

Improving Cognitive Function of the Elderly through Tai Chi Exercise Program and Cognitive Stimulation

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ABSTRACT

The increasing proportion of elderly followed by the increasing life expectancy has improved the prevalence of various chronic-degenerative diseases and dementia. The promotive efforts using exercise programs, such as Tai Chi and cognitive therapy, significantly increase the physical fitness, mental well-being, and cognitive function of the elderly. This research aimed to predict the effectiveness of exercise programs for particular groups living in nursing homes. The method of this research was a quasi-experiment with a control group design. Samples are elderly living in the nursing home. The research samples were 116 elderlies living in nursing homes in Jakarta and South Sumatra. They were selected using a random sampling strategy. Statistical tests employed a dependent t-test, independent t-test, and multiple linear regression test. This study revealed that the intervention group showed different cognitive function average values before and after implementing the exercise programs (p-value = 0.001). In contrast, the control group did not show any differences. The intervention and control groups showed different cognitive function mean values after applying the exercise program (p-value = 0.057). Another finding denoted that the length of stay in the nursing home affected the elderly's cognitive functions). This research recommends policymakers and healthcare personnel use the developed exercise program to perform complementary therapy, empower the elderly, and be replaced by many orders of the healthcare system.

Keywords: Cognitive Function; Cognitive Stimulation; Elderly; Tai Chi

ABSTRAK

Meningkatnya proporsi penduduk lansia, disertai meningkatnya usia harapan hidup maka prevalensi penyakit-penyakit kronik degeneratif dan penyakit demensia juga semakin meningkat. Upaya promotif melalui program latihan (senam tai-chi dan stimulasi kognitif) sangat penting bagi lansia untuk meningkatkan kebugaran tubuh, juga meningkatkan kesehatan mental dan fungsi kognitif. Penelitian ini bertujuan memperoleh gambaran tentang efektifitas program latihan (senam tai chi dan terapi kognitif) terhadap fungsi kognitif lansia di panti. Metode penelitian menggunakan Quasi experiment with control group design. Sampel adalah lansia yang tinggal di panti. Strategi sampling menggunakan random sampling dengan jumlah sampel sebanyak 116 orang di 2 Provinsi yaitu DKI Jakarta dan Provinsi Sumatera Selatan. Uji statistik menggunakan dependent t-test, independent t-test, dan uji Regresi Linier Ganda. Hasil penelitian menunjukkan ada perbedaan nilai rata-rata fungsi kognitif lansia sebelum sesudah intervensi program latihan pada kelompok intervensi (p -value=0.001), sedangkan pada kelompok kontrol tidak ada perbedaan; ada perbedaan nilai rata-rata fungsi kognitif lansia antara kelompok intervensi dan kelompok control sesudah intervensi program latihan (p -value = 0.057); ada pengaruh antara lama tinggal di panti terhadap fungsi kognitif lansia. Rekomendasi: program latihan yang dihasilkan dapat dijadikan sebagai landasan bagi pemangku kebijakan dan pengelola pelayanan kesehatan dalam rangka melaksanakan berbagai terapi komplementer dalam meningkatkan pemberdayaan lansia serta dapat direplikasikan di berbagai tatanan pelayanan kesehatan.

Kata Kunci: Fungsi Kognitif; Stimulasi Kognitif; Lansia Senam Tai Chi.

INTRODUCTION

The elderly population continues to increase as advances in the health sector are characterized by increasing life expectancy and decreasing mortality rates. This demographic development can have health, economic and social impacts. Health problems in the elderly begin with the deterioration of body cells, resulting in decreased function and endurance and increased risk factors for disease. The prevalence of degenerative diseases experienced by the elderly increases with age and the largest percentage is at the age of 75 years and over. Results (Central Bureau of Statistics, 2018) shows that the prevalence of degenerative diseases has increased when

compared to Riskesdas 2013, including cancer, stroke, chronic kidney disease, diabetes mellitus, and hypertension. In addition to degenerative diseases, Alzheimer's Disease International (ADI) reports that more than 55 million people worldwide will suffer from dementia by 2020. This number will nearly double every 20 years, reaching 78 million by 2030 and 139 million by 2050. The largest increase is in developing countries. Currently 60% of people with dementia live in low- and middle-income countries, but by 2050 this figure will rise to 71%. (Alzheimer Diseases International, 2023).. In Indonesia, there were an estimated 1.2 million people with

dementia in 2016, which will increase to 2 million by 2030 and 4 million by 2050. Some of the factors driving the high cost of dementia care in Asia include a lack of understanding of the disease and a lack of resources and training for caregivers of people living with dementia. (Alzheimer Diseases Indonesia, 2023)

Dementia is a brain disorder that affects cognitive function, especially memory, ability to think and ability to carry out daily activities. Dementia is caused by damage or injury to the brain and it is estimated that 5% of the elderly experience some form of dementia. One of the most common forms of dementia is Alzheimer's disease, around 60-70% of cases. Dementia is a major cause of disability and dependence of the elderly which has a significant impact not only on the elderly individual but also on the family and society. (WHO, 2017). Impaired cognitive function is accompanied by an inability to control emotions and social behavior or motivation (Eliopoulos, 2018). (Eliopoulos, 2018).

