NERS Jurnal Keperawatan
https://ners.fkep.unand.ac.id/index.php/NJK
ISSN: 1907-686X (PRINT) 2461-0747 (ONLINE)

Implementation of Balance Exercise to Improve Physical Mobility and Prevent the Risk of Falls in Elderly Residents in Nursing Homes

Widyawati Dian Lestari[a], Vivi Sovianti[b*], Maya Cobalt Angio Septianingtyas[c]
[a,b,c]*Faculty of Health Sciences and Technology, Telogorejo University, Semarang, Indonesia*
e-mail correspondence: vivisovianti@universitastelogorejo.ac.id

Received: 17 September 2025
Accepted: 7 April 2026
Available online: 27 May 2026
DOI: https://doi.org/10.25077/njk.v22i1.375

Abstract

Aging is commonly associated with progressive decline in musculoskeletal function, which leads to reduced physical mobility and significantly increases the risk of falls among the elderly. Therefore, effective interventions are needed to improve balance and mobility to prevent falls and maintain functional independence in this population. The aim of this study was to determine the effect of balance training on increasing physical mobility and reducing the risk of falls. This type of research is a pre-experimental study without a control group. The population in this study was 78 people, the sample in this study was 30 respondents who were selected using purposive sampling techniques based on inclusion and exclusion characteristics. The instruments used were the Elderly Mobility Scale and the Timed Up and Go Test which had been tested for validity and reliability. Data analysis used descriptive statistical tests and the Wilcoxon test. The intervention in this study was balance training, which was performed three times a week. The study found that 66.7% of respondents in the pre-test needed assistance, and 60% of respondents were in the moderate risk of falling. The post-test results showed that all respondents were in the moderate risk of falling (63.3%). The Wilcoxon test showed a significant difference before and after the intervention with a p-value of 0.02 ($p < 0.05$). Balance exercise effectively improves physical mobility and reduces fall risk among elderly nursing home residents. Future studies should apply longer and more intensive interventions with larger samples and control groups to strengthen effectiveness comparisons.

Keywords: Balance Exercise, Elderly, Physical Mobility, Risk of Falls.

INTRODUCTION

Older adults living in nursing homes or long-term care facilities often have physical limitations, lack family care, or require specialized care (Martha et al., 2020). In nursing homes, they receive a comfortable environment and support from healthcare professionals and caregivers. However, as they age, several changes occur. Seniors often experience various physical, psychological, social, and economic challenges (Shelly et al., 2023). Physically, aging leads to a decline in muscle and joint function, leading to impaired mobility. Many older adults also suffer from osteoarthritis or osteoporosis, which cause joint pain and an increased risk of fractures, hindering daily activities such as walking and prolonged standing (Clynes et al., 2019) ;(Farid et al., 2022). Physiological changes in the musculoskeletal system can cause a wide variety of degenerative processes in the elderly, one of

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

the most common being impaired physical mobility which includes various conditions of the bones, muscles, joints and ligaments (Grote et al., 2019) ;(Rudi et al., 2019). This disorder can cause chronic pain, swelling and decreased muscle strength resulting in difficulties with walking and other activities (de Zwart et al., 2022) ;(Lim et al., 2024). Loss of muscle mass and function in the elderly can reduce physical mobility in the elderly (Wardhani & Kurniaji, 2024).

Physical mobility is a person's ability to move freely, regularly and independently in carrying out daily activities, such as walking, standing, sitting or changing positions (Asp et al., 2025). In older adults, this ability is greatly influenced by various factors, particularly physiological changes due to the aging process, which lead to a decline in the function of body systems, including the musculoskeletal system. These changes include muscle weakness, joint stiffness, and decreased coordination and flexibility, which can lead to impaired physical mobility (Alfaeni & Puspita, 2025). This disorder is characterized by decreased muscle strength, limited joint range of motion, and tremors often seen in the hands, head, or lower jaw. One of the main causes of this disorder is a musculoskeletal disorder (Riska et al., 2023). Muscular and skeletal disorders (MSDs) are disorders of the musculoskeletal system, including muscle weakness, joint stiffness, and decreased overall motor function. MSDs in older adults not only impact quality of life and independence but are also a major risk factor for falls and serious injuries, which can worsen their physical and psychological condition (Wardani et al., 2023). Therefore, handling physical mobility disorders in the elderly is an important aspect in efforts to improve quality of life and prevent further complications.

