

The Effect of Balance Exercise on Muscle Strength in the Elderly at UPT Panti Sosial Tresna Werdha Glenmore

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ABSTRACT

Background: The aging process causes a decline in musculoskeletal function, one of which is decreased muscle strength, which impacts balance and independence in older adults. Balance training is one physical intervention that can improve muscle strength in older adults. The purpose of this study was to determine the effect of balance exercise on muscle strength in older adults at the UPT Panti Sosial Tresna Werdha Glenmore.

Methods: This study used a questionnaire-experimental design with a one-group pre-test and post-test approach. The sample consisted of 30 elderly people selected by total sampling. Muscle strength was measured using the Manual Muscle Testing (MMT) instrument before and after the intervention. Data were analyzed using the Wilcoxon test.

Results: Before the intervention, most elderly people had mild muscle strength (76.7%). After the balance exercise intervention, the majority of elderly people experienced an increase in muscle strength to the normal category (73.3%). The Wilcoxon test results showed a P-value of 0.000 (<0.05), indicating a significant effect of balance exercise on muscle strength in elderly people.

Conclusion: Balance exercise significantly improves muscle strength in older adults. This intervention can be implemented as a routine exercise program to improve physical function and quality of life in older adults.

I. Introduction

Elderly is the final stage of human life that everyone will experience. Aging is a natural process, meaning a person will go through three stages in their life: childhood, adulthood, and old age (Mawaddah, 2020). As humans age, a degenerative aging process occurs which usually impacts changes in the human psyche or self, including physical, cognitive, emotional, social, and sexual changes (National & Pillars, 2020). One decline in body function that occurs in the elderly is decreased muscle strength (Murtiyanti Ninik, 2019). Decreased muscle strength in the elderly occurs due to changes in muscle structure due to aging or biological changes that cause changes in muscle structure, the number and size of muscle fibers, atrophy or hypertrophy in some muscle fibers, an increase in fat tissue and connective tissue that can result in decreased strength, as well as decreased functional ability in the elderly, which can cause weakness in the lower extremity muscles (Hasibuan, 2021). Muscle weakness in the lower extremities will result in decreased muscle strength which will cause balance disorders in the elderly body, resulting in slow movement, short steps, feet unable to land firmly and decreased alertness/reflexes to predict when slipping/tripping (Hasibuan, 2021).

According to data from the World Health Organization (WHO), the number of elderly people in the world in 2024 based on the age of 60-64 years is 351.5 million people, the age of 65-69 years is 292.5 million people, the age of 70-74 years is 228 million people, the age of 75-79 years is 148.8 million people, the age of 80-84 years is 90.2 million people, the age of 85-89 years is 49.7 million people, the age of 90-94 years is 19.2 million people, the age of 95-99 years is 4.5 million people, and the age of

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over 100 years is 0.59 million people. According to data from the Indonesian Central Bureau of Statistics, the elderly population with an age of >60 years shows that it has increased from year to year. Data obtained in 2024 the percentage of the elderly population in Indonesia was 12% of the total population. This figure shows that there was an increase compared to the previous year. In the previous year, the elderly population in Indonesia was 11.75% of the total population. Based on data from the Central Statistics Agency (BPS), the number of elderly people in East Java Province in 2024 was recorded at 15.57% of the total population. This is equivalent to approximately 6,526,287 people out of the total population of East Java, which is approximately 41.91 million. The Central Statistics Agency of Banyuwangi Regency recorded the number of elderly people in Banyuwangi Regency in 2024 at 16.75% or 299,030 people, an increase from the previous year's 15.91% or 283,220 people.

Based on the statistical data above, it shows that the number of elderly people increases every year. The increase in the number of elderly people can have both positive and negative impacts. The positive impact that appears in healthy elderly people is that they will be active and productive, while the negative impact is that elderly people can become a burden due to their health problems which result in increased health care costs, increased disability, lack of social support and an unfavorable environment and become a burden on the family (Sakinah, et al. 2020). Changes that occur during the aging process include reduced levels of physical activity and decreased walking speed as well as decreased muscle strength in elderly people in maintaining body balance, which can result in an increased risk of falls and will cause dependence in elderly people in carrying out daily activities (Martins, et al. 2020). This occurs due to changes in the elderly's musculoskeletal system, including connective tissue (collagen and elastin), cartilage, bones, muscles, and joints. The musculoskeletal system experiences a decline due to a decrease in the number and size of muscle fibers, resulting in a decrease in lower extremity strength, endurance, coordination, limitations of LGS (Joint Range of Motion) and a decrease in balance (Nasri & Widarti, 2020). Decreased neuromuscular function is a major cause of muscle strength loss. Muscle damage occurs due to a reduction in the number of muscle fibers and general atrophy of organs and tissues. Lower extremity muscle weakness can lead to decreased muscle strength in the elderly, which is a major factor in impaired balance. Muscle strength in the elderly decreases by 10-15% per week and up to 5.5% per day, with both activity and rest (Nofrel et al., 2020). This loss of balance puts the elderly at a very high risk of falls, which can lead to injury, reduced mobility, decreased independence, self-confidence, lifestyle changes, and even death (Hasibuan et al., 2021).

