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Aerobic exercise with low-intensity gymnastics against physical fitness and body mass index in the elderly

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Abstract

Decreased physical activity in the elderly is a problem today, lack of physical activity and not understanding physical activity causes a decrease in fitness and body mass index for the elderly. This study aims to improve the physical fitness and body mass index of the elderly with Aerobic exercise with low-intensity gymnastics. This study was a quasi-experiment with a single-group pretest posttest group design. Subjects involved with purposive sampling techniques with sample criteria with the application of inclusion and exclusion criteria with 40 elderly social services in Surakarta city. Instruments to measure physical fitness used the Rock Port test as far as 1609 m and body mass index measurements of weight and height. Data analysis using prerequisite tests and Kolmogorov Smirnov tests with SPPS 25 for Windows programs. The homogeneity test in this study used Test F. The data obtained were processed using IBM SPSS version 25 and paired T-test. The results showed a significant difference between physical fitness before and after aerobic exercise with low-intensity gymnastics, it was from the results of significance 0.056 (<0.05). While the results showed there was a significant difference between body mass index before and after aerobic exercise with low-intensity gymnastics from the results of significance P = 0.028 (<0.05). From these results, aerobic exercise can improve physical fitness and body mass index in the elderly. So that the elderly can take advantage of these activities to maintain their body health.

Keywords: Physical fitness, body mass index, aerobic, elderly.

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INTRODUCTION

Indonesia is one of the countries with the largest population in the world, including the elderly population. In almost 5 decades, the percentage of Indonesian elderly has more or less doubled (1971-2019), namely to 9.6% (25 million), where female elderly are approximately 1% more than male elderly

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(10.10% versus 9.10%) (Statistics Indonesia, 2019). Of all the elderly in Indonesia, the young elderly (60-69 years) far dominate with a magnitude reaching 63.82%, followed by the middle elderly (70-79 years) & the elderly (80+ years) using the respective magnitudes of 27.68% & 8.50%. This year, there are already 5 provinces that have an old population structure where the elderly population has reached 10%, namely Special Region of Yogyakarta (14.50%), Central Java (13.36%), East Java (12.96%), Bali (11.30%) & West Sulawesi (11.15%) (Kementrian Kesehatan RI, 2017).

The body mass index of the elderly has increased, this is based on a decrease in activity, a less active lifestyle, and a decrease in the body's ability (Oktriani, 2019). The elderly experience an increase in body mass index, one of which is a decrease in physical activity due to limiting activity due to a decrease in body ability. A decrease in physical fitness will significantly increase physical complaints and BMI (Harden et al., 2022). A decrease in physical fitness will significantly increase physical complaints and BMI. Physical fitness is the body's ability to carry out activities without experiencing significant fatigue (Jefferis et al., 2014). The elderly will get a good fitness level if they regularly do physical activity or exercise (Rauner et al., 2013).

The physical activity carried out by the elderly will be closely related to quality of life, health, and well-being (Chen et al., 2016). Conversely, humans do not do physical activity according to their needs. In that case, they will likely be susceptible to diseases due to lack of movement (Hypokinetics), such as type 2 diabetes (Gram et al., 2014). Low physical activity levels increase the risk of obesity and many other chronic diseases, including coronary heart disease, diabetes and bowel cancer (Ogilvie et al., 2011).

Physical activity in the elderly is certainly different from other age categories. Physical activity is the activity of moving or moving the body. Physical activity in the elderly must be adjusted to the abilities and conditions of the elderly concerned, and this is because of the difference in the immune system of each elderly. Farming, gardening, and walking upstairs are physical

activities carried out by the elderly. The activity of the elderly can be measured through (frequency), how much effort is used during the activity (intensity), how long the activity is done (time), and what type of activity is done (type) (Elsawy & Higgins, 2010).

Training programs for the elderly include types of cardiovascular exercise, muscle strength, flexibility, and coordination with a frequency of 3 to 6 times per week, duration of 30-40 minutes each exercise session with a low intensity between 60% - 70% of the maximum pulse rate (Putra & Suharjana, 2018; Satriya et al., 2022). In addition to maintaining the health and fitness of the elderly, the compiled physical activity exercise program can also be used as a therapeutic tool (Nur'amalia, Abdullah, et al., 2022).

Physical fitness is a very important thing for the elderly. A person will get a good fitness level if he regularly does physical activity or sports (Ruscheweyh et al., 2011). Other studies have shown that low-intensity walking exercises affect physical fitness (Kemmler et al., 2010). In addition to maintaining fitness levels, physical activity exercise programs can also be used as therapeutic tools (Santos et al., 2012). If the elderly do not do physical activity, they will be susceptible to diseases due to lack of movement, one of which is obesity. Obesity is usually characterized by increased body fat but a loss of muscle mass and functional capacity in the elderly (Navarrete-Villanueva et al., 2021). In addition, obesity in a person also shows an imbalance in body mass in terms of body weight and height. Body Mass Index / BMI can be used as a reference scale for measuring a person's nutritional status, including the elderly (Patel et al., 2012). In addition, the nutritional status of the elderly measured through the BMI scale is used as one of the indicators of elderly health.

