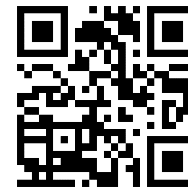


The Effectiveness of Yoga Exercise on Muscle Strength in the Elderly



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ABSTRACT: The increasing number of elderly people in Indonesia also increases the risk of degenerative diseases. In the elderly, it will bring about a complete change in their physique related to the decreased ability of body tissues, especially in physiological functions in the musculoskeletal and neurological systems. This study aimed to determine the effectiveness of Yoga exercise on increasing muscle strength in the elderly. This type of research is experimental. The population was all elderly Tresna Wreda Budhi Dharma Sleman Nursing Homes, Special Region of Yogyakarta, totaling 20 people with criteria above 60 years. Measuring lower body strength using a 30-second chair stand test. Yoga exercises were carried out for 16 meetings. The results showed that yoga exercise for 16 sessions effectively increased muscle strength in the elderly, with an increase of 12.5%. Suggestions that can be submitted based on the study in this study are yoga exercise training can be used as an option in muscle strength training for the elderly to improve muscle strength and maintain the ability to carry out daily activities; it is expected to be used as a reference for further researchers to conduct research with cases others in dealing with physical problems in the elderly.

KEYWORDS: Yoga exercise, muscle strength, elderly.

INTRODUCTION

Aging is a condition that occurs in human life. A large number of Indonesia's elderly population will have a positive or negative impact in the future. Based on population projection data, in 2017, there were 23.66 million elderly people in Indonesia (9.03%), while in 2020, the number of elderly people increased to 27.08 million. It is predicted that in 2025 it will be 33.69 million. In 2030 it will be 40.95 million, and in 2035 it will be 48.19 million. These data indicate that the increase in number of the elderly population is getting higher. Looking at the data on the growth rate of the elderly, in 2025, Indonesia is estimated to occupy the 5th position as the country with the largest number of elderly people in the world (Ohoitenan & Agustina, 2020).

The aging process is not a disease. Aging is the process of slowly losing the ability of body tissues to maintain normal structure and function. These anatomical changes have an impact on decreasing muscle strength. In the elderly, it will bring about a complete change in their physique related to the reduced ability of body tissues, especially in physiological functions in the musculoskeletal and neurological systems. Changes in the musculoskeletal system in the elderly experience a decrease in hand grip strength by 5-15%, leg strength by 20-40% in men, hand grip in women by 10-20%, and leg strength by 30-50% (Lupa et al., 2017).

As you age, muscle fibers shrink, and muscle mass decreases. As muscle mass decreases, muscle strength also decreases. Muscular strength begins to decline around age 40, with an accelerated decline after age 60 ((Nomura et al., 2018); (Hara et al., 2018)). According to (Guedes et al., 2018), people can lose about 10 to 15% of muscle strength each week if the muscles are fully rested, and as much as 5.5% can be lost daily under conditions of complete rest and immobility. The decrease in physical ability is caused by the degeneration process, leading to reduced body activity in the elderly. Degenerative diseases are diseases that occur due to the aging process. An inactive or sedentary lifestyle will be one of the risk factors for the emergence of various diseases caused by lack of movement (hypokinetic) ((Nandi et al., 2019); (Baker & Petersen, 2018); (Hou et al., 2019)).

A real decrease in function in the elderly is a decrease in muscle strength which will result in a reduction of the ability of muscle flexibility, which will affect the ability to maintain postural balance or body balance. Decreased muscle strength can lead to a reduction in functional ability in the elderly because muscle strength affects almost all daily activities so that their life needs can increase, and there is dependence on help from others. Decreased muscle strength in the upper extremities can cause the elderly

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to be unable to hold cups or glasses properly and unable to have and lift heavy objects (Jeon). Decreased muscle strength in the lower extremities can cause movements to become sluggish and stiff, steps become short, feet cannot tread firmly, easily wobble, and standing is already unstable, which can pose a risk of falling easily (Grimmer et al., 2019).

Realizing healthy, independent, active, and productive elderly people requires physical activity or sport that allows the elderly to maintain their physical fitness. The sport in question is yoga exercise. Yoga practice should be recommended to the elderly to increase muscle flexibility and range of motion of the joints, which is essential in improving the quality of life of the elderly. Yoga is a very popular sport today; Yoga practice is a comprehensive health system that is beneficial for improving physical health and providing peace of mind and soul ((Moore & Pennington, 2021); (Cartwright et al., 2020)). Yoga in Sanskrit is "yuj," which means the union of breath, body, and soul ((Bhardwaj, 2019); (Erkin & Akçay, 2018); (Tiwari & Negi, 2019); (Hemamalini, 2018)). Yoga is a systematic condition for improving the body's condition, understanding the mind, and liberating the soul.