A fall is an unintentional event that can suddenly result in a person lying or sitting on the floor. Falls are more likely in older adults due to impaired balance and gait. Falls in the elderly can lead to complications such as fractures and even death. Falls are the most dangerous condition and have the second worst impact on older adults who experience injuries from falls. Balance and gait impairments are the most common causes of falls in older adults and often lead to injury, disability, loss of independence, and limited quality of life (Rusminingsih et al., 2021). Data on the incidence of falls in the elderly worldwide shows that each year, approximately 28% - 35% of people aged 65 and over, and approximately 32% - 42% of those aged 70 and over. In the United States, 14 million older adults experienced falls in 2020, and in 2021, a total of 38,742 people died from falls (Kakara et al., 2023). In Indonesia, according to the World Health Organization (2023), approximately 28-35% of people aged 65 years and over have experienced falls each year and increases to 32-42% for elderly people aged over 70 years. The prevalence of falls in the elderly reaches 30% to 50%, with the incidence of recurrent falls reaching 40% and it is reported that men fall more often and experience more injuries than women (FKM UI, 2022). The results of the 2021 population data collection showed that the elderly population in East Java aged 60-69 years was 8.56%, then elderly aged 70-74 years were 2.24% and elderly aged 75 years and over were 2.59% (Elderly Population Profile of East Java Province, 2021). Based on the results of a preliminary study conducted by researchers at the Integrated Implementation Unit of the Glenmore Werdha Social Institution, data obtained 6 out of 10 experienced decreased muscle strength and thus had a risk of falling.

Elderly people need exercise to increase muscle strength, thereby reducing the risk of falls. One form of physical exercise is balance exercise (Listyarini, 2018). Balance exercise is an effective exercise that can prevent decreased muscle strength and maintain muscle mass. It can also improve functional balance, which can restore balance in the elderly (Hasibuan, 2021). Balance exercise will improve functional and static balance, which is very effective in the elderly. Balance training can improve

movement and reduce or prevent the frequency of falls in the elderly (Aprilia et al., 2023). This is supported by research conducted by Rita & Anggraini (2020), which stated that balance exercise can increase muscle strength in 15 elderly people. Before the balance exercise, 9 elderly people had moderate muscle strength and 6 elderly people had low muscle strength. After providing balance exercise training, it was found that 12 elderly people were included in the good muscle strength category, and 3 elderly people were still in the moderate category.

Based on the description above, the researcher is very interested in conducting research on "The Effect of Balance Exercise on Muscle Strength in the Elderly at the UPT Panti Sosial Tresna Werdha Glenmore"

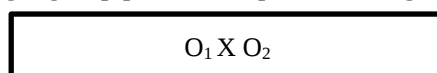
II. METHODS

The type of research is a research plan that is structured in such a way that researchers can obtain answers to research questions. (Nursalam, 2020).

This type of research is quantitative with a quasi-experimental design, namely an experiment that is carried out without strict limitations on randomization, while at the same time being able to control validity threats (Notoatmodjo, 2018).

This study used a one-group pre-test and post-test design, which is a study that reveals causal relationships involving a single group of subjects. A group of subjects was observed before the intervention, then again after the intervention. In this design, there was no comparison (control) group, but rather a first observation (pretest), allowing researchers to test changes that occurred after the treatment with a post-test (Nursalam, 2017).

In diagram form, the single group pretest and posttest design can be described as follows:



Information :

O_1 : Pretest Value (before treatment)

X : Balance exercise treatment

O_2 : Posttest Value (after treatment)

III. RESULTS

Table 1. Frequency Distribution of Respondents Based on Gender at UPT Panti Sosial Tresna Werdha Glenmore

Gender	Amount	
	Frequency	Presentation
Male	17	56,7
Female	13	43,3
Total	30	100

Table 1 It is known that the majority of respondents were male, 56.7% or 17 respondents, and a small proportion were female, 43.3% or 13 respondents.