Government efforts to empower and improve the welfare of the elderly are carried out in an integrated, cross-program and cross-sector manner, aimed at keeping the elderly healthy, independent and productive. (Indonesian Ministry of Health, 2019). Government policy in elderly health services aims to improve the health status of the elderly and improve the quality of life of the elderly with dementia.

The National Strategy aims to realize the prevention of alzheimer's disease and other dementias towards healthy and productive elderly. (Ministry of Health, 2015). Efforts developed to support these policies include promotive and preventive efforts which are important factors in empowering the elderly to be able to be independent in meeting their needs.

Health promotion is a direct and indirect action to improve health and prevent disease. Health promotion is a preventive approach to health that is oriented towards self-actualization and guides individuals to maintain or improve their health and actively build new positive behaviors. (Haugan and Eriksson, 2021).. Health promotion supports empowering older adults to make healthy choices about their life behaviors. Through health promotion programs, older people can learn healthy behaviors, which are the result of beliefs about health in achieving self-control in making decisions to act. Older people can be actively involved in health promotion programs.

One of the promotive efforts made is the exercise program. Exercise programs are very important for the elderly to improve body fitness, as well as improve mental health. Exercise can increase joint flexibility, maintain muscle mass, control blood sugar levels and body weight and improve the well-being of the elderly.

(Williams, 2023). Tai chi and cognitive stimulation are exercise programs that are complementary therapies in nursing. Complementary therapy is a treatment technique to promote healing, through connectivity between the body-mind-spirit of each individual. (Lindquist, R., Snyder, M., & Tracy, 2014).. Complementary therapies are medically proven practices or treatments that are additional and complementary to mainstream therapies or treatments. These therapies can help patients improve their quality of life and make them feel healthier. (Mailani, 2023). Nursing through a holistic approach uses complementary therapies as techniques/interventions that assist nurses in integrating physical, mental, emotional, and spiritual dimensions in nursing services. A holistic approach can improve the health of the elderly through actions directed at maintaining and improving all aspects of the elderly's well-being. (Miller, 2015). This is in accordance with the principles in tai chi practice, which combines physical movement, breathing, feelings and thoughts in a unity that creates harmony between physical, mental, emotional and spiritual. (Sutanto, 2015).

The use of complementary therapies for specific conditions is often used to promote healthy behaviors such as the use of tai chi to improve flexibility and prevent falls in the elderly. Tai Chi is now also believed to improve memory and help the thinking

process, as well as increase brain volume. This is in accordance with the results of research by Siu and Diana (2018) who found there was an improvement in cognitive function through an increase in the average MMSE score from 25.46 to 26.71 after participating in tai chi training. Tai-chi which is done regularly can improve cognitive function and physical function of the elderly. Cognitive function of the elderly is individualized, based on personal resources, health status and unique experiences of the elderly. (Eliopoulos, 2018).

Cognitive stimulation is an effort to optimize the quality of intelligence health in clients with brain, nerve and muscle disorders carried out through stimulation or training in order to have or improve intelligence abilities. Cognitive stimulation is also a useful intervention to improve the mood of people with dementia. (Marinho *et al.*, 2021). In addition, the principle of cognitive stimulation is to use various forms and techniques to change the way the elderly think, feel and behave and teach the elderly to respond to what they think. This helps the elderly to recognize any negative thoughts and replace them with positive thoughts. According to (Cafferata, Hicks and von Bastian, 2021), cognitive stimulation therapy combines the main properties of other holistic therapies. This therapy is

usually given for seven weeks with two sessions per week lasting about 45 minutes each. The goal is to encourage mental stimulation, use orientation openly, elicit opinions, use memories as an aid to orienting place and time, provide encouragement to help remember, and strengthen relationships.

Cognitive stimulation is a psychosocial intervention in dementia care, beneficial for improving cognitive function and aspects of client well-being. This intervention consists of various measures including reality orientation (time, place and person), memory therapy, puzzle therapy, brain gym and activity therapy.

