

THE EFFECT OF BALANCE EXERCISE ON MUSCLE STRENGTH IN THE ELDERLY

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ABSTRACT

Elderly (elderly) is an advanced stage that is passed through in the life process of every human being which is characterized by a decline in the ability and function of the body both physically and psychologically. WHO (World Health Organization) noted that there were 600 million elderly people in 2015 worldwide, the number of elderly people in West Java in 2017 was 4.16 million people or around 8.67 percent of the total population of West Java, consisting of 2.02 million people (8.31 percent) elderly men and 2.14 million people (9.03 percent) elderly women, in Bogor City 55,283 thousand people. The research design was a pre-experimental design with a one-group pre-post test design. The sample in this study was 35 respondents, sampling by Total sampling. The study was conducted on July 2-5, 2025. Balance Exercise was carried out twice a week. It is known that the results of the study of muscle strength values before being given Balance Exercise showed that there were 17 respondents (48.6%) with Grade 4 muscle strength results, and the results of the study of muscle strength values after Balance Exercise were given were 15 respondents (42.9%) with Grade 4 muscle strength results, there were 10 respondents (28.6%) with Grade 5 muscle strength results. Based on the results of the analysis with the Non Parametric test, the Wilcoxon signed rank test with the results of p value = 0.012 which is smaller than (P value <0.05) shows the influence of Balance Exercise on muscle strength.

Keywords: Balance Exercise, Muscle Strength, Elderly

INTRODUCTION

Aging, or growing older, is a natural and sometimes subtle process. This process occurs naturally and is accompanied by a decline in physical, psychological, and social conditions, all of which interact with each other.¹

The WHO (World Health Organization) noted that there were 600 million elderly people worldwide in 2015. It is estimated that the number of elderly people in Indonesia will continue to grow by around 465 thousand people per year. According to the WHO, the elderly population in Southeast Asia is 8% or around 168 million people. By 2050, the elderly population is estimated to increase threefold from this year. In 2000, the number of elderly people was around 5,300,000 (7.4%) of the total population, while in 2016 the number of elderly people was 24,000,000 (9.77%) of the total population, and by 2020 the number of elderly people is estimated to reach 28,800,000 (11.34%) of the total population.⁵

The results of the Indonesian Population Projection for 2010-2035, the number of elderly people in West Java in 2017 was 4.16 million people or around 8.67 percent of the total population of West Java, consisting of 2.02 million people (8.31 percent) elderly men and 2.14 million people (9.03 percent) elderly women. The number of elderly people aged over 60 years

in Bogor Regency reached 264,981 thousand people and in Bogor City 55,283 thousand people. This number is the largest number of elderly people in West Java.⁵

Elderly people experience declines in the musculoskeletal system. One of these declines is muscle strength caused by decreased muscle mass. Dead muscle cells are replaced by connective tissue and fat. Strength, or the amount of force produced by muscles, decreases with age. Lower extremity muscle strength decreases by 40% between the ages of 30 and 80. Lifestyle changes and decreased use of the neuromuscular system are the main causes of muscle strength loss.⁶

Decreased muscle strength in the elderly occurs due to changes in muscle structure due to aging. These changes include a decrease in the number and size of muscle fibers, atrophy of some muscle fibers and hypertrophy of others, an increase in fat and connective tissue, and other negative effects. These effects include decreased strength, decreased flexibility, slowed reaction time, and decreased functional ability.

Researchers from Columbia University Medical Center found that the decline in muscle strength with aging is caused by calcium leakage from a protein group in muscle cells called ryanodine, which then triggers a chain of events that limits muscle fiber contraction. With reduced calcium availability, muscle contractions weaken. Decreased daily activity limits range of motion, which in turn affects muscle strength, flexibility, and balance, making older adults more reluctant to move. At rest, muscle strength decreases by 5% per day. Another factor that influences muscle strength is nutritional status. Nutritional status is the body's condition resulting from food intake, absorption, and utilization.