Elderly people with impaired physical mobility have a much higher risk of experiencing falls, which can not only cause serious injuries such as broken bones, bruises, or head trauma, but also result in decreased independence, increased dependency, and even the risk of death (Saraswati et al., 2022). Falls represent a major yet frequently underestimated public health problem among the elderly, particularly due to their recurrent nature and substantial impact on functional decline and quality of life. The risk of falls increases progressively with age as a result of complex physiological changes, including reduced muscle strength and mass (sarcopenia), impaired balance, decreased vestibular function, and diminished proprioceptive sensitivity, all of which compromise postural stability and movement control (Ivan et al., 2024). All of these changes make older adults more susceptible to loss of stability when standing or walking. Furthermore, fall risk factors can be divided into two main categories: intrinsic and extrinsic. Intrinsic factors include chronic medical conditions (such as diabetes, hypertension, and neurological disorders), visual impairment, the use of certain medications, and cognitive decline. Meanwhile, extrinsic factors include unsafe environmental conditions, such as poor lighting, slippery floors, stairs without handrails, and the lack of appropriate walking aids (Wicaksana & Rachman, 2019).

Epidemiological data show that falls affect approximately 28–35% of individuals aged 65 years and older annually, with the prevalence increasing to 32–42% among those over 70 years of age (WHO, 2023). In Indonesia, the Indonesian Family Life Survey (IFLS) reported that fall incidence reaches 30% among elderly aged ≥65 years and rises sharply to 50% among those aged ≥80 years (Novianti & Naufal, 2023). Furthermore, data from the Central Bureau of Statistics of Semarang indicate that the prevalence of falls among elderly ranges between 30% and 50%, with nursing home residents demonstrating an even higher frequency and recurrence of falls compared to elderly individuals living at home (Badan Pusat Statistik Kota Semarang, 2023). Exercise is a cornerstone non-pharmacological strategy for fall prevention: systematic reviews and meta-analyses have shown that strength-plus-balance or multicomponent programs reduce fall risk and improve functional performance in older adults, although results can vary by setting and intervention dose. For example, a recent systematic review and meta-analysis found overall benefit of strength, balance, and aerobic training for fall prevention and functional outcomes in older populations (Sadaqa et al., 2023). Multicomponent and structured balance programs have demonstrated improvements in balance and physical function in

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

long-term care residents in randomized and quasi-experimental trials, supporting the feasibility of institutional exercise interventions (Sadaqa et al., 2024). Moreover, targeted modalities such as dual-task or specifically dosed balance training show promise for improving dynamic balance and reducing falls when delivered with adequate intensity and adherenc (Jobair et al., 2025).

Physical exercise is widely recognized as a key non-pharmacological strategy to enhance independence and reduce fall risk in older adults (Malasari et al., 2022). mong different exercise modalities, balance training has emerged as particularly effective: research shows that structured balance programs can improve postural stability, lower extremity strength, and coordination, thereby reducing fall risk (Endaryanto et al., 2023). In addition, balance exercises function to increase body stability when moving and reduce the risk of falling (Muladi, 2022). However, despite the growing recognition of exercise-based interventions, there remains limited evidence regarding the effectiveness of structured balance exercise programs specifically among elderly residents in nursing homes in Indonesia, particularly those implemented within the context of institutional care settings.

This gap underscores the need for empirical investigation into targeted balance exercise interventions for this vulnerable population. Therefore, the purpose of this study is to examine the effectiveness of balance exercise in improving physical mobility and reducing the risk of falls among elderly individuals living in nursing homes.

METHODS

This study employed a quantitative approach using a pre-experimental one-group pretest–posttest design without a control group. This design was selected due to ethical and logistical constraints within the nursing home setting, where randomization and withholding of intervention were not feasible, as all residents were encouraged to participate in fall-prevention programs. Consequently, causal inference is limited and the findings should be interpreted with caution, as the absence of a control group restricts the ability to fully eliminate potential confounding variables. The study population consisted of 78 elderly residents living in a government-supported nursing home providing long-term care services in Semarang, Indonesia. From this population, 30 respondents were selected using purposive sampling based on predefined inclusion and exclusion criteria. The sample size was determined using the Slovin formula; however, it is acknowledged that this method does not account for statistical power or effect size. Due to the preliminary nature of this study and limited access to participants, formal power analysis was not conducted, which represents a limitation and should be addressed in future controlled trials. Inclusion criteria were: (1) elderly individuals aged 60–80 years; (2) male and female; (3) willing to participate as evidenced by written informed consent; and (4) able to complete the intervention from beginning to end. Exclusion criteria included: (1) cognitive, auditory, or visual impairments (such as cataracts and glaucoma); (2) physical limitations due to stroke; and (3) total dependence or bedridden condition.