Research results (Halimsetiono, 2022) illustrates that holistic interventions consisting of cognitive stimulation therapy, reality orientation therapy, reminiscence therapy, and validation therapy can improve cognition, quality of life, and psychological well-being; reduce symptoms of depression and behavioral disorders; provide opportunities for social interaction. In addition, research results (Kuswati, 2019) found that brain stimulation activities for the elderly in integrated groups which include physical activities, mental stimulation or spiritual activities and social activities have an effect on cognitive function in the elderly. Likewise with the results of research (Abas *et al.*, 2020) showed that there was an effect of Brain Training Movement (GLO) gymnastics

on the cognitive level of respondents (p value = 0.001). The average cognitive level of respondents increased from 22.95 to 27.95 after being given GLO Exercise 12 times for 1 month.

There have been many studies related to tai chi, but the combination of tai chi exercises with cognitive therapy which is a complementary therapy development is still limited. Meanwhile, the elderly need a regular exercise program to improve their physical and mental health so that they remain healthy, independent and productive. The purpose of the study was to obtain an overview of the effect of the tai chi exercise program and cognitive stimulation on improving the cognitive function of the elderly.

METHOD

This study used a quasi experiment pre-post test design with control group design. The population is the elderly who live in the orphanage, while the sample is the elderly with inclusion criteria: Aged 60 years and over living in the orphanage, not bedridden, not experiencing visual and hearing disabilities, willing to be a respondent and able to read and write.

The sampling strategy used simple random sampling. The sample size was 120 people (60 intervention group and 60 control group). In the course of the sample drop out

4 people so that the number of samples became 116 people. This study was conducted in DKI Jakarta and South Sumatra Province. Data analysis used univariate, bivariate and multivariate analysis. Statistical tests using dependent t-test, independent t-test; and Multiple Linear Regression Test. All respondents had received an explanation of the research and had given consent to become respondents by signing an inform consent. Researchers obtained a research permit from the DKI Jakarta Provincial Health Office and an ethical permit from the Ethics Committee of the Jakarta Health Polytechnic II Ministry of Health No. LB.02.01/KE/L/167/2016 before starting the research.

Exercise program (Tai Chi Gymnastics and Cognitive Stimulation)

Tai chi is an exercise that combines physical movement, breathing, feelings and thoughts in a unity that creates harmonization between physical, mental, emotional and spiritual. While cognitive stimulation is an effort to optimize the quality of intelligence health in clients with brain, nerve and muscle disorders carried out through stimulation or training in order to have or improve intelligence abilities. The exercise program which is a combination of tai chi exercises and cognitive stimulation is carried out through activities: 1) Conducting training for nurses in nursing homes about the exercise program carried out to the elderly (training is carried out in 1 day);

2) Train the elderly to follow tai chi exercises and cognitive stimulation 2 times a week for 8 weeks where the implementation of activities 8 times with guidance and 8 times independently using a monitoring book; 3) Evaluate the exercise program through measuring the health status and cognitive function of the elderly before and after the intervention.

Measurement Tools

The instrument used to measure cognitive function uses a modified Mini Mental State Examination (MMSE), consisting of 30 items used to measure orientation, registration, attention and calculation, memory and language. The results of the assessment in the form of a score, namely a value of 25-30 means that the elderly do not experience cognitive impairment, a value of 18-24 means that the elderly experience mild-moderate cognitive impairment, and a value <18 means that the elderly experience severe cognitive impairment.

Health worker support was measured using a modified questionnaire from the MOS social support survey measuring emotional, appreciative, informational and instrumental support, consisting of 20 items on a 0-3 Likert scale.

RESULTS AND DISCUSSION

1. Elderly Characteristics

Table 1: Respondents' characteristic scores based on age, length of stay in the institution and health worker support (n=116).

Variables	Group	N	Mean	Median	SD	Min-Max
Age	Intervention	57	70,70	70	9,805	60-88
	Control	59	69,51	68	6,678	60-78
Length of stay at the center	Intervention	57	44,80	36	55,367	1-319
	Control	59	36,17	28	28,534	2-120
Health Personnel Support	Intervention	57	33,72	30	12,588	0-73
	Control	59	30,56	31	9,511	3-46

Table 1. shows the average age of the elderly in the intervention group was 70 years, while the control group was 69 years old. The length of stay in the nursing home for the intervention group was longer, with an average of 44 months compared to the control group, which was 36 months. Health

worker support is almost the same in both groups, namely the intervention group score 33 and control score 30, after being categorized it was found that health worker support for the elderly was half adequate and half was inadequate.

