

## The Effects of Brain Gym and Coloring Pictures on Cognitive Functions of the Elderly

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### Abstract

Elderly phase is the final process of human age in growth and development. Aging is a change that impacts physical and cognitive functions. The decrease of cognitive functions can interfere with all activities of the elderly. The objective of this research is to investigate the effects of brain gym and coloring pictures on the cognitive functions of the elderly. This study used a quasi-experimental design with a pre-test and post-test without a control group. Purposive sampling was applied to select the respondents at an elderly nursing home. The total sample was 30 respondents that included 15 respondents of the brain gym intervention group and 15 respondents of the coloring picture intervention group. The results showed that there was no significant difference in cognitive function before and after the intervention given to the coloring picture group with the p-value  $0.414 > \alpha (0.05)$ . Meanwhile, there was a significant difference in cognitive function before and after the intervention given to the brain gym group with the p-value  $0.025 < \alpha (0.05)$ . The management of nursing home should provide the brain gym activities to improve the cognitive functions of the elderly.

**Keywords:** The elderly, brain gym, coloring pictures.

### Abstrak

Fase lanjut usia merupakan proses akhir usia manusia dalam tumbuh kembang. Penuaan adalah perubahan yang berdampak pada fungsi fisik dan kognitif. Penurunan fungsi kognitif dapat mengganggu semua aktivitas lansia. Tujuan penelitian ini adalah untuk mengetahui pengaruh senam otak dan mewarnai gambar terhadap fungsi kognitif lansia. Penelitian ini menggunakan desain eksperimen semu dengan pre-test dan post-test tanpa kelompok kontrol. Purposive sampling diterapkan untuk memilih responden di panti jompo. Jumlah sampel sebanyak 30 responden yang terdiri dari 15 responden kelompok intervensi senam otak dan 15 responden kelompok intervensi mewarnai gambar. Hasil penelitian menunjukkan bahwa tidak terdapat perbedaan yang signifikan fungsi kognitif sebelum dan sesudah diberikan intervensi pada kelompok gambar mewarnai dengan p-value  $0,414 > \alpha (0,05)$ . Sementara itu, terdapat perbedaan yang signifikan fungsi kognitif sebelum dan sesudah diberikan intervensi pada kelompok senam otak dengan p-value  $0,025 < \alpha (0,05)$ . Manajemen panti jompo sebaiknya menyediakan kegiatan senam otak untuk meningkatkan fungsi kognitif lansia.

**Kata kunci:** Lansia, mewarnai gambar, senam otak.

## Introduction

Aging or growing old is a natural and occasionally inconspicuous process. This process occurs naturally with the decline of physical, psychological, and social conditions interacting with one another. The aging process of the elderly is described linearly through four stages, namely impairment, functional limitations, disability, and handicap that is experienced simultaneously with the decline process. One of the body systems experiencing a decline is a cognitive or intellectual system called dementia (Hartinah, Pranata, & Koerniawan, 2019).

In 1998, the Health Ministry of the Indonesian Republic reported that the increase in dementia incidence is directly proportional to the rise of the population's life expectancy. Approximately 5% of the elderly age range 65-70 years suffer from dementia, and it doubles in each of 5 years to reach more than 45% at the age above 85 years. Dementia is a collection of symptoms characterized by cognitive and memory impairment that can affect the daily activities.

People with Alzheimer's disease experience impaired memory and thought processing affecting the ability to make decisions. The decline in cognitive function of the elderly with dementia often affects their daily activities and social interactions. This condition will also influence the life quality of the elderly. The Interventions that stimulate cognitive function are necessary to improve the life quality of the elderly with dementia. Pharmacological and non-pharmacological are two ways used to manage dementia.

The Pharmacological interventions are giving drugs to elevate cognitive function, and non-pharmacological interventions are providing interventions that included Cognitive Rehabilitation Therapy (CRT).

