



The effect of brain vitalization exercise on muscle strength and endurance in people with dementia

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Abstract: This study aims to determine the effect of brain vitalization exercise on muscle strength and endurance in people with dementia. The pre-experimental method with a one-group pretest-posttest design was used in this study. Purposive sampling technique was used, then 31 subjects with dementia was obtained from 78 people in Cibeunying Kidul District population. The Arm Curl Test instrument were used in research to measure arm muscle strength and Chair Stand Test measure leg muscle endurance. The data analysis technique in this study used Paired Sample T Test using SPSS version 25 software. Based on data analysis, the results showed that the muscle strength ($0.000 < 0.05$) and durability ($0.000 < 0.05$) obtained very significant, so it can be concluded that there is a significant effect of brain vitalization exercise on muscle strength and endurance in people with dementia.

Keywords: exercise, brain vitalization, muscle strength, muscle endurance, dementia.

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INTRODUCTION

Older adults have various declines in health status caused by several factors, especially physical health factors. The same thing is contained in various theories in the article, where the decline in health in the elderly has a negative impact on the quality of life, it also goes hand in hand with increasing age (Kiik et al., 2018). Decreased postural stability and increased risk of falling are one of the challenges that will be faced by the elderly due to reduced neuromuscular responses. This declining health status is known as aging, where in the process there are several negative impacts such as increased body fat, reduced muscle strength in the upper and lower limbs, and low levels of flexibility, agility, and endurance (Milanović et al., 2013). So that several diseases appear that attack the elderly due to the negative impact, including the elderly suffering from mild cognitive disorders, dementia, to symptoms of depression (Barnes et al., 2007; Huang et al., 2015; Lee et al., 2016). In addition, things that often occur in the elderly are reduced endurance, increased sedentary behavior and the risk of falling. Elderly who have disorders of the central nervous system, which is better known as dementia in general will experience obstacles in daily life (Silva et al., 2019).

In addition, the elderly also have several problems, especially in brain function, where in a study it was found that the elderly experienced a decrease in brain function. Where the brain function gradually decreases with age as in the decline in cognitive aspects, namely a decrease in memory/memory function, a decrease in naming abilities and speed in retrieving information that has been stored in the memory center (Putra & Suharjana, 2018). Decreased cognitive performance is one of the symptoms of dementia, this is because the decline experienced has a bad impact on a person's ability (Taylor & Close, 2018). There are records from the World Alzheimer's Reports that people with dementia continue to grow more and more so that this is allegedly going to be the biggest health crisis of this century (Sari et al., 2016). Then in line with this issue, WHO has data in 2010 which shows that in 2010 there were as many as 36 million people with dementia in the world and it will continue to soar, even until it is predicted that as many as 66 million people will suffer from dementia in 2030. In Indonesia, there are



almost one million people suffer from dementia in 2011. Based on this, researchers have researched in 1998 showing that the age group over 50 years has a high risk of developing Alzheimer's disease, this is in line with the case of Alzheimer's in Indonesia which has a case with the age of 56 years as the case with the youngest age. Elderly people aged 65-70 years suffer from dementia as much as 5% and continues to increase over time to reach 45% more in a period of 5 years, especially in the elderly over 85 years (Hartati & Widayanti, 2010). Disorders that occur in the brain will lead to dementia, this is caused by several symptoms that arise including disturbances in memory function, having difficulty in thinking, poor communication, poor problem solving, as well as changes in behavior and emotional level. Many assumptions related to aging problems are caused by a decrease in a person's memory, even though for people with dementia, these problems are not part of the natural process of aging (Razak & Zakaria, 2019).

Decrease in muscle strength is also caused by the aging process (Pinontoan et al., 2015). This process has an impact on muscle strength and functional capacity (the result of a combination of nerve and muscle changes) which tends to disappear (Pion et al., 2017). As people get older, most humans have a decline in muscle strength. Sarcopenia is a fundamental factor in the phenomenon of quantitative loss of muscle mass (Macaluso & De Vito, 2004). At the age of 40 years, a person begins to experience a decrease in muscle strength and at the age of 75 years and over the process of decreasing muscle strength runs faster (Pinontoan et al., 2015). At the age of 30 years old there was a peak in muscle strength, then after the age of 80 years began a decline of 30-40% (Setaiwan & Setiowati, 2014). In line with the results of research (Pinontoan et al., 2015), which confirms that muscle strength tends to decrease with age.