Yoga is one of the most natural and comfortable forms of exercise that is practiced all over the world in some form or another by people of every gender, age, physical ability, etc. ((Vaidya et al., 2021); (Shawahna & Abdelhaq, 2020)). If practiced regularly, yoga will connect the mind, body, and spirit, allowing for a stronger connection with other people and the universe (Zafeiroudi, 2021). Yoga is a systematic condition for improving the body's condition, understanding the mind, and liberating the soul. If practiced regularly, Yoga will connect the mind, body, and spirit, which allows for a stronger connection with other people and the universe ((Guddeti et al., 2019); (Boaventura et al., 2022)). Yoga is a form of exercise that combines breathing techniques, relaxation, meditation, and stretching. Yoga is a person's activity that focuses the mind on controlling the five senses and the body.

Yoga is a concept that was born in India, then developed in society from ancient times until now, and has experienced changes and differences. Through a series of careful and concentrated physical exercises, a Yoga practitioner is taught to awaken all parts of his body and soul. From the background described above, the authors are interested in researching the effectiveness of Yoga exercises on muscle strength in the elderly.

METHOD

This type of research is experimental. The experimental method is a systematic method to build a relationship containing a causal-effect relationship phenomenon. The population was all elderly Tresna Wreda Budhi Dharma Sleman Nursing Homes, Special Region of Yogyakarta, totaling 20 people with criteria above 60 years. Measuring lower body strength using a 30-second chair stand test. Purpose: to measure lower or lower body strength, which is very important for the elderly to perform many tasks such as climbing stairs, walking, and reducing the risk of falling opportunities for the elderly. Facilities and Equipment: Flat surface, chairs, stopwatch Officers: Test guides and score takers. Implementation: The test taker sits on the chair that has been provided; his right and left hands are folded and crossed on his chest, then stands up straight within 30 seconds. Assessment: Strength scores are seen from the ability of the participants to stand for 30 seconds; the best score from one experiment is recorded as a score in seconds with an accuracy of 0.5 kg. Data analysis techniques include descriptive analysis, prerequisite test (normality and homogeneity test), and hypothesis testing using paired sample test. Analysis using SPSS 23 software.

FINDING

The treatment was carried out for 16 meetings. Each meeting was held for 1 hour, starting with warming up \pm 10 minutes, the core exercise by giving Yoga exercise \pm 40 minutes, and cooling down \pm 10. The results of the descriptive statistical analysis of the pretest and posttest of muscle strength in the elderly are presented in Table 1:

Table 1. Results of Statistical Descriptive Analysis

Muscle Strength	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	20	8,00	13,00	10,80	1,77
Posttest	20	9,00	14,00	12,15	1,69

Based on Table 1, it shows that the muscle strength of the elderly at the pretest was on average 10.80 ± 1.77 , while at the posttest after being given Yoga exercise, it increased by an average of 12.15 ± 1.69 .

Data normality test using the Shapiro-Wilk method using SPSS 23, the results are in Table 2:

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Table 2. Results of Normality Test Analysis

Muscle Strength	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest	0,202	20	0,176
Posttest	0,165	20	0,157

Based on the statistical analysis of the normality test that has been carried out using the Shapiro-Wilk test, muscle strength data at pretest and posttest obtained normality test results with a significance value of $p > 0.05$, which means the data is normally distributed.

Homogeneity test using Levene Statistics using SPSS 23, the results are in Table 3:

Table 3. Results of Homogeneity Test Analysis

Test of Homogeneity of Variances			
Pretest-Posttest			
Levene Statistic	df1	df2	Sig.
0,101	1	38	0,752

Based on the results of the analysis in Table 3, it can be seen that the pretest-posttest muscle strength of the elderly obtained a sig. $p > 0.05$, so the data is homogeneous.

The hypothesis was tested using t test analysis, namely paired sample t test ($df = n-1$) using SPSS 23. The results of hypothesis testing are presented in Table 4:

Table 4. Analysis Results of Paired Sample T Test

Paired Samples Test								
Pair	Paired Differences					t	df	Sig.(2-tailed)
	Mean	Std, Deviation	Std, Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pretest - Posttest	-1,35	0,67	0,15	-1,66	-1,04	9,000	19	,000

Based on the results of the analysis in Table 4, it can be seen that the t count is 9.000 and the t table (df 19) is 2.093 with a p significance value of 0.000. Because $t_{\text{arithmetic}} 9,000 > t_{\text{table}} 2,093$, and a significance value of $0.000 < 0.05$, this result indicates that there is a significant difference. Thus the alternative hypothesis (H_a) which reads "There is a significant effect of Yoga exercise on muscle strength in the elderly", is **accepted**. The magnitude of the increase in muscle strength in the elderly after being given Yoga exercise was 1.35 or 12.5%.