Table 2. Distribution of Respondent Characteristics Based on Gender, Marital Status, and Education (n=116)

Variables	Ex. Intervention		Control Group		Total	
	N	%	N	%	N	%
Gender						
1.Male	28	49,1	28	47,5	56	47,83
2.Female	29	50,9	31	52,5	60	52,17
Marital status						
1.Kawin	7	12,3	1	1,7	8	6,95
2.Widow/Widower	44	77,2	51	86,4	95	82,60
3.Not Married	6	10,5	7	7	13	10,45
Education						
1.	49	86	51	86,4	100	86,20
2. ≥SMU	8	14	8	13,6	16	13,8

Table 2. Describes the characteristics of the two groups of elderly people, namely almost

the same percentage between female and male gender in both groups. the majority of

marital status is widowed / widower, the percentage is greater in the control group (86.4%) than the intervention group (77.2%). The majority of education was

<SMU in both the intervention and control groups.

2. Differences in Cognitive Function of the Elderly before and after exercise program intervention in intervention and control groups

Table 3. Analysis of Cognitive Function of the Elderly Before and After Exercise Program Intervention in Intervention Group and Control Group (N=116)

Variables	Group	Mean	SD	95% CI	t	P value
Cognitive Function	Ex. Intervention					
	Before	23,89	4,382	-2,858 - -0,756	-3,444	0,001
	After	25,70	3,590			
	Difference	1,81	0,792			
	Control group					
	Before	24,97	3,499	-0,275 - 1,394	1,342	0,158
After	24,41	3,672				
	Difference	0,56	0,173			

* *Dependent t-test*

Table 3. shows that there is a significant difference in cognitive function in the intervention group before and after the exercise program intervention (p value = 0.001), with a difference in the average

value of 1.81 points . While in the control group there was no significant difference in cognitive function of the elderly (p value = 0.158).

3. Differences in Cognitive Function of the Elderly after the Exercise Program intervention between groups

Table 4. Analysis of Cognitive Function of the Elderly After Exercise Program intervention between groups (n=116)

Variables	Group	N	Mean	SD	95% CI	F	P value
Cognitive Function	Intervention	57	25,70	3,590	0,41 - 2,631	0,418	0,057
	Control	59	24,41	3,672			

**Independent t-test*

Table 4. shows that there are differences in cognitive function of the elderly between the intervention group and the control

group after the exercise program intervention with a p value = 0.057.

4. Effect of Elderly Characteristics on Cognitive Function

Table 5. Effect of Elderly Characteristics on Cognitive Function

Variables	B	St. Error	Beta	t	p-value
Cognitive Function	0.030	0.016	0.248	1.932	0.058
- Length of stay in the orphanage	23.867	0.722		33.035	0.000
- Constant					

** Multiple Linear Regression Test*

Table 5. Describing the results of the multivariate multiple linear regression test, it was found that only one independent variable, namely the length of stay in the nursing home, had an effect on the dependent variable of cognitive function of the elderly with a p value = 0.058. This shows that in addition to the Exercise program, there is a variable length of stay in the nursing home that contributes to the cognitive function of the elderly.

The results of this study found that there was a significant difference in cognitive function of the elderly in the intervention group before and after the application of the exercise program by 1.81 points. While in the control group no significant difference was found. In addition, there was a significant difference in the cognitive function of the elderly between the

intervention group and the control group after the exercise program.

An exercise program consists of three components, namely physical, cognitive and social, which affect the cognitive function of the elderly. Tai chi is an exercise program that can accommodate all three components. Physically, gentle, continuous, slow-moving exercises are suitable for the elderly. Concentration and cognitive activity are required during tai chi exercises because each step can involve the movement of various parts of the body. Tai chi is a complementary therapy that is a medically proven practice or treatment as an addition and complement to the main therapy or treatment, which can help patients improve their quality of life and make them feel healthier. (F. Mailani, 2023). Physical and mental activity through

tai chi has an impact on the cognitive function of the elderly where the exercise program will result in improved cardiac and respiratory function health which is often indicated by cognitive performance.

This is in accordance with the principles in tai chi exercise proposed by (Sutanto, 2015) which combines physical movement, breathing, feelings and thoughts in a unity that creates harmonization between physical, mental, emotional and spiritual. Therefore, it is necessary to increase physical and cognitive activities through regular scheduling and need attention from health workers in the orphanage so that the elderly are active in various activities.