One of the CRT interventions is an alternative therapy that includes art therapy and activity therapy, such as a brain gym. Brain gym is a series of simple movement exercises that help to optimize the function of all kinds of centers in the human brain. This exercise can escalate blood and oxygen flow to the brain, improve memory and concentration, increase body energy, regulate blood pressure, and enhance vision, physical balance, and coordination. Light movements with the hand and foot games can provide stimulation or stimulus to the brain so that it aids to improve the balance or harmonization between emotional and logical controls, optimize the performance functions of the five senses, and maintain flexibility and balance. Brain gym is applicable for all ages, such as the elderly, infants, autistic children, adolescents, and adults (Lilik Pranata, Dheni koerniawan, 2019). All the elderly certainly want to be able to live in prosperity in their old age with their children and their families in their own homes (Yusuf, Kurnia, Aero, & Noerviana, 2018).

A previous related study revealed that the average cognitive function of the elderly before the brain gym intervention was 21.67, with a standard deviation of 3.869. Then after the brain gym intervention, the average cognitive function of the elderly was 25.63, with a standard deviation of 2.250. The results of the statistical test also showed the p-value  $<0.05$ , and the increase in cognitive function of the elderly after the brain gym intervention was 84.54% of the initial cognitive function (Guslinda & Hamdayani, 2013). Another study reported that the depression level of the elderly decreased after obtaining brain-cognitive therapy (Prasetya, Hamid, & Susanti, 2010). The other research pointed out that the elderly with the decreased cognitive function will experience body mass index decline as well (Layla & Wati, 2017).

The results of other similar studies also showed the positive impacts of the brain gym. The brain's vitality gym affected physical fitness in the elderly. Furthermore, it improved the cognitive function (Lukman, 2020). Moreover, it helped to increase the cognitive function level of the pre-elderly (Kartolo, 2020). Besides, it was more effective to use the brain gym in improving the mental health of the elderly (Bachtiar, 2019). At last, the brain gym and Poco-Poco exercise increased the executive function of the elderly population (Turana, 2020).

Dealing with it, a research result also indicated that brain training improved the cognitive function of the elderly (Ibnu Abas, Agus Setiawan, Widyatuti, 2020). Meanwhile, a study on the use of Mandala color therapy revealed that there was no significant difference between the test before and after Mandala color intervention with p-value = 0.324 and a mean reduction of 0.69 points. However, there was a significant difference with p-value = 0.042 in the elderly group with mild and severe cognitive impairment (Ayu TP, Dwi, & Wilis, 2019). Through this assistance for the elderly, it is hoped that it can provide benefits for increasing the life expectancy and health status of the elderly (R, Nurdin, & Saleh, 2019). Another study reported that there was a correlation between the painting duration and neurocognitive function (Putri, 2019). The other study showed that the application of art therapy to make batik Colet was useful to prevent dementia if it was carried out regularly and continuously (Ulfiana, 2020). On the basis of the background and discussion above, the researchers are interested in conducting a study that combines brain gym art therapy (coloring pictures). Therefore, this study entitled "The Effects of Brain Gym and Coloring Pictures on Cognitive Functions of the Elderly".

Aging is not a disease. It is a process of decreasing the body's resistance responding to the stimuli coming from in or out of the body. However, various diseases frequently afflict the elderly (Elina Susanti, A Manurung, 2018). The age limit of the appearance of people begins to decline is unclear. The physiological functions of the body organs in each individual are different in the peak and decline points. It is also extremely individual as the physiological function of the body generally reaches its peak at the age of 20 and 30 years (Azizah & Lilik Ma'rifatul, 2011).

