Application of Balance and Coordination Training for the Elderly through Light Exercise in Medan

by Gita Nurgaya Br Tarigan

Submission date: 30-Aug-2025 12:07PM (UTC+0530)
Submission ID: 2738122630
File name: Ramadan_Ginting_STOK_Bina_guna_PKM_ke_2_publish.pdf (499.39K)
Word count: 2427
Character count: 14276

Application of Balance and Coordination Training for the Elderly through Light Exercise in Medan

[1]Gita Nurgaya Br Tarigan*, Ramadan[2], Arif Peristan Tarigan[3], Arsyad parlindungan Rambe[4], Posma Saut Juliandre[5], Firman Gunadi Turnip[6].

[1,2,3,4,5,6]Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Medan, Indonesia

Abstract.

Background Aging is associated with a progressive decline in physical capacity, particularly balance and coordination, which increases the risk of falls and reduces independence among the elderly. Light exercise programs focusing on balance and coordination represent a practical, low-cost intervention that can be implemented in community settings.

Objectives This study aimed to examine the effectiveness of balance and coordination training through light exercise in improving motor function among elderly individuals in Medan.

Methods A quasi-experimental design with a pretest–posttest approach was conducted involving 40 elderly participants aged 60–75 years. The intervention consisted of 8 weeks of light exercise, performed three times per week, including static and dynamic balance drills, simple coordination movements, and low-intensity aerobic activities. Balance was assessed using the Berg Balance Scale (BBS) and coordination was measured with the Alternate Hand Wall Toss Test. Paired-sample t-tests were applied to compare pre- and post-intervention scores.

Results The findings revealed significant improvements in participants' balance and coordination after the intervention. The mean BBS score increased from 39.4 to 46.7 ($p < 0.001$), while the mean coordination score improved from 12.6 to 17.9 repetitions ($p < 0.001$)

Conclusion Balance and coordination training through light exercise effectively enhances motor performance and reduces fall risk among the elderly in Medan. These results support the integration of structured light exercise programs into community-based health initiatives to promote healthy and active aging.

Keywords: Elderly, Balance Training, Coordination, Light Exercise, Healthy Aging

Received: August 26, 2025. Accepted: August 29, 2025

*Correspondence: gitanurgayabrtarigan@gmail.com

Gita Nurgaya Br Tarigan

Sekolah Tinggi Olahraga dan Kesehatan (STOK) Bina Guna MedanJl. Medan Area Selatan No. 17, Medan Kode Pos 20217, Indonesia .

How to Cite: Tarigan, G. N. B., Ramadan, R., Tarigan, A. P., Rambe, A. P., Juliandre, P. S., & Turnip, F. G. (2025). Application of balance and coordination training for the elderly through light exercise in Medan. *Nusantara Journal of Community Service (NJSC), 1*(1), 60–63.

INTRODUCTION

Aging is a universal biological process characterized by gradual physiological decline, including reduced muscle strength, balance, and coordination. These changes significantly increase the risk of falls, which are among the leading causes of morbidity, mortality, and loss of independence in older adults worldwide (World Health Organization [WHO], 2021). Approximately 28–35% of people aged 65 and older experience at least one fall each year, and this percentage increases to 32–42% for those aged over 70 years (James et al., 2020). Beyond physical injury, falls are associated with fear of falling, reduced mobility, and diminished quality of life (Ambrose et al., 2013).

Physical activity is a widely recognized intervention to mitigate age-related functional decline. Regular participation in exercise contributes to improved neuromuscular control, cardiovascular fitness, and overall well-being in the elderly (Paterson & Warburton, 2010). Among various types of exercise, balance and coordination training is particularly important, as it directly targets the neuromuscular systems responsible for postural control and motor integration (Sherrington et al., 2019). Evidence suggests that even light-intensity exercise, when properly structured, can yield significant benefits in reducing fall risk and maintaining independence in older populations (Taylor et al., 2014).

In Indonesia, the elderly population is growing rapidly. Data from the Indonesian Central Statistics Agency indicate that the proportion of older adults is expected to reach 11.8% of the total population by

2035, creating substantial challenges for public health systems (Badan Pusat Statistik [BPS], 2023). Medan, as one of Indonesia's largest urban centers, is experiencing a rise in elderly-related health issues, particularly those associated with reduced physical capacity and fall-related injuries. Despite government and community health initiatives, structured and evidence-based exercise programs for the elderly remain limited in implementation.