The study was conducted from May to June 2025 at a residential nursing home characterized by moderate-level care, with routine supervision by nursing staff who assisted in participant monitoring and ensured safety during intervention sessions. Physical mobility and fall risk were assessed using the Elderly Mobility Scale (EMS) and the Timed Up and Go Test (TUG). The EMS categorizes mobility into dependent, needs assistance, and independent, while TUG scores interpret fall risk as low (<10 seconds), moderate (10–20 seconds), and high (>20 seconds), based on established normative standards. Both instruments had been previously tested for validity and reliability in this study population, showing acceptable results (EMS r = 0.666; TUG r = 0.754; Cronbach's alpha = 0.734 and 0.83, respectively), indicating adequate internal consistency and measurement reliability. Ethical approval was obtained from the institutional ethics committee (No. 028/IV/EC/STIKES/2025). Ethical considerations included obtaining written informed consent, ensuring confidentiality through the use

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

of anonymized codes, protecting participants' privacy, and guaranteeing their right to withdraw at any stage without consequences. Special attention was given to the vulnerability of the elderly population, following the principles of the Declaration of Helsinki and COPE guidelines. In this study, a data normality test was conducted and the results showed that the data were not normally distributed with a P value < 0.05 or 0.00, so the statistical test used was the Wilcoxon test.

The intervention implemented in this study was a Balance Exercise program, a structured exercise specifically designed to improve lower extremity muscle strength and enhance the vestibular system to support body balance and reduce the risk of falls in older adults. This program was carried out in accordance with the established Standard Operating Procedure (SOP) for balance training. The exercise program was conducted three times per week, with each session lasting 15–20 minutes. Two chairs were used as supporting equipment: one chair with a backrest and one chair without a backrest. All training sessions were performed in a safe area that was spacious and free from obstacles to minimize the risk of injury.

Stages of the Intervention

1.Preparation

The researcher ensured that the exercise area was safe and hazard-free. Participants were assessed for physical readiness before beginning the session, and their positions were arranged to allow sufficient space for free movement during the exercise.

2.Warm-up Phase (±5 minutes)

Participants performed light warm-up exercises such as marching in place to stretch the muscles and prepare the body for the core balance exercises.

3.Core Balance Exercise Phase (±10 minutes)

The core exercise phase consisted of the following movements performed sequentially:

a. Sitting upright with arms folded without leaning against the backrest – 1 minute.
b. Transferring from a chair with a backrest to a chair without a backrest (sit-to-sit transfer) – 1 minute.
c. Standing without back support – 1 minute.
d. Standing with both feet close together – 1 minute.
e. Standing with arms extended forward and stepping one leg forward as wide as comfortably possible – 1 minute.
f. Picking up an object by moving from standing to squatting and returning to standing – 1.5 minutes.
g. Standing while turning the head alternately to the right and left – 1 minute.
h. Slowly rotating the body 360 degrees – 1.5 minutes.
i. Standing on one leg alternately (right and left) – 1 minute.
   The intensity and difficulty level of the exercises were adjusted according to each participant's physical capacity. Progression was implemented gradually if participants demonstrated good tolerance and stability, without dizziness, pain, or excessive fatigue.

4.Cool-down Phase (±5 minutes)

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

The session concluded with static stretching exercises to restore muscle flexibility, followed by deep breathing for relaxation and slow walking in place to gradually reduce heart rate.

Adherence Monitoring and Evaluation

Participant adherence was monitored through attendance records and direct observation during each session. Exercise progress was documented, including duration, level of difficulty, and participant comfort. Adjustments to the exercise program were made, when necessary, based on individual performance and safety considerations. Participants who missed more than two consecutive sessions were excluded from the final analysis to maintain the internal validity of the study.

After the intervention was completed, the researcher administered a post-test to the respondents. In this study, a data normality test was conducted and the results showed that the data were not normally distributed with a P <0.05 or 0.00 result, so the statistical test used was the Wilcoxon test.

RESULTS

Table 1. Data Characteristics (n=30)

Data Characteristics	Frequency	Persentase%
Age		
60 – 74 Elderly	19	63,3
75 – 90 Old	11	36,7
Gender		
Male	13	43,3
Female	17	56,7
Total	**30**	**100**

Based on table 1, data on the characteristics of the elderly age is obtained, namely the majority are elderly, as many as 19 respondents (63.3%), and the least are old elderly, as many as 11 respondents (36.7%). This research is in line with research conducted by in his research, he explained that the majority of respondents were aged 60-74 years, with 41 respondents (62.0%) experiencing physical mobility disorders that led to the risk of falling. The results of the study showed that the characteristics of respondents based on gender were 13 male respondents (43.3%) and 17 female respondents (56.7%).