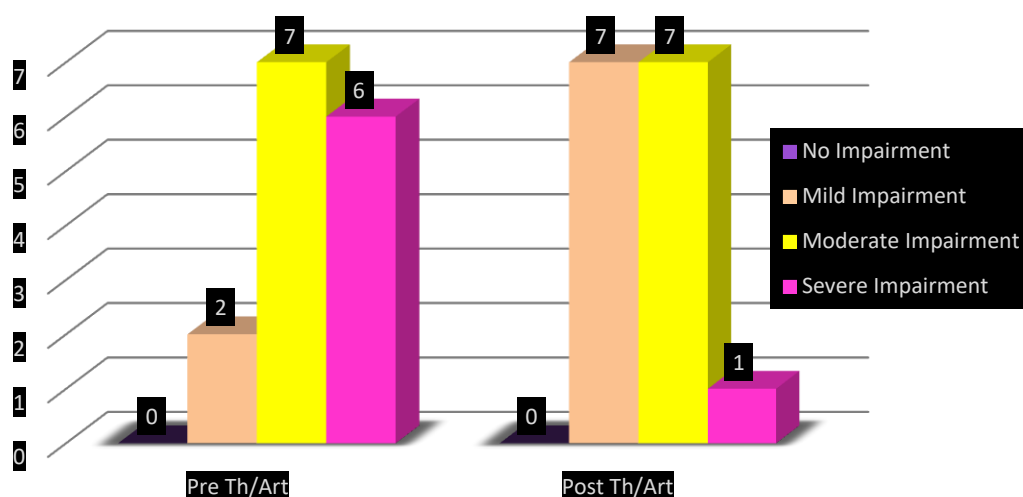
The body organ will remain intact temporarily after reaching the peak point (Hardika & Pranata, 2019). It gradually decreases as we are getting older. Gymnastics, a body exercise, is created deliberately, arranged systematically, and carried out consciously to form and develop a person in harmony (Proverawati, 2010). The benefits of doing regular and correct exercise in a sufficient period include slowing down the degeneration process due to age changes, forming various mental attitudes, and providing stimulation for weak nerves for the elderly (Lilik Pranata, Dheni koerniawan, 2019).

## Method

This study used a quasi-experimental design with a pre-test and post-test without a control group. Purposive sampling was applied to select the respondents at an elderly nursing home. The total sample was 30 respondents that included 15 respondents of the brain gym intervention group and 15 respondents of the coloring picture intervention group. The researchers conducted the intervention activities in 10 consecutive days, every morning at 09.30-10.00, with a duration of 15-30 minutes, the first day a pretest and the last day a post-test. The inclusion criteria of the study were the elderly aged  $\geq 50$  years and able to move the lower and upper extremities. The assessment of cognitive functions of the elderly used the Mini-Mental State Examination (MMSE) that consists of six parts, namely Orientation, Registration, Attention and Count, Memory, Language, Basic Motor with a total maximum score of 30.

## Result

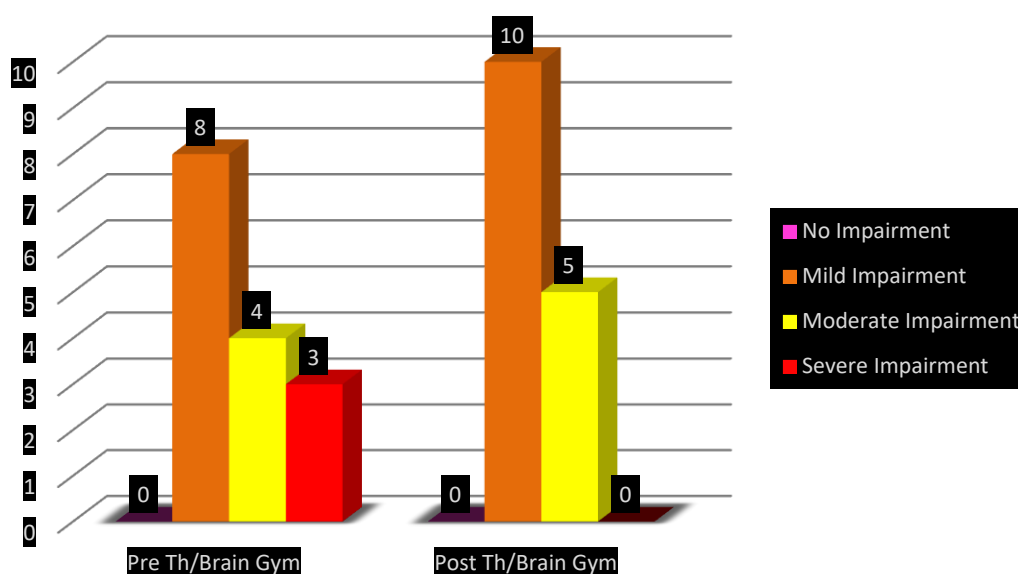
The results of the research are described as follows:



### Diagram 1. The Cognitive Function of Pre and Post Intervention of Coloring Picture

Diagram 1 showed that before the intervention, the respondents of the coloring picture group experienced different types of cognitive function impairments, namely two respondents (13%) with mild impairment, seven respondents (47%) with moderate impairment, and six respondents (40%) with severe impairment.