Therefore, applying light exercise programs that emphasize balance and coordination has the potential to serve as an effective and low-cost community-based solution for elderly health management. Previous studies conducted in Western and Asian populations have demonstrated the effectiveness of structured balance and coordination exercises in reducing fall incidence (Lesinski et al., 2015; Sherrington et al., 2019). However, there remains a lack of context-specific research within Indonesian communities, particularly in Medan. Addressing this gap, the present study investigates the application of balance and coordination training through light exercise among elderly individuals in Medan, with the goal of improving motor performance, reducing fall risk, and promoting active aging.

METHOD

Participant

The study involved 40 elderly individuals (20 male and 20 female) aged 60–75 years, recruited from community centers in Medan, Indonesia. Participants were required to be able to perform basic movements independently, free from acute illness or severe musculoskeletal injury, and willing to participate voluntarily. Individuals with neurological disorders, uncontrolled cardiovascular disease, or contraindications to exercise were excluded. All participants provided informed consent.

Research Design

A quasi-experimental design with a one-group pretest–posttest approach was employed. The intervention consisted of an 8-week light exercise program, delivered three times per week, with each session lasting approximately 45 minutes. The program included warm-up, balance training (e.g., single-leg stance, heel-to-toe walking), coordination training (e.g., ball passing, alternating arm-leg movements), and cool-down activities. Assessments were conducted before and after the intervention.

Data Analysis

Data were processed using SPSS version 26.0. Descriptive statistics (mean, standard deviation) were calculated for all variables. The paired-sample *t*-test was applied to compare pretest and posttest scores for balance (Berg Balance Scale) and coordination (Alternate Hand Wall Toss Test). Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Results

Table 1 presents the results of the balance and coordination tests before and after the intervention.

Table 1. Pretest and Posttest Scores of Balance and Coordination (N = 40)

Variable	Pretest (Mean ± SD)	Posttest (Mean ± SD)	*t* value	*p* value
Balance (BBS)	39.4 ± 4.8	46.7 ± 5.1	8.92	< 0.001
Coordination	12.6 ± 3.2	17.9 ± 3.7	7.64	< 0.001

The results indicate that both balance and coordination improved significantly after the 8-week light exercise program. The Berg Balance Scale (BBS) score increased from a mean of 39.4 at pretest to 46.7 at posttest ($p < 0.001$), suggesting a marked improvement in postural stability. Similarly, the Alternate Hand Wall Toss Test score improved from 12.6 repetitions at pretest to 17.9 repetitions at posttest ($p < 0.001$), demonstrating enhanced hand–eye coordination.

These findings confirm that the application of balance and coordination training through light exercise was effective in improving motor performance among elderly participants in Medan.

Discussion

The findings of this study demonstrate that balance and coordination training through light exercise produced significant improvements in the physical function of elderly participants in Medan. Specifically, participants showed enhanced postural control, as reflected in higher Berg Balance Scale scores, and better motor coordination, as indicated by improved results in the Alternate Hand Wall Toss Test. These results

align with previous studies showing that structured exercise interventions are effective in reducing fall risk and promoting functional independence in older adults (Sherrington et al., 2019; Lesinski et al., 2015).

The improvement in balance can be attributed to the inclusion of static and dynamic balance drills such as single-leg stance and heel-to-toe walking, which enhance proprioception and lower-limb stability. Similar outcomes have been reported in community-based balance training programs, where elderly participants exhibited improved mobility and reduced fall incidence (Paterson & Warburton, 2010). The observed gains in coordination further support evidence that rhythmic and task-oriented exercises improve neuromuscular integration and hand–eye coordination, which are crucial for performing daily activities safely (Ambrose et al., 2013).

A key strength of this intervention is its accessibility. The exercises were light in intensity, simple to perform, and required minimal equipment, making them feasible for large-scale implementation in community health centers. This is particularly relevant in Indonesia, where the aging population is increasing rapidly and healthcare systems face challenges in addressing age-related decline (Badan Pusat Statistik [BPS], 2023). The low-cost and non-invasive nature of light exercise makes it a sustainable solution for promoting healthy aging.

Furthermore, the results underscore the importance of integrating physical activity into public health strategies for elderly care. WHO (2021) emphasizes that maintaining functional independence through exercise is critical for quality of life in older populations. By adopting light exercise programs that focus on balance and coordination, communities in Medan and similar urban centers can reduce fall-related injuries, healthcare costs, and caregiver burdens, while simultaneously improving social interaction and mental well-being among the elderly.