Table 2. Physical mobility before and after balance exercise (n=30)

Variable	Balance Exercise			
	Pre-test		*Post- test*	
	F	%	F	%
Elderly Mobility Scale				
Dependence (0-9)	10	33,3%	-	-
Needs Assistance (10-13)	20	66,7%	30	100%
Independence (≥14)	-	-	-	-
Fall Risk				
Low Risk (0-10 seconds)			14	46,7%
Moderate Risk (11-29 seconds)	18	60,0%	16	53,3%
High Risk (≥30 seconds)	12	40,0%	-	-
Total	30	100%	30	100%

Based on Table 2, show that physical mobility before being given balance exercise intervention was mostly for dependent activities, with 10 respondents (33.3%) and 20 respondents (66.7%) for activities requiring assistance. After the elderly were given balance exercise intervention, the majority of elderly were in the activity requiring assistance category, with 30 respondents (100). The results of

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

this study are in accordance with research (Mar'ah et al. 2021) 19 respondents (33.3%) needed help, and 26 respondents (45.6%) were dependent. The risk of falling before balance training was moderate in 18 respondents (60.0%) and high in 12 respondents (40.0%). After the balance training intervention, the risk of falling was low in 14 respondents (46.7%) and moderate in 16 respondents (53.3%).

Table 3. The effect of balance exercise on the physical mobility of the elderly (n=30)

Variable	Negative Ranks	Positive Ranks	Ties	*P-value*
Pre-post Physical Mobility	0	10	20	0,02
Pre-post Fall Risk	26	0	4	0,00

The data shows that there is a difference between the level of physical mobility before and after being given balance training in respondents with a p-value of 0.02 < 0.05. Where 10 respondents experienced an increase in physical mobility after being given balance training intervention, no respondents experienced a decrease in physical mobility, and 20 respondents experienced no increase or decrease in physical mobility. In the fall risk data, it can be concluded that there is a difference between the level of fall risk before and after being given balance training in respondents with a p-value of 0.00. Where 26 respondents experienced a decrease in fall risk after balance training intervention and 4 respondents experienced no increase or decrease in fall risk.

DISCUSSION

Characteristics Based on Age and Gender

The findings of this study support existing evidence that aging is associated with progressive deterioration of the musculoskeletal and neurosensory systems, resulting in reduced gait stability, muscle strength, and postural control. These changes directly contribute to declining physical mobility and increased fall risk among older adults. The higher vulnerability observed in female participants can be attributed to postmenopausal estrogen deficiency, which accelerates bone resorption, reduces muscle strength, and compromises joint stability. This phenomenon has been consistently reported by (Widyantari et al., 2024) ;(Mar'ah Konitatillah et al., 2021), who identified estrogen decline as a major contributor to reduced bone density and postural instability in elderly women. Furthermore, (Budiartha et al., 2020) onfirmed that elderly women experience greater limitations in physical mobility and higher fall prevalence compared to men.

These demographic characteristics provide an important contextual basis for interpreting the improvements observed following balance exercise intervention, as the study targeted a population inherently at high risk of mobility impairment and falls.

Mechanisms Underlying Improvement in Physical Mobility

The significant improvement in physical mobility observed in this study, reflected by the transition from dependent mobility to mobility requiring assistance, can be explained by physiological adaptations induced through balance exercise. Repetitive balance training enhances neuromuscular coordination by increasing motor unit recruitment, improving proprioceptive sensitivity, and strengthening core and lower extremity muscles responsible for postural control. Additionally, balance exercise promotes better integration between the vestibular, visual, and somatosensory systems, thereby enhancing movement efficiency and stability.

These findings are consistent with (Wardani et al., 2023), who reported improved motor coordination and postural control following structured balance training. According to (Setyawati & Retnaningsih,

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

2024) also demonstrated that balance exercises significantly enhanced trunk stability and functional mobility in elderly individuals. Similarly (Farid et al., 2022 ound that balance training effectively improved postural stability in the elderly population. Furthermore, balance-based or mixed-modality (balance, resistance, and gait) training significantly improved balance performance, including gait speed, static and dynamic balance, and mobility outcomes in older adults (Ni et al., 2024);(Zhang et al., 2025).