In addition to muscle strength, the problem for the elderly is the high risk of decreasing muscle endurance in the face of external influences and homeostatic mechanisms which have a decrease in efficiency, so that many diseases eventually attack the elderly (Herdiana, 2013). An elderly person tends to have the risk of accidents and the risk of falling, in reducing the high risk so it is important to do an increase in muscle endurance. In muscle endurance the term cardiovascular factor is known, where in the process muscle endurance tends to depend on the ability to transport oxygen to active muscles and the supply of oxygen obtained from the ability of the muscles (DQ Xu, Li, & Hong, 2006). Sport is an effective way that can be done by the elderly in order to maintain the condition of their physical fitness. This condition deserves to be maintained considering that physical fitness in the elderly is closely related to health conditions, including the freshness or fitness of the heart, lungs, blood circulation, muscle strength, and joint flexibility (Setaiwan & Setiowati, 2014).

Referring to the previous discussions, that the declines that occur in the body functions of the elderly are indeed the impact of the increasing age of a person, especially the elderly. (Sari et al., 2016). In this regard, the nervous system of the elderly will also experience significant changes, where the condition of brain weight decreases by 10-20%, then the decrease/ shrinkage will decrease every year (Setaiwan & Setiowati, 2014). Lack of physical activity, especially in the elderly, is allegedly one of the biggest reasons for these changes. Lack of physical activity will also cause Noncommunicable Diseases (NCDs) which are one of the main causes of death in the world (Ekawati et al., 2020). The decline in the elderly in terms of muscle strength is the result of a bad lifestyle, where the elderly have a lifestyle that is less physically active so that there is a great risk for them to experience a decrease in muscle strength. To minimize this risk, it is recommended for the elderly to carry out regular physical activity so that muscle function increases again effectively. In research, it is stated that regular physical activity exercises can reduce muscle weakness in many elderly people (Thomas & Hageman, 2003). The results of previous studies found that bodyweight training with total-body resistance training can increase muscle strength (Nasrulloh & Wicaksono, 2020). Routine Physical activity has also been shown to directly show a positive effect on a person's level of health, by doing physical activity regularly it also provides benefits and good impacts in terms of social factors (Ekawati et al., 2020). By maintaining an active lifestyle, it has been proven in a study that it has a positive impact on muscle strength and endurance compared to the elderly who do not adopt an active lifestyle (DQ Xu et al., 2006).

Once again, it has been stated that the aging process that occurs in the elderly tends to reduce muscle strength and endurance, so that a solution is needed as a way to overcome it, one of which is routine physical activity which will certainly improve the muscle function of the elderly (D. Xu et al., 2008). One solution to the physical activity routine can be in the form of brain vitalization exercises that will improve muscle function in the elderly. This is in line with previous research, where brain

vitalization exercise has a component of physical activity training that will have a significant influence, especially on human physical fitness. Brain vitalization exercise also turns out to have a positive impact and benefits in improving the quality of life in the elderly (Herdiana, 2013). Thus, based on the problems found in people with dementia there are also various benefits obtained from doing brain vitalization exercise routines, therefore researchers will further discuss a research variable with other variables which aims to test whether there is an effect of giving gymnastic exercise treatment. brain vitalization of muscle strength and muscle endurance in people with dementia.

Based on the results of the study involving 42 subjects (32 women, 10 men) who were recruited to be the research sample and randomized into 3 groups: 13 subjects did the 6-month Endurance Training (ET) program, 15 subjects with the 6-month Resistance Training (RT) program and 14 subjects in the control group. The purpose of this study was to determine whether systematic Endurance Training (ET) can also increase muscle strength and whether systematic Resistance Training (RT) can also increase the aerobic capacity of the elderly. This study concluded that both Endurance Training (ET) and Resistance Training (RT) have a positive effect on the health and fitness of older people, Endurance Training (ET) increases aerobic capacity, and may be more effective in reducing cardiovascular risk.

METHOD

Pre-experimental method with One-Group Pretest-Posttest design is used in this study (Fraenkel & Wallen, 2012). Brain vitalization exercises will be given to determine its effect on muscle strength and endurance. The implementation of the research is located at the *Gedung Serbaguna* Jl. Babakan H. Tamim Rt 01 Rw 06, Cibeunying Kidul District. A total of 78 elderly people became the population in this study. A purposive sample was used in this study, the sample criteria were selected through the Mini Mental State Examination (MMSE) test, after the MMSE test was carried out so as to produce as many as 31 people who indicated mild dementia.