Exercise programs through cognitive stimulation aim to implement strategies to improve the cognitive function of the elderly. This cognitive stimulation helps the elderly develop a rational mindset, engage in reality testing, and reshape behavior by changing internal messages. The combination of tai chi exercises with cognitive stimulation carried out on the elderly in the Panti has been tested to improve the cognitive function of the elderly, this is indicated by an increase in cognitive function through the elderly MMSE score increasing from 23.89 to 25.70 after following the exercise program. Supported by the results of research (Siu

and Lee, 2018) found that there was an increase in cognitive function of the elderly after participating in tai chi, namely 1.38 points with an average MMSE score of 25.46 to 26.74. Elderly participation in tai chi can improve executive function through a series of continuous movement learning.

Cognitive stimulation carried out by the elderly in the orphanage includes reality orientation, memory therapy and puzzles. These three types of cognitive stimulation are proven to be able to improve the cognitive function of the elderly. The results of this study are supported by the results of Halimsetiono's research (2022) with a literature study method which states that holistic interventions consisting of cognitive stimulation therapy, reality orientation therapy, reminiscence therapy, and validation therapy can improve cognition, quality of life, and psychological well-being; reduce symptoms of depression and behavioral disorders; and provide opportunities for social interaction in dementia clients. In line with the results of research (Prahasagita and Lestari, 2023) showed that the stimulus provided through physical activity, reminiscence therapy, memory training, and puzzle therapy regularly and continuously has an influence on improving the cognitive function of the elderly.

Cognitive training using puzzle therapy provides stimulation to the brain through stimuli that cause the brain to actively work in processing, retrieving, and interpreting information so that puzzle therapy can improve cognitive function of the elderly. Research results (Komsin and Isnaini, 2020) It was found that there was an effect of Crossword Puzzle Therapy (CPT) on Elderly Cognitive Function where the MMSE Score of the elderly who received CPT increased significantly than the elderly who did not get CPT.

Reminiscence therapy is an activity carried out with the elderly to recall the past or good memories during their lifetime. The elderly are asked to remember and retell things that feel positive during childhood, adolescence, and adulthood to recall activities that have been carried out in the past. The ability to remember the past is expected to improve the cognitive function of the elderly. This is in line with the results of research (Cuevas *et al.*, 2020) showed that reminiscence therapy is effective in the elderly with Alzheimer's disease, in the areas of cognition, daily activities, and quality of life. In addition, for therapy to be effective, it must be carried out regularly in a small group of patients for an average of 45 minutes within 8 to 12 weeks. Cognitive stimulation carried out in groups at home increases social interaction among the

elderly which is an important factor in improving the cognitive function of the elderly. Based on the results of observations during the cognitive stimulation intervention, it appears that the elderly support each other in the group when arranging the pictures in the puzzle, communicate with each other and laugh together. The elderly also said they liked to gather and really enjoyed the puzzle game. In addition, the elderly are also able to tell their pleasant past memories, they respond to each other and make comments when sharing these experiences.

The results of the multivariate test found that the variable length of stay in the orphanage affects the cognitive function of the elderly. The elderly who became respondents were on average 70 years old and some were even 88 years old. With the length of stay in the orphanage accompanied by an increase in age will certainly affect the cognitive function of the elderly. In addition, the absence of a cognitive exercise program for the elderly in the orphanage also affects the deterioration of cognitive function because it is less stimulated. The elderly only follow routine activities such as sports, religious activities, and skills. There are no group activities such as sharing experiences or reading activities together, group puzzle games that can help improve elderly

socialization as well as cognitive function. To reduce boredom due to the length of stay in the orphanage and improve the cognitive function of the elderly, the cognitive stimulation intervention carried out is very useful and very appropriate for the elderly. This can be seen from the results of the study where there was an increase in the MMSE score by 1.81 points in the elderly who were intervened by the exercise program. These results are supported by the results of research (Ngadiran, 2020) illustrates that the length of stay in the orphanage has a relationship with anxiety levels. If anxiety is not handled properly, it can have an impact on the incidence of depression and even impaired cognitive function. Therefore, adequate family support and health workers are needed to reduce feelings of isolation and loneliness. This is in accordance with the results of research (Nitami, Yuliana and Prasetya, 2019) found there was a positive relationship between family social support and cognitive function. Elderly people who have supportive family social support tend not to experience cognitive function impairment and only experience mild cognitive function impairment compared to elderly people who have non-supportive family social support.

CONCLUSION

The exercise program (Tai Chi Gymnastics and Cognitive Stimulation) has been proven effective in improving the cognitive function of the elderly. Therefore, it is hoped that this exercise program can be used as one of the modality and complementary therapies in nursing that can be used in all homes and other health care settings. It is necessary to train nursing home nurses on various modality and complementary therapies in order to be able to provide assistance to the elderly, and develop self help groups for the elderly in nursing homes through empowering the potential of the elderly in carrying out various group activities to improve communication and interaction between fellow elderly.

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