However, the effect size in the current study (r = 0.577) was slightly lower compared to that reported by (Azizah et.al. 2025), possibly due to shorter intervention duration and the presence of participants with pre-existing dependency on mobility aids. Balance exercises help the elderly improve their balance and stability during activities (Hawako et al., 2022). Respondents who remained highly dependent were predominantly those who habitually relied on assistive devices, suggesting that long-term dependency may reduce adaptability to physical training. This aligns with (Setyawati & Retnaningsih, 2024), who emphasized that baseline functional status strongly influences responsiveness to rehabilitation interventions.

Balance Exercise and Reduction of Fall Risk

The risk of falling is defined as the possibility or potential for a person to experience a fall, which can result in physical injury, decreased cognitive and motor function, and increased morbidity and mortality rates, especially in vulnerable groups (Wijayanti et al., 2022). Clinically, falls are classified as sentinel events in healthcare because they can reflect the quality of care and an individual's overall health. The risk of falls becomes more significant in the elderly population due to physiological changes associated with aging, such as decreased muscle strength (sarcopenia), impaired balance, decreased postural reflexes, and decreased vision and hearing (Sudiartawan et al., 2017).

The results of this study indicate that the risk of falling before the balance exercise intervention was moderate and at least high. After the balance exercise intervention, the risk of falling was low and at least moderate. Before intervention, elderly people who are at risk of falling generally show symptoms such as an unsteady gait, fear of moving, and dependence on assistive devices or support from others when moving from place to place (Saraswati et al., 2022). However, after undergoing balance exercises focused on strengthening lower body muscles, improving coordination, and training the balance system, significant progress was seen. Seniors experienced improvements in posture and stability when standing and walking, along with increased confidence in carrying out daily activities (Sudiartawan et al., 2022).

The risk of falling in the elderly tends to increase as various risk factors that accompany the aging process increase, such as chronological age, degenerative medical conditions, and an environment that does not support safe physical activity (Ikhsan, 2020). Physiologically, aging triggers deterioration of the musculoskeletal system, particularly morphological changes in muscles, including muscle atrophy, decreased strength and contraction capacity, and reduced muscle elasticity and flexibility. Decreased muscle function in the elderly hinders the body's rapid and accurate response and adjustment to changes in position, thus impairing the speed and accuracy of movement in daily activities. This condition reduces balance and stability, increasing the risk of falls (Sholekah et al., 2022).

As they age, the elderly also experience various physical disorders such as decreased muscle mass and strength (sarcopenia), impaired balance, reduced vision and hearing function, and decreased joint flexibility (Susyanti & Nurhakim, 2019). This condition causes the elderly to be more vulnerable to the risk of falls, injuries, and a decline in overall quality of life (Sidik, 2021). Therefore, optimal

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

attention to the physical condition of the elderly, especially those living in nursing homes, is very important to maintain their independence, health and well-being in old age (Rodr et al., 2023).

Researchers provided balance exercise interventions with physical exercises aimed at helping to increase lower limb muscle strength and to improve the vestibular system and body balance. The goals of balance exercise in elderly people with impaired physical mobility and risk of falls are to improve balance and stability in elderly people in maintaining good posture when standing and walking, reduce the risk of falls and prevent injuries due to falls that often occur in elderly people with impaired physical mobility, maintain muscle strength that supports physical mobility and body balance, support rehabilitation and independence of elderly people in daily activities (Sari et al., 2021). In this study, effect size calculations were carried out with the result that the risk of falling experienced a very large change, r = 0.931.

Critical Reflection and Study Limitations

Despite the positive outcomes, several limitations must be acknowledged. The use of a pre-experimental one-group design without a control group limits the ability to establish definitive causal relationships, as improvements may be partially influenced by external factors or spontaneous recovery. Additionally, the relatively small sample size (n = 30) restricts the generalizability of the findings. The short intervention duration further limits observation of long-term physiological adaptation and sustained mobility improvement. These limitations are consistent with observations made by Sudiartawan et al. (2017) and Wijayanti et al. (2022), who emphasized the need for controlled designs and longer intervention periods to validate the impact of fall prevention interventions in elderly populations.

Implications for Nursing Practice and Policy

The findings of this study have significant implications for geriatric nursing practice. Balance exercise programs should be integrated into routine nursing care within nursing homes as part of comprehensive fall prevention strategies. Nurses play a vital role in assessing mobility, supervising exercise sessions, monitoring progress, and ensuring compliance. Consistent implementation of structured balance exercise protocols can help maintain independence, reduce institutional fall rates, and improve overall quality of life for elderly residents (Abdul et al., 2022; Sidik, 2021). From a policy perspective, long-term care institutions should prioritize structured physical activity programs and allocate resources for training nursing staff in balance training techniques to support sustainable fall prevention models.