Table 2. Frequency Distribution of Respondents Based on Age at UPT Panti Sosial Tresna Werdha Glenmore

Age	Amount	
	Frequency	Presentation
60 – 74 old	29	96,7
75 – 89 old	1	3,3
Total	30	100

Table 2 It is known that the age of the respondents is mostly 60-74 years old, as many as 96.7% or 29 respondents and a small number are 75-89 years old, as many as 3.3% or 1 respondent.

Table 3. Frequency Distribution of Respondents Based on Muscle Strength Before Balance Exercise at UPT Panti Sosial Tresna Werdha Glenmore

Muscle strength	Amount	
	Frequency	Presentation
Normal	7	23,3
Light	23	76,7
Total	30	100

Table 3 It is known that the age of the respondents is mostly elderly muscle strength before giving balance exercise in the light category as many as 76.7% or 23 respondents and some muscle strength in the normal category as many as 23.3% or 7 respondents.

Table 4. Frequency Distribution of Respondents Based on Muscle Strength After Balance Exercise at UPT Panti Sosial Tresna Werdha Glenmore

Muscle strength	Amount	
	Frequency	Presentation
Normal	22	73,3
Ringan	8	26,7
Total	30	100

Table 4 It is known that the age of the respondents is mostly elderly muscle strength after giving balance exercise in the normal category as many as 73.3% or 22 respondents and some muscle strength in the light category as many as 26.7% or 8 respondents.

Table 5. Wilcoxon test results on the effect of balance exercise on muscle strength in the elderly at UPT Panti Sosial Tresna Werdha Glenmore

Test Statistics ^a	
	Sesudah - Sebelum
Z	-3,873 ^b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Based on the results of the Wilcoxon test in the table above, the P value (0.000) <0.05 was obtained, this means that there is an effect of balance exercise on muscle strength in the elderly at UPT Panti Sosial Tresna Werdha Glenmore.

IV. DISCUSSION

Respondent characteristics based on gender

Based on Table 1, it is known that the majority of respondents in this study were male, namely 17 people (56.7%), while females numbered 13 people (43.3%). This distribution indicates that male respondents were more involved in muscle strength and balance measurement activities at the UPT Panti Sosial Tresna Werdha Glenmore than female respondents.

Gender is an important factor that can influence the physical condition of older adults, including muscle strength and the risk of mobility impairment. Men physiologically have greater muscle mass and physical strength than women, so they tend to maintain muscle strength longer in old age (Hassan et al., 2021). This may be one reason why more male older adults were eligible and able to participate in physical activity in this study.

However, national data shows that the number of elderly women is generally higher than that of men, especially in the age group over 75, because women have a higher life expectancy (Central Statistics Agency, 2024). However, in the context of social services or physical intervention activities, the participation of elderly men is often greater because some elderly women experience earlier limitations in terms of mobility (Ministry of Health of the Republic of Indonesia, 2022).

Characteristics of respondents based on age

Based on Table 2, it is known that the majority of respondents are in the 60–74 age group, namely 96.7% or 29 people, while only 1 person or 3.3% are in the 75–89 age group. Based on the World Health Organization (WHO) classification, the age of 60–74 years is included in the early elderly category (young old), while the age of 75 years and above is classified as advanced elderly (WHO, 2023).

This distribution indicates that the majority of the elderly involved in this study are still in the age range with relatively better functional capacity. Elderly individuals aged 60–74 years generally still have fairly good muscle strength, coordination, and balance, and tend to be more physically and socially active than elderly individuals over 75 years (Setiati & Rizka, 2021). Age is crucial for analyzing research on muscle strength and physical interventions in the elderly, as the older a person is, the greater the risk of decreased muscle function (sarcopenia) and impaired balance, which can lead to activity limitations and the risk of falls (Yamada et al., 2019).

Muscle strength before giving balance exercise

Based on Table 3, it is known that the majority of respondents had muscle strength in the light category, namely 76.7% or 23 people, while the remaining 23.3% or 7 people were in the normal category. These results indicate that the majority of elderly people at the UPT Panti Sosial Tresna Werdha Glenmore experienced decreased muscle strength, although it was not yet classified as severe.

Muscle strength in older adults naturally declines with age, especially after age 60. This decline is known as sarcopenia, a condition characterized by progressive loss of muscle mass and strength that can impact mobility and quality of life in older adults (Cruz-Jentoft et al., 2019). This explains why most respondents in this study fell into the mild muscle strength category.