Activities that have been developed to improve physical fitness and body mass index in the elderly are currently not suitable for use and development. However, this problem must be given a solution so that the elderly do not decrease their physical activity so that the health of the elderly can be maintained to be able to carry out daily activities. Physical activity for the elderly

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must be careful because of the decrease in the ability and capacity of the body to play a decrease (Desmonika et al., 2022; Nuraeni et al., 2019). Sports for the elderly must use light exercise, be pleasant in nature and have benefits that nourish the body. The selection of gymnastics is inseparable from research (Cadore et al., 2013; Fatmawati et al., 2021), which states that light-intensity gymnastics activities are suitable for the elderly.

METHOD

This study used quantitative research in the form of a quasi-experimental research design with one group pretest-posttest to determine the change in value between before and after group treatment. The population in this study is all members of the Elderly Social Service Institution in the Surakarta city area. The sample in this study was 40 elderly, and the subjects were 40 elderly with inclusion and exclusion criteria. The implementation time is April-June 2023. The population in this study is the Elderly Social Service Institution in the Surakarta city area. The sample in this study was 40 elderly.

Inclusion criteria include ages 60–79 years, walking without aids, cooperative and willing to participate in research by signing a participation form to be a research subject. Exclusion criteria include comorbid diseases (angina pectoris, myocardial infarction, pulmonary disease, stroke, osteoarthritis of the knee joint or pelvic grades III-IV, Parkinson's) that hinder activity. with a total of 40 elderly. Interviews in recruiting research subjects are carried out to ensure that the criteria can be contained in prospective research subjects. To collect data for research purposes, research instruments are needed, the instruments used in this study use the Rock Port test as far as 1609 m. Before carrying out test activities in the form of willingness to participate in research activities, data collection is given in writing and checking to determine the weight and height of the elderly. Calculation of sample normality is a test of the normality or absence of the data analyzed. This study's data normality calculation used Kolmogorov Smirnov with the program SPPS 25 for Windows. The calculation

of homogeneity is intended to ensure that the groups that make up the sample come from the same population. The calculation of homogeneity in this study used Test F. Hypothesis testing using Test t using the help of the SPSS 25 program compares the initial test results with the final test results using the Rock Port test as far as 1609 m and measuring weight and body mass index in the elderly.

Research Procedure

The initial stage of this research was conducted by conducting interviews with research subjects so that the samples used were in accordance with the wishes of the research. After the subject is selected, the subject is given a document explaining the prospective subjects' willingness to participate in research activities. Furthermore, checks were carried out from the initial test of physical fitness and body mass index using the Rock Port test as far as 1609 m instrument for physical fitness and questionnaires and direct measurements to find out the body mass index of the elderly. Furthermore, treatment was given to subjects for 8 weeks to see the development of physical fitness values and body mass index by doing a posttest at the end of the treatment session. This research has obtained permission from the Faculty of Sports Universitas Sebelas Maret Surakarta with letter number 948/UN27. 11/PK.03.03/2023.

RESULT

At the end of the study, the overall data analyzed were 40 elderly people. In the first week of low-intensity aerobic exercise, exercise still runs normally. Furthermore, the elderly who were the study sample experienced complaints of pain in the body for the next 1 week, and the condition improved with rest, and the subject could still follow the research activities in the next session. There were no other complaints for the next three weeks experienced by the elderly after doing low-intensity aerobic exercise, and it could be done for 8 weeks of treatment. The complaint improved with rest, and the subject could still participate in a low-intensity aerobic exercise in the next session. No other

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complaints are experienced by the elderly after doing low-intensity aerobic exercise. Thus, the final values of Vo2Max influenced by low-intensity aerobic exercise are as follows:

Table 1. Paired Samples Statistics Physical Fitness

		Mean	N	Std. Deviation	Std. Error Mean	t	Correlation	Sig.
Pair 1	Pretest	15.63	40	8.34416	1.319	-3.189	.735	.000
	Posttest	18.70	40	8.39780	1.327			

Based on the paired sample test results analysis, a probability value of 0.000 is obtained. Thus, H0 is rejected as 0.000 < 0.05. This means that "Healthy Heart" gymnastics for the elderly community improves physical fitness. This result also showed that the average before treatment was 15.63, and the average after treatment was 18.70. The average score is greater after treatment by 3.07.