CONCLUSION

Balance exercise has been shown to be effective in improving physical mobility and reducing the risk of falls in older adults in nursing homes by enhancing postural stability and motor coordination. However, the limitations of the design without a control group, the small sample size, and the short duration of the intervention limit the generalizability of the results. Therefore, further research with a more robust experimental design and longer duration is needed to strengthen the evidence for the effectiveness of this intervention. Balance exercise can be recommended as a practical and low-cost intervention in geriatric nursing practice to support the independence and safety of older adults.

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

REFERENCES

Alfaeni, N. N., & Puspita, T. (2025). Analysis of Gerontic Nursing Care on a Patient with Impaired Physical Mobility Using Elastic Band. Nursing Case Insight Journal, 3(2), 69–71. https://doi.org/https://doi.org/10.63166/4vw1jy41

Asp, M., Simonsson, B., & Molarius, A. (2025). Physical activity , physical mobility , and mental health among persons 70 years or older : results from a large population-based study in Sweden. 83(225). https://doi.org/https://doi.org/10.1186/s13690-025-01718-w

Badan Pusat Statistik Kota Semarang. (2023). Profil lansia Kota Semarang 2022. BPS Kota Semarang, 11.

Budiartha, I. G. A. I. M., Aryana, I. S., Purnami, N. K. R., Putrawan, I. B., AStika, I. N., & Kuswardhani, R. T. (2020). Hubungan massa otot pada sarkopenia dengan status fungsional lanjut usia di desa Pedawa, kabupaten Buleleng, Bali. Jurnal Penyakit Dalam Udayana, 3(2), 37–39. https://doi.org/10.36216/jpd.v3i2.73

Clynes, M. A., Jameson, K. A., Edwards, M. H., Cooper, C., & Dennison, E. M. (2019). Impact of osteoarthritis on activities of daily living: does joint site matter? Aging Clinical and Experimental Research, 31(8), 1049–1056. https://doi.org/10.1007/s40520-019-01163-0

de Zwart, A. H., Dekker, J., Verberne, S. K., Roorda, L. D., van der Esch, M., Lems, W. F., & van der Leeden, M. (2022). Association Between Measures of Muscle Strength and Performance of Daily Activities in Patients With Knee Osteoarthritis. Journal of Rehabilitation Medicine, 54(5), 1–5. https://doi.org/10.2340/jrm.v54.2942

Endaryanto, Agung Hermawan, C., Fisioterapi Fakultas Ilmu Kesehatan ITSK Soepraoen Malang -Jl S Supriadi No, P. R., Sukun, K., Malang, K., & Timur Indonesia, J. (2023). Ankle strategy exercise dapat meningkatkan keseimbangan dinamis lansia di kelurahan Menteng kecamatan Jekan Raya kota Palangka Raya Nurul Halimah. Jurnal Sport Science, 13(2), 57–64. https://doi.org/10.17977/um057v13i2p57-64

Farid, R., Budi, I. S., Al Athfal, M. A., Hisanah, H. A., & Haya, A. F. (2022). Program Latihan Keseimbangan Untuk Peningkatan Profil Keseimbangan Individu Lanjut Usia: Critical Review. Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 14(1), 23–30. https://doi.org/10.34011/juriskesbdg.v14i1.1852

Grote, C., Reinhardt, D., Zhang, M., & Wang, J. (2019). Regulatory mechanisms and clinical manifestations of musculoskeletal aging. Journal of Orthopaedic Research, 37(7), 1475–1488. https://doi.org/10.1002/jor.24292

Hawako, H. H., Sulung, N., Utami, R. F., Febriani, Y., Fort, U., Kock, D., Soekarno Hatta, B. J., Kelurahan, M., Ganting, K., Mandiangin, K., & Selayan, B. T. (2022). AKTIVITAS FISIK DAN FUNGSI KOGNITIF DENGAN RESIKO JATUH PADA LANSIA Physical Activity and Cognitive Function and the Risk of Falling in the Elderly. Physio Move Journal, 44(2), 44–54.