Decreased muscle strength can be caused by various factors, including lack of physical activity, suboptimal nutritional intake, and chronic illness. Elderly people living in social care are also at risk of experiencing decreased daily activity due to limited movement stimulation and minimal physical routines (Setiati & Rizka, 2021).

Under these conditions, interventions such as balance training are important as preventive and rehabilitative measures to increase muscle strength and reduce the risk of falls (Sherrington et al., 2020). These preliminary data serve as an important reference in evaluating the effectiveness of exercise on improving physical function in the elderly.

Muscle strength after balance exercise

Based on Table 4, it is known that the majority of respondents after being given the balance exercise intervention experienced an increase in muscle strength to the normal category, namely 73.3% or 22 respondents. Meanwhile, 8 people or 26.7% of respondents were still in the mild muscle strength category.

This increase in muscle strength to the normal range indicates that balance exercise has a positive impact on muscle strength in older adults. Regular balance training can stimulate the activation of large muscles in the lower body, such as the thighs and calves, and improve neuromuscular coordination, contributing to strength and postural stability (Sherrington et al., 2020).

Furthermore, balance training also serves as a form of functional exercise that can improve the ability to perform daily activities independently, reduce the risk of falls, and improve the quality of life of older adults (Gillespie et al., 2019). The results of this study align with previous research that found that a 4- to 8-week physical exercise program can show significant results on muscle strength and balance in older adults (Cadore & Izquierdo, 2018).

Thus, these results reinforce the importance of implementing physical intervention programs such as balance exercises regularly in the elderly population, especially those living in social institutions such as nursing homes, to prevent the decline in physical function due to the aging process.

The Effect of Balance Exercise on Muscle Strength in the Elderly

Based on the Wilcoxon test results in the table above, the P-value was 0.000, which is less than the 0.05 significance level ($P < 0.05$). This indicates a significant effect of balance exercise on muscle strength in the elderly at the Glenmore Social Welfare Center.

The Wilcoxon test itself is a non-parametric test used to compare two paired data sets, in this case muscle strength data before and after balance exercise intervention. These significant results indicate that balance exercise is effective in increasing muscle strength in the elderly.

This research reinforces the theory that balance training, especially when performed regularly and in a structured manner, can improve neuromuscular function, postural stability, and muscle strength in the elderly population (Cadore & Izquierdo, 2018). Elderly individuals who engage in physical training, such as balance exercises, experience improved lower extremity muscle capacity, which is crucial for supporting mobility and reducing the risk of falls (Sherrington et al., 2020). Furthermore, balance exercise is also known to stimulate optimal activation of the body's supporting muscles, improve central nervous system control, and support muscle flexibility and reactivity in maintaining balance during movement (Gillespie et al., 2019).

Thus, balance exercise intervention can be recommended as a useful exercise program to increase muscle strength and maintain the independence of the elderly in carrying out daily activities.

V. CONCLUSION

Based on the research results, it can be concluded that there is a significant effect between the provision of balance exercises on increasing muscle strength of the elderly at the UPT Panti Sosial Tresna Werdha Glenmore. This is proven by the results of the Wilcoxon test which showed a P-value of 0.000 (<0.05), which means there is a significant difference between muscle strength before and after the intervention. The majority of elderly who previously had mild muscle strength experienced an increase to the normal category after being given balance exercises. The results of this study indicate that balance exercises are an effective intervention and can be used as a routine exercise program to increase muscle strength, prevent decline in physical function, and support the independence of the elderly in daily activities.