Table 2. Average Body Mass Index before and after Aerobic exercise with low-intensity gymnastics

IMT	Min	Max	Mean ± SD	P
Pretest	20	26	24±1,276	0,029*
Posttest	21	26	24±1,000	0,032*

Description:*= Shapiro-Wilk distribution

Based on Table 2, BMI can be seen before aerobic exercise with low-intensity gymnastics with a minimum value of 20, maximum value of 26, average SD 24±1.276 and P value = 0.029 (<0.05) with interpretation of data not normally distributed. BMI after aerobic exercise with low-intensity gymnastics minimum value 21, maximum value 26, average SD 24±1,000 and P value = 0.032 (>0.05) with normal distributed data interpretation. After univariate analysis, it was found that the distribution of BMI data before and after aerobic exercise with low-intensity gymnastics was normal.

Table 3. Paired Samples Test Physical Fitness

		Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Pair 1	Pretest PostTest	-3.07500	6.09913	.96436	-3.189	39	0.003

The significance value (2-tailed) of this treatment is 0.003 (p < 0.05). So that the results of the initial test and the final test experience significant changes (meaningful). The initial and final tests proved to be higher based on descriptive

statistics. It can be concluded that "healthy heart" gymnastics can improve physical fitness.

Table 4. Paired T Test on BMI Before and After Aerobic exercise with low-intensity gymnastics

BMI	N	P
Pretest Posttest	40	0,028

In table 5. The Wilcoxon test results of Body Mass Index before and after aerobic exercise with low-intensity gymnastics is P = 0.028 (<0.05) with the interpretation that there is a significant difference between body mass index before and after aerobic exercise with low-intensity gymnastics.

Table 5. Physical Fitness subject feasibility test

Physical Fitness	N	P
Pretest Posttest	40	0,056

In table 5. The results of the Wilcoxon test from physical fitness results before and after Aerobic exercise with low-intensity gymnastics are P = 0.056 (<0.05) with the interpretation that there is a significant difference between physical fitness before and after Aerobic exercise with low-intensity gymnastics.

DISCUSSION

In this study, aerobic exercise with low-intensity gymnastics was carried out 3 times a week for 8 weeks, with significant differences between before and after the intervention. This study seeks to ascertain the effect of physical activity in the form of low-intensity aerobic exercise on improving physical fitness and body mass index in the elderly. From the treatment results, paired sample test results were obtained, and a probability value of 0.000 was obtained. Thus, H0 is rejected as 0.000 < 0.05. This means that "Heart-Healthy Gymnastics" for the elderly community affects the improvement of physical fitness. These results also showed that the mean before treatment was 15.63, and the average after treatment was 18.70. The average score was greater after treatment of 3.07. while on body mass index So that the results of the initial

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test and final test results experience significant changes (meaningful). The initial and late tests proved to be higher based on descriptive statistics. Aerobic exercise with low-intensity gymnastics improved physical fitness, similar to gymnastics intended for the elderly in this study. This study's results align with research (Kemmler et al., 2010), which showed improvements in physical fitness scores greater than in aerobic exercise in the elderly. Aerobic exercise with low-intensity gymnastics also improves body capacity and aerobic exercise by doing other activities for the elderly. The improvement is possible due to increased respiratory muscle strength, decreased lung residual volume, increased gas exchange efficiency, and a slowed decline in lung function (Feitz et al., 2022).

Much evidence supports the benefits of physical activity in slowing physiological ageing changes that decrease exercise capacity, optimize age-related changes in body composition, control chronic disease, and lower the risk of physical disability (Thomas et al., 2021). The ACSM recommends exercise in the elderly, including aerobic exercise, strengthening, and flexibility. Aerobic exercise is recommended 3–5 days a week for 150–300 minutes in one week. Low-intensity exercise, such as light walking, stretching, lifting weights, sit-ups and pushups with walls, impacts physical and cognitive health in the elderly, especially in the elderly (Ribeiro et al., 2012). Physical activity has also proven to be a "medicine" for the elderly. Low levels of physical activity are associated with an increased risk of mortality and the development of chronic health problems in the elderly over 65 years of age.

Conversely, high levels of physical activity reduce the risk of mortality of the elderly. Those who were moderately active at 150 minutes per week had a 30% reduction in mortality compared to those who were less active (Taylor, 2014). The greatest benefit of this physical activity is obtained by those aged 60 years and over (Arem et al., 2015). Therefore, those who handle the elderly have an important role in encouraging the elderly community to achieve the

appropriate activity level so that their health improves and lives long (Taylor, 2014).

