly gymnastics on improving cognitive function in the elderly. It is hoped that the elderly can routinely carry out combination therapy of brain gymnastics and elderly gymnastics to improve cognitive function and for further researchers who want to conduct research with the same theme, it is hoped that they will conduct research using an exercise program by paying attention to the weaknesses that exist, and these results can be used as a comparison, so that later the brain gymnastics and elderly gymnastics training program can be developed to obtain better results.

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