In December, five instructors who were previously assigned for one month had done brain vitalization exercise training. Five lecturers as a research team and cadre members participated in the preparation and process of this research. The research was conducted in January. The research instrument chair stand test (CST) and arm curl test (ACT) were used in this study as a measuring tool in measuring the differences in the results of the pretest and posttest. In measuring the strength and endurance of the lower extremity muscles in the elderly using CST for 30 seconds (Jones et al., 1999). Inevaluate the muscular endurance of the limbs in this study, using a simple measuring instrument such as the "CST" (Pinheiro et al., 2015). Meanwhile, functional evaluation is important to do, to carry out this evaluation usually using CST for 30 seconds, where the test is related to daily life that will measure lower muscle strength and endurance (Millor et al., 2013). The test consists of standing and sitting movements from a chair as much as possible for 30 seconds. Chair height of 40cm is recommended as a measure of the standard chair that can be used in the test. In the first stage, participants were instructed to sit in a chair with their back in an upright position. Then they were given directions to look straight ahead and stand up after being instructed on the count of "1, 2, 3, go" the position of the arms folded on the chest with them choosing their own pace for the tempo (Millor et al., 2013). Furthermore, the Arm curl test for 30 seconds was used as a field test to measure upper extremity strength in the elderly (Dunsky et al., 2011). In line with this, this test is also part of the fitness test, which has a function to measure the muscle strength of the upper extremity of the elderly (Liu et al., 2017). Where the upper extremity is the upper skeleton of motion (sacpula bone, clavicle bone, humerus bone, ulna bone, radius bone, carpal bone).

In the field, the research procedure applied for the continuation of the study began by giving directions to the sample to sit upright in a chair, with the dominant hand position on the edge of the chair. Then again given direction for the dominant hand to hold the dumbbell firmly, while the other hand was given direction to hold the chair for good balance. When the research process takes place, the body position of the sample must remain upright and the initial position of the arm must be straight down and then bend up to the maximum. The next step is to give the "start" signal, where the sample must perform the test movement for a maximum of 30 seconds (Oktriani et al., 2020). *Paired sample t test* used as data analysis in this study to determine whether there is an effect on muscle strength and endurance through the treatment of brain vitalization exercise that has been given. SPSS version 25 is used to support data processing and analysis.

RESULTS AND DISCUSSION

Results

Referring to the acquisition of the results of data processing and analysis, where the results are in the form of changes in the significance of muscle strength and endurance through brain vitalization exercises for the elderly with dementia, with the results obtained in the form of muscle strength in the pre test results with an average value of 14.06 and a standard deviation of 3.94. In the post test results, the average value = 16.45 and the standard deviation value is 3.872. while the results of muscle endurance on the results of the pre test with an average value = 10.94 and a standard deviation value = 3.812. In the post test results obtained an average value of 12.61 and a standard deviation of 3.941. Normality test using Shapiro Wilk on muscle strength pre test with gain sig value. = 0.923 > 0.05, which means that the data is normally distributed, and the results of the post-test muscle strength obtained the value of sig. = 0.241 > 0.05 which means the data is normally distributed. Then the results on the muscle endurance pre test obtained sig values. = 0.144 > 0.05 which means the data is normally distributed. This is similar to the results of the post-test muscle endurance with a value of sig. = 0.875 > 0.05 which means the data is normally distributed. Parametric test was used in this study because the data were normally distributed and homogeneous. Furthermore, the paired sample t test was used as a hypothesis test in this study, the results are shown in the following table:

Table 1. Test Results Paired Samples T-Test

No	Variable	t value	Sig.	Information	Conclusion
1	Muscle strength	-5.497	0.000	H0 Rejected	Significant
2	Muscle endurance	-5.369	0.000	H0 Rejected	Significant

From Table 1, the results of muscle strength data are obtained at the value of $t = -5.497$ with a sig. = 0.000 < 0.05. Therefore, concluded that there was a significant effect on muscle strength in the elderly with dementia through brain vitalization exercise. Furthermore, the results of muscle endurance data obtained by the value of $t = -5.369$ with a value of sig. = 0.000 < 0.05, so the data is significant. Muscle strength in samples of people with dementia from pretest to posttest there was a significant change in samples given brain vitalization exercise treatment. Likewise, the elderly with dementia in muscle endurance who have been given brain vitalization exercise treatment describe significant changes. So, it can be concluded that there is a significant effect on muscle strength and muscle endurance of people with dementia through brain vitalization exercise.

Discussion

The results of this study shows that there is an influence on the muscle strength of the elderly with dementia through the provision of brain vitalization exercises. Brain vitalization exercise can have a positive effect on muscle function in people with dementia. This is in line with the research results (D. Xu et al., 2008) that the elderly who participated in Tai Chi (TC) exercise showed significant changes in muscle strength. People with dementia who do physical activities such as brain vitalization exercises, Tai Chi, and physical activities that are appropriate for their ability and age can increase muscle strength. Based on several explanations, physical activity carried out by the elderly can certainly reduce the risk of injury. The foundation that has been put forward (Fitri et al., 2020), that physical fitness can be improved through physical activity training so that it can slow down physical decline in people with dementia. By doing health sports, Physical fitness of the elderly can be maintained so that they will freely carry out daily activities with physical activity as a means (Justine et al., 2013; Oktriani et al., 2020).