REFERENCES

- Aprilia, I., Wulandari, Y., & Santosa, B. (2023). Pengaruh balance exercise terhadap keseimbangan dan risiko jatuh pada lansia. *Jurnal Keperawatan Komprehensif*, 9(1), 12–18.
- Badan Pusat Statistik. (2024). Statistik penduduk lanjut usia Indonesia 2024. <https://bps.go.id>
- Cadore, E. L., & Izquierdo, M. (2018). Exercise interventions in polypathological aging adults that coexist with sarcopenia: A systematic review. *Ageing Research Reviews*, 47, 90–99. <https://doi.org/10.1016/j.arr.2018.07.006>
- Cruz-Jentoft, A. J., Bahat, G., Bauer, J., Boirie, Y., Bruyère, O., Cederholm, T., ... & Schols, J. M. (2019). Sarcopenia: Revised European consensus on definition and diagnosis. *Age and Ageing*, 48(1), 16–31. <https://doi.org/10.1093/ageing/afy169>
- FKM UI. (2022). Laporan prevalensi jatuh pada lansia di Indonesia. Fakultas Kesehatan Masyarakat Universitas Indonesia.
- Gillespie, L. D., Robertson, M. C., Gillespie, W. J., Sherrington, C., Gates, S., Clemson, L. M., & Lamb, S. E. (2019). Interventions for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews*, (11). <https://doi.org/10.1002/14651858.CD007146.pub3>
- Hasibuan, F. (2021). Keseimbangan tubuh dan latihan lansia. Jakarta: Mitra Cendekia Media.
- Hasibuan, F., Anggraini, E., & Sari, A. (2021). Keseimbangan fungsional dan risiko jatuh pada lansia. *Jurnal Geriatri Nusantara*, 4(2), 88–96.
- Hassan, B. H., Hewitt, J., Keogh, J. W. L., Bermeo, S., Duque, G., & Henwood, T. R. (2021). Impact of resistance training on sarcopenia in nursing care facilities: A pilot study. *Geriatrics*, 6(1), 22. <https://doi.org/10.3390/geriatrics6010022>
- Kakara, R., James, S. L., & Peterson, A. B. (2023). Falls and fall injuries among adults aged ≥ 65 years—United States, 2020–2021. *Morbidity and Mortality Weekly Report*, 72(2), 45–50.
- Kementerian Kesehatan Republik Indonesia. (2022). Profil kesehatan Indonesia tahun 2022. <https://www.kemkes.go.id>
- Listyarini, D. (2018). Latihan fisik untuk lansia. Yogyakarta: Pustaka Baru Press.
- Martins, W. R., Safons, M. P., & Bottaro, M. (2020). Effects of exercise on physical function, balance, and risk of falls in elderly: A systematic review. *Clinical Interventions in Aging*, 15, 275–284.
- Mawaddah, N. (2020). Lansia dan proses penuaan. *Jurnal Ilmu Kesehatan*, 5(1), 15–21.

- Murtiyanti, N. (2019). Penurunan fungsi otot pada lanjut usia. *Jurnal Geriatri Indonesia*, 3(2), 30–35.
- Nasri, H., & Widarti, F. (2020). Penurunan sistem muskuloskeletal pada lansia. *Jurnal Kesehatan Holistik*, 6(1), 22–27.
- National, & Pillars. (2020). *Aging and physical decline: A physiological perspective*. New York: Vital Health Publishing.
- Nofrel, N., Putra, H., & Lestari, S. (2020). Strength decline and fall risk among elderly: A critical review. *Jurnal Keperawatan Lansia*, 7(1), 40–48.
- Notoatmodjo, S. (2018). *Metodologi penelitian kesehatan*. Jakarta: Rineka Cipta.
- Nursalam. (2017). *Metodologi penelitian ilmu keperawatan: Pendekatan praktis*. Jakarta: Salemba Medika.
- Nursalam. (2020). *Konsep dan penerapan metodologi penelitian ilmu keperawatan*. Jakarta: Salemba Medika.
- Profil Penduduk Lanjut Usia Provinsi Jawa Timur. (2021). Badan Pusat Statistik Provinsi Jawa Timur. <https://jatim.bps.go.id>
- Rita, L., & Anggraini, F. (2020). Pengaruh latihan balance exercise terhadap kekuatan otot lansia. *Jurnal Keperawatan Medikal Bedah*, 8(1), 22–29.
- Rusminingsih, D., Syahrul, S., & Damayanti, R. (2021). Faktor risiko kejadian jatuh pada lansia. *Jurnal Kesehatan Komunitas*, 9(2), 123–130.
- Sakinah, N., Lestari, E., & Pratiwi, D. (2020). Dampak pertambahan lansia terhadap sistem kesehatan dan sosial. *Jurnal Kebijakan Kesehatan Indonesia*, 9(2), 75–82.
- Setiati, S., & Rizka, A. (2021). *Geriatri praktis*. Jakarta: Balai Penerbit FKUI.
- Sherrington, C., Michaleff, Z. A., Fairhall, N., Paul, S. S., Tiedemann, A., Whitney, J., ... & Lord, S. R. (2020). Exercise to prevent falls in older adults: An updated systematic review and meta-analysis. *British Journal of Sports Medicine*, 54(15), 885–891. <https://doi.org/10.1136/bjsports-2019-101512>
- WHO (World Health Organization). (2024). *World population prospects: Ageing 2024*. <https://www.who.int/data>
- World Health Organization. (2023). *Global report on falls prevention in older age*. <https://www.who.int/publications/i/item/9789241591281>