After the intervention, the number of respondents who experienced severe cognitive function impairment decreased from six respondents (40%) to one respondent (7%). The rest respondents experienced other two-level impairments, namely seven respondents (47%) with mild impairment and seven respondents (47%) with moderate impairment.



### Diagram 2. The Cognitive Function of Pre and Post Intervention of Brain Gym

Diagram 2 revealed that before the intervention, the numbers of respondents of the brain gym group that experienced cognitive function impairment in the three levels were as follows eight respondents (53%) with mild impairment, four respondents (27%) with moderate respondents (27%), and three respondents (20%) with severe impairment.

After the intervention, the number of mild impairment respondents increased from eight respondents (53%) to ten respondents (67%). Moreover, the number of moderate impairment

respondents improved from four respondents (27%) to five respondents (33%). Meanwhile, none of the respondents experienced severe impairment.

**Table 1. The Result of Statistical Analysis on the Difference of the Elderly Cognitive Function Pre and Post the Intervention of Coloring Pictures and Brain Gym**

Cognitive Function Variables	Coloring Picture Group			Brain Gym Group		
	n	Sum of rank	<i>p</i>	n	Sum of rank	<i>p</i>
Decline	2			0		
Increase	4	14	0.41	5	15	0.02
Stable	9		4	10		5
<b>Total</b>	<b>15</b>			<b>15</b>		

Table 1 illustrated that after the coloring picture intervention, there were two respondents with cognitive function decline, four respondents with cognitive function increase, and nine respondents with stable cognitive function. Statistical Wilcoxon Test showed that the sum of the rank value of the coloring group (14) was smaller than the sum of the rank value of the brain gym group (15). The result of the pre and post-intervention revealed that the *p*-value was 0.414 >  $\alpha$  (0.05). It indicated that there was no significant difference in the elderly cognitive function before and after the coloring picture intervention.

Table 1 also showed that after the brain gym intervention, there was no cognitive function decline on the respondents, five respondents with cognitive function increase, and ten respondents with stable cognitive function. Statistical Wilcoxon Test indicated that the sum of the rank value of the brain gym group (15) was higher than the sum of the rank value of the coloring group (14). The result of the pre and post-intervention revealed that the *p*-value was 0.02 <  $\alpha$  (0.05). It pointed out that there was a significant difference in the elderly cognitive function before and after the brain gym intervention.

**Tabel 2. The Result of Analysis on the Difference of the Elderly Cognitive Function after the Interventions of Coloring Picture and Brain Gym**

Cognitive Function Variables	n	Mean Rank	<i>p</i>
Coloring Picture	15	13.38	0.233
Brain Gym	15	17.17	
Total	30		

Table 2 described the differences in the elderly cognitive function after the coloring pictures and brain gym interventions. The table showed that the Mean Rank of coloring picture group 13.83 was lower than the Mean Rank of brain gym group 17.17. There was a difference of 3.34 between them. Furthermore, the result of Mann-Whitney test indicated the  $p$ -value = 0.223 >  $\alpha$  (0.05). In other words, there was no significant difference in the elderly cognitive function after coloring pictures and brain gym interventions.

## **Discussion**

Brain gym will not only accelerate blood flow and oxygen to the brain but also stimulate both hemispheres to work. The body's functions continue to change according to the aging process (Pranata, 2020b). This situation will have a significant impact when there are changes in the physiological functions of the human body (Pranata, 2020a). Just as a life will inevitably experience death, this mechanism becomes a natural law in the human body (Pranata, 2020c), with the final stage of human development, namely the elderly (Pranata, 2020c). All organs undergo changes that will threaten even obstacles in living daily life, such as cognitive disorders, then the situation this must be given therapy to reduce these obstacles, in order to provide independence to the elderly (Pranata, Lilik, Dheni Koerniawan, 2019). One of these activities is brain exercise therapy and coloring pictures. This method is more effective because the elderly do simple and light active activities. The activities are competitive and non-competitive. The brain gym also helps to keep the mind fresh so that the elderly can retain their memories because they often memorize movements and work in an orderly manner.

## **Conclusion**

The results show that the brain gym is very beneficial in improving the cognitive function of the elderly. The families of the elderly and administrators of elderly nursing home should provide brain gym exercise to the elderly regularly and continuously.

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