Based on the results of a preliminary survey in the Tanah Baru village area, RT 003/004, there were 35 elderly people consisting of 20 women and 15 men. Of the 35 elderly, 17 complained of muscle problems. The results of brief interviews with local RTs showed that both male and female elderly complained of difficulty walking, pain and aches in muscles and joints. To reduce pain and aches, local cadres recommend consuming nutritious foods containing sufficient calcium, minerals, and vitamins.

METHOD

The research method is Pre-Experimental Design. This study uses a One-group pretest posttest design, which reveals a causal relationship by involving one group of subjects. The subject group was observed before the intervention was carried out, then observed again after the intervention.²² This research design is quantitative research. Quantitative methods can be

interpreted as research methods based on the philosophy of positivism, used to research certain populations or samples, data collection using research instruments, data analysis is quantitative/statistical, with the aim of testing the established hypothesis.²¹

The population in this study were subjects who met the established inclusion criteria. The population in this study was 35 elderly people in Tanah Baru Village, RT 003/004, Bogor City.

RESULTS

Table 1 Results of Muscle Strength Tests in the Elderly Before Balance Exercise

No.	Muscle Strength	Frequency	Percentage (%)
1.	Grade 1	1	2.9%
2.	Grade 2	3	8.6%
3.	Grade 3	13	37.1%
4.	Grade 4	17	48.6%
5.	Grade 5	1	2.9%
	Total:	35	100%

Based on the results of Table 1 above, it is known that out of 35 respondents, the results of Muscle Strength in the Elderly before Balance Exercise in the Tanah Baru Village Area, RT 003/004, Bogor City, obtained the most results of 17 respondents (48.6%) with Grade 4 muscle strength results. It is known that the Mean or average value of muscle strength before Balance Exercise was 4.41 with a total of 35 respondents.

Table 2 Results of muscle strength test in the elderly after balance exercise

No.	Muscle Strength	Frequency	Percentage (%)
1.	Grade 2	3	8.6%
2.	Grade 3	7	20%
3.	Grade 4	15	42.9%
4.	Grade 5	10	28.6%
	Total:	35	100%

Based on the results of Table 2 above, it is known that out of 35 respondents, the results of the Muscle Strength value in the Elderly in the Tanah Baru Village Area, RT 003/004, Bogor City, obtained the most results from 15 respondents (42.9%) with a muscle strength value of Grade 4. It is known that the Mean or average value of the muscle strength value in the elderly after being carried out was 4.91 with a total of 35 respondents.

Table 3 Results of the Effect of Balance Exercise on Muscle Strength in the Elderly

<i>Test Statistics</i>	
	<i>Post-test - Pre-test</i>
<i>Z</i>	<i>-2.516a</i>
<i>Asymp. Sig. (2-tailed)</i>	<i>0.012</i>

Based on the results of Table 3 above, it is known that if the data is not normally distributed, the Wilcoxon signed rank test hypothesis test is used. Results of Hypothesis Testing *Wilcoxon signed rank test* in the table above, namely seen from the Sig. (Significant) value of 0.012. So, if the P value < 0.05 (H_0 is rejected, H_a is accepted) it means that there is an effect of Balance Exercise on muscle strength in the elderly aged over 60 years in Tanah Baru Village, RT 003/004, Bogor City.

DISCUSSION

1. Muscle Strength in the Elderly before Balance Exercise

Based on the results of the study, it is known that from 35 respondents, the results of muscle strength values in the elderly before the Balance Exercise in the Tanah Baru Village Area RT 003/004, Bogor City, obtained the most results of 17 respondents (48.6%) with muscle strength results of Grade 4. This means that some respondents have a muscle strength scale of 4, usually the elderly can still follow orders well, are able to do it fully but are still weak. Of all those studied, it was found that the majority of the total number of respondents were female, namely 20 people (57.1%).

Muscle strength is the ability of a muscle to overcome a load. Muscle strength is the force, force, or tension a muscle or group of muscles can generate during a maximal contraction. Several factors influence muscle strength, including age, gender, physical activity (sports, balance training), nutrient intake, and nutritional status.