High levels of physical activity are associated with good quality of life in the elderly, both on the scale of physical health quality and mental health quality. Therefore, it is necessary to develop an appropriate physical activity program for the elderly, accompanied by policy support from the local government and socialization. (World Health Organization, 2020) recommends policies to promote physical activity as follows: First, ensure that the physical environment for walking, cycling, and other forms of physical activity is accessible and safe for all. Second, introduce transportation policies that promote active and safe methods of getting to school and work, such as walking or cycling. Third, improve sports facilities, recreation and other recreational activities. Fourth, increase the amount of safe space available to actively play (Kamaruddin, 2022). A study Hou & Sun, (2022) showed improvements in endurance, lower leg strength, balance, walking speed, and peak oxygen consumption as a result of low-intensity exercise in the elderly. Low-intensity provides better exercise participation compliance than moderate or high-intensity exercise (Mei & Chang, 2023).

Increased physical fitness and body mass index have changed and have positively impacted the elderly. Aerobic exercise with low-intensity gymnastics in this study used a frequency of 3x a week with low intensity and a duration of 30 minutes for each exercise. Although applying Aerobic exercise with low-intensity gymnastics is still not optimal in getting good results, the study subjects get improvements from the value of physical fitness and body mass index, shown by a significant increase in statistical values. Based on previous research, the improvement in body mass index increased and was also clinically meaningful (Lee & So, 2019).

Improvement of physical fitness after doing Aerobic exercise with low-intensity gymnastics can be caused by physiological improvements in the body due to the impact of the activities carried out. A study conducted by (Bai et al.,

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2022) found that increasing muscle strength will improve the fitness of the elderly body. Increased cardiac output (maximal ejection volume and heart rate) and venous and arterial oxygen differences (capillary density and muscle myoglobin concentration) contribute to improvements in physical fitness and maximal body mass index produced by movement in aerobic exercise with low-intensity gymnastics.

Aerobic exercise with low-intensity gymnastics will cause an increase in capillaries in the muscles and the number of mitochondria in the skeletal muscles (Mei & Chang, 2023). Increased muscle mass and blood flow in muscles trained are other factors that improve physical fitness. New capillaries formed in the muscles will increase blood flow to the muscles and expand the gas exchange area during physical activity. Maximal oxygen consumption is proportional to the oxidative capacity of muscle fibres. Increased mitochondria will increase the oxidative capacity of muscles and the ability to extract and use oxygen from arterial blood. Improvements in the muscles will reduce the load on the cardiorespiratory system in meeting the needs of oxygen and nutrients to muscle tissue.

Aerobic exercise with low-intensity gymnastics uses the basic position of moving the whole body from head to toe so that the body is moved. This position increases the ability to move the body by moving slowly and minimizing the occurrence of injuries or movements that endanger the body. In research conducted on the elderly, elderly fitness gymnastics exercises improved physical activity levels in the elderly group. Aerobic exercise with low-intensity gymnastics for 8 weeks performed in late adulthood also showed significant improvements in the lower leg and back strength (Thomas et al., 2021).

Aerobic exercise with low-intensity gymnastics for the elderly is included in aerobic exercise. Increased cardiac output formed from changes in ejection volume or heart rate is the cardiocirculatory component of activity-induced adaptation. The aerobic exercise shows benefits for improved cardiac output and arterial–venous oxygen differences (Cardoso et al., 2020). This suggests

that aerobic exercise impacts central and peripheral oxygen transport and use adaptations. The duration and frequency of aerobic exercise with low-intensity gymnastics vary in previous studies Low-intensity aerobic exercise can be done with a duration of 15-20 minutes/day and a frequency of 1-3 times each week. From these results, Aerobic exercise with low-intensity gymnastics can make an alternative physical activity for the elderly with the benefits provided when the elderly do the activity, in addition to improving physical fitness and stabilizing the body mass index of the elderly, physical activity in the form of low-intensity gymnastics as an activity that can support health for the elderly body. The effects of physical activity can be directly related to increased fitness levels and health maintenance, which can be healthy for the elderly (Fatmawati et al., 2021). Therefore, this study aims to see the effect of aerobic exercise with elderly intensity on physical fitness and body mass index in elderly athletes. In the future, it is hoped that studies will emerge that can design physical activities that can have an impact on the health of the elderly, considering that the elderly currently lack physical activity knowledge and lack of physical activity entering the elderly.

CONCLUSION

Aerobic exercise with low-intensity gymnastics in the elderly improves physical fitness and body mass index, and the increase in changes obtained in the elderly can be very significant. In future studies, other exercise methods can be carried out or assessment of aerobic capacity, fitness, and body mass index for the elderly. To have an impact on physical fitness and body mass index from this study, the elderly need to support the health of the elderly because, at that time, activity has decreased. Furthermore, a physical activity carried out by the elderly is better, with the right frequency and appropriate duration of activity, and can be adjusted in future studies in accordance with ACSM recommendations.

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