Ikhsan. (2020). Hubungan aktifitas fisik dengan risiko jatuh pada lansia di wilayah kerja puskesmas nusa indah kota bengkulu. JNPH, 8(1), 48–53. https://doi.org/https://doi.org/10.37676/jnph.v8i1.1006

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Ivan, Ade, Erika, N., & Ariel, F. M. (2024). Dampak Gangguan Aktivitas Fisik Lansia Terhadap Keseimbangan Dinamis Dan Stabilitas Tubuh: Pendekatan Kinesiology Impact of Physical Activity Disorders in the Elderly on Dynamic Balance and Body Stability: A Kinesiology Approach. 01, 41–45.

Jobair, M., Kenneth, K., Thomson, N. K. F., Lung, W., & William, W. (2025). Effectiveness of dual - task exercise in improving balance and preventing falls among older adults: systematic review with meta - analysis and meta - regression. In European Geriatric Medicine (Issue 0123456789). Springer International Publishing. https://doi.org/10.1007/s41999-025-01328-3

Lim, J., Choi, A., & Kim, B. (2024). The Effects of Resistance Training on Pain, Strength, and Function in Osteoarthritis: Systematic Review and Meta-Analysis. Journal of Personalized Medicine, 14(12), 1–11. https://doi.org/10.3390/jpm14121130

Malasari, Silvia, Sutriani, S., Irwan, & Masyitha, A. (2022). Balance Exercise Improves Muscle Strength and Body Stability in Frail Older People. Journal of Nursing Care, 5(1). https://doi.org/10.24198/jnc.v5i1.34837

Mar'ah Konitatillah, S. K., Susumaningrum, L. A., Rasni, H., Susanto, T., & Dewi, R. (2021). Hubungan Kemampuan Mobilisasi dengan Risiko Jatuh pada Lansia Hipertensi. Jkep, 6(1), 9–25. https://doi.org/10.32668/jkep.v6i1.323

Martha, Putu, A. P., Djoar, & Kurniawan, R. (2020). Faktor risiko jatuh pada lansia di Panti X Surabaya. JHeS (Journal of Health Studies), 4(1), 7–12. https://doi.org/10.31101/jhes.1012

Muladi, A. (2022). Pengaruh Balance Exercise Terhadap Tingkat Keseimbangan Postural Dalam Menurunkan Resiko Jatuh Pada Lansia. Intan Husada : Jurnal Ilmiah Keperawatan, 10(02), 145–154. https://doi.org/10.52236/ih.v10i2.248

Ni, Y., Li, S., Lv, X., Wang, Y., Xu, L., Xi, Y., Sun, Y., & Bao, J. (2024). Efficacy of sensory-based static balance training on the balance ability, aging attitude, and perceived stress of older adults in the community: a randomized controlled trial. BMC Geriatrics, 24(49), 1–13. https://doi.org/10.1186/s12877-023-04596-5

Riska, Risty Wardhani, Nisa, & Salsabila, K. (2023). Pengaruh Pemberian Dynamic Neuromuscular Stabilization untuk Meningkatkan Keseimbangan pada Lansia; Narrative Review. FISIO MU: Physiotherapy Evidences, 4(1), 41–50. https://doi.org/10.23917/fisiomu.v4i1.19839

Rodr, A., Mar, Y., Mart, C., & Jos, J. (2023). Quality of Life and Well-Being of Older Adults in Nursing Homes: Systematic Review. 12(7). https://doi.org/https://doi.org/10.3390/socsci12070418

Rudi, A., Setyanto, Budhi, & Rinto. (2019). Analisis Faktor Yang Mempengaruhi Risiko Jatuh Pada Lansia. Jurnal Ilmiah Ilmu Kesehatan: Wawasan Kesehatan, 5(2), 162–166. https://doi.org/10.33485/jiik-wk.v5i2.119

Sadaqa, M., Debes, W. A., Zsanett, N., Bera-baka, Z., Vachtler-szepesi, M., Loretta, N., & Hock, M. (2024). Multicomponent Exercise Intervention for Preventing Falls and Improving Physical Functioning in Older Nursing Home Residents: A Single-Blinded Pilot Randomised Controlled Trial. Clinical Medicine, 13, 1577. https://doi.org/https://doi.org/10.3390/jcm13061577

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Sadaqa, M., Németh, Z., Makai, A., Premusz, V., & Hoxk, M. (2023). Effectiveness of exercise interventions on fall prevention in ambulatory community-dwelling older adults: a systematic review with narrative synthesis. Frontiers in Public Health, 1209319(August), 1–14. https://doi.org/10.3389/fpubh.2023.1209319

Saraswati, R., Fasya, Z. A., Santoso, E. B., & Artikel, I. (2022). Balance Exercise Menurunkan Risiko Jatuh. Jurnal Ilmiah Kesehatan Keperawatan, 18(1), 42–47. https://ejournal.unimugo.ac.id/jikk

Sari, N., Yulia Fitri, E. Y., Wahyuni, D., Keperawatan, B., Kedokteran, F., & Sriwijaya, U. (2021). Balance Exercise sebagai Intervensi untuk Meningkatkan Stabilitas Postural pada Lansia.