In a previous study (Budiharjo et al., 2004), giving the Elderly Fitness Gymnastics treatment to a sample of untrained elderly women. The results of the study stated that giving the Elderly Fitness Gymnastics treatment 3 times a week showed a greater increase in muscle strength than the treatment group only 2 times a week for 2 months. This shows that the frequency of exercise performed can affect the achievement of the results of the treatment of the variables studied. In reality, the elderly will experience sarcopenia, which means that with age, muscle strength will decrease. Sarcopenia can be reduced by appropriate physical activity, and this is confirmed by explanation (Grimby, 1988), that muscle strength will decrease with age, but the elderly who have an active pattern of physical activity will provide better stimulation of muscle strength. The similar result done (Ferreira et al., 2012) where

in the research obtained that muscle strength can be increased by doing physical activity in the elderly. With increasing muscle strength, it is expected that there will be an increase in the activity of the elderly (Lan et al., 2000). In addition, the elderly who maintain a physically active lifestyle, compared those who do not maintain an active lifestyle have better functions in terms of muscle strength and endurance (D. Q. Xu et al., 2006).

As previously known, there are several benefits that will be obtained through brain vitality exercise, including in terms of the level of physical fitness, especially in the elderly with dementia and optimally increasing the quality of life in the elderly with dementia (Herdiana, 2013). In this study, a significant increase in muscle strength and endurance was formed, where in brain vitality exercise there were elements of movement that included (1) 6 minute walk test (6MWT), (2) chair seat and reach test (CSRT), (3) chair stand test (CST), (4) 8 foot up and go test (8 FUGT). Where the elements of the movement are found in the elderly testing instrument. The elements of movement used in brain vitalization exercise also refer to research that has been carried out in an effort to increase the level of physical fitness of the elderly with dementia (Fitri, M., Rahmi, U., Sulastri, A., 2020). In a study, it has also been revealed that exercise-based exercise models, especially in fitness for the elderly and brain vitalization exercises, have been shown to have an effect on improving physical fitness and brain function in the elderly. Where the exercise model developed in the study was able to improve the physical fitness of the elderly by 0.32 points and improve the brain function (cognitive) of the elderly by 1.75 points. especially in elderly fitness gymnastics and brain vitalization exercises have been shown to have an effect on improving physical fitness and brain function in the elderly. Where the exercise model developed in the study was able to improve the physical fitness of the elderly by 0.32 points and improve the brain function (cognitive) of the elderly by 1.75 points. especially in elderly fitness gymnastics and brain vitalization exercises have been shown to have an effect on improving physical fitness and brain function in the elderly. Where the exercise model developed in the study was able to improve the physical fitness of the elderly by 0.32 points and improve the brain function (cognitive) of the elderly by 1.75 points (Putra & Suharjana, 2018). Moreover, gymnastics is a fun activity to do. In a study it was stated that exercise activities given to a sample of perimenopausal women gave a feeling of pleasure so that it could reduce the level of depression felt by participants (Supratmanto & Kushartanti, 2018).

Thus, the importance of continuous brain vitalization exercise needs to be carried out / applied considering the benefits obtained have a positive impact, especially for the elderly with dementia. Of course, with some developments that will be carried out, especially on the elements of exercise that will be applied in brain vitalization exercises in future research. Based on research results (Ferreira et al., 2012), state that Low-intensity physical activity carried out regularly by the elderly, such as in elderly gymnastics, tends to increase their muscle endurance. Likewise with the results of data analysis in this study, it can be seen that there is an influence on muscle endurance in people with dementia through the provision of brain vitalization exercises. In article Previous research has shown that Tai Chi Chuan (TCC) exercise can increase muscle endurance in the elderly. The results also show that this exercise can be an effective approach to increase strength and muscle endurance in elderly individuals (Lan et al., 2000). While in previous small scope of research (Aminuddin, 2015), by using brain exercise treatment in the elderly which is carried out for 10-15 minutes 5 times a week for 1 month. The results of the study showed significant changes before and after treatment on the level of dementia in the elderly. The involvement of the elderly in sports activities will stimulate various components of physical fitness that are needed so that they can carry out more adequate daily activities (Junaidi, 2011). Various kinds of routine physical activity will greatly affect, endurance training can mainly increase aerobic capacity and reduce body fat, while strength training mainly results in increased strength and muscle mass (Sillanpää et al., 2012).

CONCLUSION

This study can be concluded that there is a significant effect on muscle strength in people with dementia and endurance muscles of people who have dementia through the provision of exercise treatment/brain vitalization exercise activities. Furthermore, researchers will develop research, especially in terms of the components contained in brain vitalization exercise which will then also be linked to other variables related to health in people with dementia. so that it can be concluded again that

there is a significant effect on muscle strength of people with dementia and muscle endurance of people with dementia through the provision of brain vitalization exercises/exercise activities.

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