DISCUSSION

The results showed that yoga exercise for 16 meetings was effective in increasing muscle strength in the elderly. The results of this study are in line with research that has been carried out (Mondal et al., 2017) based on statistical analysis using SPSS, showing that there is an overall significant increase in $F(2.24) = 35, 706, p = 0.000$ in the COP area for all five trials. Condition after yoga training, posthoc test showed a significant improvement for the elderly. The results of this study are in line with research that has been carried out by (Patel et al., 2019). The title of the effect of Yoga on balance in the geriatric population is that there is a very significant decrease ($p\text{-value} < 0.05$) in TUG test scores between group A while there is a significant increase ($p\text{-value} < 0.05$). Physical exercise Yoga is able to improve, strengthen and maximize flexibility and muscle strength (Donahoe-Fillmore & Grant, 2019); (Zarco et al., 2022); (Vaidya et al., 2021)), and balance ((Bintari et al., 2021). (Buttichak et al., 2019) said that muscle strength, muscle endurance, flexibility, and cardiovascular endurance could increase after being given Yoga therapy. Area(Csepregi et al., 2022) reported a significant increase in ankle flexibility, shoulder elevation, trunk extension, and trunk flexion after being given Hatha Yoga exercises. This can happen because of stretching/static stretching. Asanas as an essential component of increasing flexibility in Yoga practice. The results of the study by (Munawarah & Triariani, 2019) show that giving Yoga Exercises can improve static balance in the elderly.

Yoga combines physical movements in breathing, relaxation and meditation techniques, and stretching exercises. Yoga practice

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Is a combination of static and passive stretching. One Yoga session consists of several different parts that are performed sequentially, namely (1) postures (asanas of Hatha Yoga), (2) breathing techniques (pranayama), and (3) mental concentration or meditation (dhyana) (Yadav et al., 2022). Muscle stretching movements include movements in yoga such as bending to touch the feet in a standing and sitting position, arching the back like a cobra pose, and movements such as prostrating. In this stretch, the movement is done by stretching the muscle slowly until the muscle being stretched feels sore (still tolerable). In this situation, the body weight or other body parts hold the muscle stretch position, so the stretching is more maximal. When the muscle is passively stretched, some mechanical breakdown will occur between the cross-bridge filaments (actin and myosin). There will be a distance between these filaments, and the sarcomere will become elongated. When the strain is removed, the sarcomeres remain in an extended position. In addition, if stretching is carried out continuously, the fascia that covers the muscle (epimysium, endomysium, and perimysium) will experience semi-permanent lengthening. Other tissues such as tendons and ligaments will also lengthen. So this stretch can stimulate the production and storage of ingredients such as gel glycosaminoglycans (GAGs). This substance, along with water and hyaluronic, lubricates and maintains the distance between the fibers of the tissue.

Yoga exercise utilizes three phenomena of stimulation of receptors in muscles: muscle spindles, reciprocal inhibition, and Golgi tendon organs (GTO). When stretching a muscle, there is a change in muscle length that activates the muscle spindles in the muscle belly, which will send a signal to change the length of the muscle to the spinal cord, which will respond to this signal as a threatening change so that it will send a signal for contraction of the muscle being stretched which is called the stretch reflex. (Prochazka, 2021). So, it is necessary to stretch slowly and gradually hold the muscle spindles to adapt to changes so that the spinal cord will reduce the quality of the contraction impulses so that the muscles are more easily stretched and can do deeper yoga postures which will then increase flexibility. During yoga, the Golgi tendon organs are stimulated by changes in muscle tension that occur during restraining movements (LaSala et al., 2021). GTO will signal to the spinal cord about changes in muscle tension (Shah, 2012). Muscle contractions that occur when holding a Yoga posture cause muscle relaxation after doing that posture which ultimately, Yoga movements can increase flexibility and relaxation of the body. This condition shows that the implementation of yoga exercise has a good influence on static balance in the elderly. One of the benefits of implementing yoga is to reduce mass and increase muscle strength, including the pelvic, leg, and leg muscles that play an active role in the static balance of the elderly and prevent or slow down functional muscle loss.

CONCLUSION

The study concludes that yoga exercise for 16 meetings effectively increases muscle strength in the elderly by 12.5%. Suggestions that can be submitted based on the study in this study are yoga exercise training can be used as an option in muscle strength training for the elderly to improve muscle strength and maintain the ability to carry out daily activities; it is expected to be used as a reference for further researchers to conduct research with cases others in dealing with physical problems in the elderly.

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