Setyawati, V. Y., & Retnaningsih, D. (2024). Penerapan Range of Motion pada pasien stroke dengan gangguan mobilitas fisik. Jurnal Manajemen Asuhan Keperawatan, 8(1), 18–24. https://doi.org/10.33655/mak.v8i1.179

Shelly, S., Rahmanto, Safun, & Ardinsyah, B. F. (2023). Pelayanan Fisioterapi melalui Pemeriksaan dan Latihan Keseimbangan untuk Mencegah Risiko Jatuh pada Lansia di Desa Ngranggonanyar. Jurnal ABDIMAS-KU: Jurnal Pengabdian Masyarakat Kedokteran, 2(2), 69. https://doi.org/10.30659/abdimasku.2.2.69-74

Sholekah, Aryanti, L., Soesanto, Edy, Aisah, & Siti. (2022). Hubungan Faktor Fisiologis Pada Lansia Dengan Resiko Jatuh di Dusun Wangil Desa Sambonganyar Kabupaten Blora. Jurnal Keperawatan Dan Kesehatan Masyarakat Cendekia Utama, 11(2), 174. https://doi.org/10.31596/jcu.v11i2.1116

Sidik, A. B. (2021). Hubungan Aktivitas Fisik Guna Mengurangi Risiko Jatuh Pada Lansia Di Panti Harapan Kita Palembang 2021. Indonesian Journal of Community Service, 2(2), 99–105.

Sudiartawan, Putu, Luh, E. Y. N., Wijaya, & Taruma. (2022). Analisis Faktor Risiko Penyebab Jatuh Pada Lanjut Usia. Jurnal Ners Widya Husada, 4(3), 95–102.

Sudiartawan, W., Eva Yanti, N. L. P., & Taruma Wijaya, A. A. N. (2017). Analisis Faktor Risiko Penyebab Jatuh Pada Lanjut Usia. Jurnal Ners Widya Husada, 4(3), 95–102. https://journal.uwhs.ac.id/index.php/jners/article/view/322/327

Susyanti, S., & Nurhakim, D. L. (2019). Karakteristik Dan Tingkat Kemandirian Lansia Dipanti Sosial. Jurnal Medica Cendikia, 6(1), 21–32.

Wardani, R., Meirino, M., Lestari, D. D., & Giawa, D. (2023). Upaya Pencegahan Gangguan Musculoskeletal Disorders (MSDs) Pada Karyawan dan Karyawati Front Office Department di Klinik Recons Fit Palembang. JARAS: Jurnal Abdimas Kedokteran Dan Kesehatan, 1(2), 116–124. https://doi.org/10.24853/jaras.1.2.116-124

Wardhani, R. R., & Kurniaji, N. S. (2024). Edukasi Exercise Untuk Menurunkan Keluhan Muskuloskeletal Disorder Pada Lansia. 6(1), 48–53.

Wicaksana, A., & Rachman, T. (2019). Gangguan Keseimbangan Postural pada Lansia. Angewandte Chemie International Edition, 6(11), 951–952., 3(1), 10–27.

Widyantari, D. P. R., Prianthara, I. M. D., Manuaba, I. A. R. W., & Suadnyana, I. A. A. (2024). Studi Perbandingan Otago Exercise dan Star Excursion Balance Exercise dalam Meningkatkan Keseimbangan

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Dinamis Lansia. Majalah Ilmiah Fisioterapi Indonesia, 12(1), 64. https://doi.org/10.24843/mifi.2024.v12.i01.p11

Wijayanti, Nabhani, & Andrian, W. (2022). Gambaran pengetahuan risiko jatuh dan kepatuhan perawat tentang manajemen risiko jatuh. Jurnal Ilmiah Kedokteran Dan Kesehatan, 1(2), 1–6. https://doi.org/https://doi.org/10.55606/klinik.v1i2.717

Zhang, S., Qian, G., Xu, H., Gu, M., Mao, S., Wang, Y., & Zhang, Y. (2025). Effects of different exercise modalities on balance performance in healthy older adults: a systematic review and network meta- analysis of randomized controlled trials. 25(570). https://doi.org/https://doi.org/10.1186/s12877-025-06212-0

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.