The results of this study are supported by Primadani Kharisma's research entitled the effect of Balance Exercise on muscle strength in the Elderly in German Village, Surgio District, Lamongan Regency in 2018. The research design used in this study is a pre-experimental design with a one group pre-test and post-test design approach using probability sampling techniques with a simple random sampling approach. The sample used in this study was 31 people consisting of 13 men and 18 women. The results of the analysis show that gender also affects a person's joint flexibility. Women are more flexible than men

because their bones are smaller and their muscles are fewer than men.

Based on the facts obtained and the understanding above, it can be concluded that women experience a greater decrease in muscle strength than men.

2. Muscle Strength in the Elderly after Balance Exercise

Based on the research results, it is known that out of 35 respondents, the results of muscle strength values in the elderly after the Elderly Balance Exercise in the Tanah Baru Village Area RT 003/004, Bogor City, obtained the highest results of 15 respondents (42.9%) with muscle strength values of Grade 4.

Muscle strength is the ability of a muscle to overcome a load. Muscle strength is the force, force, or tension a muscle or group of muscles can generate during a maximal contraction. Several factors influence muscle strength, including age, gender, physical activity (sports, balance training), nutrient intake, and nutritional status.

The results of this study are supported by Ronald Sagala's research entitled *The Effect of Balance Exercise on Muscle Balance and Muscle Strength in Elderly with a Risk of Falling in the Kolang District Health Center, Central Tapanuli Regency*. With the method This type of research is a quasi-experimental with a pre-test and post-test two-group design. The sample used in this study was 31 people consisting of 16 people in the intervention group and 15 people in the control group. The sampling technique used in this study was using a purposive sampling technique. The results of the analysis showed that after the Balance Exercise was carried out, most respondents (85.7%) were in the medium fall risk category, but in the group after the Balance Exercise was carried out, most respondents (85.7%) were in the medium fall risk category, but in the control group more than half of the respondents (61.5%) were in the medium fall risk category.

Based on the theory and research results, researchers assume that there is an increase in muscle balance and muscle strength and a decrease in the risk of falling in the elderly after being given Balance Exercise.

3. The Effect of Balance Exercise on Muscle Strength in the Elderly

Based on the research results, it is known that the results of the Wilcoxon signed rank test hypothesis test in the table above are seen from the Sig. (Significant) value of 0.012. So, if the P value <0.05 (H_0 is rejected, H_a is accepted) it means that there is an effect of Balance Exercise on muscle strength in the Elderly in the Tanah Baru Village Area, RT

003/004, Bogor City.

Balance Exercise Balance exercises are a series of movements performed to improve both static and dynamic balance through stretching and strengthening. Specific exercises to help increase muscle strength in the lower limbs and the vestibular system, or body balance.

The results of this study are supported by Ronald Sagala's research entitled the effect of Balance Exercise on Balance and Muscle Strength in the Elderly with the risk of falling at the Kolang sub-district health center, Central Tapanuli Regency. This study consisted of 31 respondents. The results of the study explain that there is an effect of Balance Exercise on Muscle Strength in the Elderly, the data obtained is the T test with the result of P value = 0.00 ($\alpha < 0.05$) so it can be concluded that there is a significant effect of Balance Exercise on muscle strength in the elderly at the Kolang sub-district health center, Central Tapanuli Regency.

From the research results, it can be assumed that between the theory and the research results, the influence of Balance Exercise on muscle strength was obtained with a p value = 0.012 which is smaller than $\alpha (\leq 0.05)$, which means that there is an influence between the independent variable and the dependent variable.

CONCLUSION

1. It is known that based on the research results, it was found that out of 35 respondents, the results of muscle strength values in the elderly before the Balance Exercise were carried out, there were 17 respondents (48.6%) with Grade 4 muscle strength results.
2. Based on the research results, it was found that out of 35 respondents, the results of muscle strength values in the elderly after Balance Exercise were 15 respondents (42.9%) with muscle strength values of Grade 4.
3. There is an influence of Balance Exercise on Balance and Muscle Strength

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