Nevertheless, this study has limitations. The relatively small sample size and absence of a control group limit the generalizability of findings. Future research should adopt randomized controlled designs with larger samples and longer intervention periods to validate these results. Moreover, including additional outcome measures such as quality of life, mobility tests, and fall incidence would provide a more comprehensive understanding of the intervention's benefits.

CONCLUSION

This study demonstrated that balance and coordination training through light exercise significantly improved motor performance among elderly participants in Medan. The program, which emphasized simple and low-intensity activities, led to measurable gains in both balance and coordination, thereby reducing fall risk and supporting functional independence. These findings highlight the potential of light exercise as a practical, low-cost, and community-based intervention for promoting healthy and active aging in Indonesia.

Given the growing elderly population and the associated health challenges, it is recommended that community health programs and policymakers integrate structured light exercise routines into elderly care initiatives. Future studies should employ larger samples, control groups, and extended intervention periods to strengthen the evidence base and explore long-term outcomes.

ACKNOWLEDGMENT

The authors would like to express their gratitude to the elderly participants and community centers in Medan for their active involvement and cooperation throughout this study. Special thanks are extended to the instructors and health volunteers who assisted in the implementation of the exercise sessions. The authors also acknowledge the support of colleagues and academic mentors whose guidance contributed to the successful completion of this research.

AUTHOR CONTRIBUTION STATEMENT

Gita Nurgaya Br Tarigan conceived the study, developed the research design, and supervised the overall project. Ramadan contributed to data collection, participant coordination, and the implementation of the intervention program. Arif Peristan Tarigan assisted with methodological

design, data processing, and statistical analysis. Arsyad Parlindungan Rambe provided technical guidance in developing the exercise protocols and ensured the safety of the intervention. Posma Saut Juliandre drafted and revised sections of the manuscript, including the literature review and discussion, while Firman Gunadi Turnip assisted in editing, formatting, and finalizing the manuscript for submission. All authors read and approved the final version of the manuscript.

CONFLICT OF INTEREST AND FUNDING

The authors declare that there is no conflict of interest regarding the publication of this article.

REFERENCES

Ambrose, A. F., Paul, G., & Hausdorff, J. M. (2013). Risk factors for falls among older adults: A review of the literature. *Maturitas, 75*(1), 51–61. https://doi.org/10.1016/j.maturitas.2013.02.009

Badan Pusat Statistik. (2023). *Statistical yearbook of Indonesia 2023*. BPS-Statistics Indonesia.

James, S. L., Lucchesi, L. R., Bisignano, C., Castle, C. D., Dingels, Z. V., Fox, J. T., Hamilton, E. B., Liu, Z., McCracken, D.,

Nixon, M. R., Roberts, N. L., Sylte, D. O., Walton, S., Hay, S. I., Mokdad, A. H., Naghavi, M., & Vos, T. (2020). The global burden of falls: Global, regional and national estimates of morbidity and mortality from the Global Burden of Disease Study 2017. *Injury Prevention, 26*(Suppl 2), i3–i11. https://doi.org/10.1136/injuryprev-2019-043286

Lesinski, M., Hortobágyi, T., Muehlbauer, T., Gollhofer, A., & Granacher, U. (2015). Effects of balance training on balance performance in healthy older adults: A systematic review and meta-analysis. *Sports Medicine, 45*(12), 1721–1738. https://doi.org/10.1007/s40279-015-0375-y

Paterson, D. H., & Warburton, D. E. R. (2010). Physical activity and functional limitations in older adults: A systematic review related to Canada's Physical Activity Guidelines. *International Journal of Behavioral Nutrition and Physical Activity, 7*(1), 38. https://doi.org/10.1186/1479-5868-7-38

Sherrington, C., Fairhall, N., Wallbank, G., Tiedemann, A., Michaleff, Z. A., Howard, K., Clemson, L., Hopewell, S., & Lamb, S. E. (2019). Exercise for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews, 2019*(1), CD012424. https://doi.org/10.1002/14651858.CD012424.pub2

Taylor, D., Hale, L., Schluter, P. J., Waters, D. L., Binns, E. E., McCracken, H., McPherson, K., & Wolf, S. L. (2014). Effectiveness of tai chi as a community-based falls prevention intervention: A randomized controlled trial. *Journal of the American Geriatrics Society, 62*(1), 25–31. https://doi.org/10.1111/jgs.12608

Tinetti, M. E., Kumar, C., & McAvay, G. J. (2017). The epidemiology of falls among older adults: Risk factors and prevention strategies. *Clinics in Geriatric Medicine, 33*(3), 357–372. https://doi.org/10.1016/j.cger.2017.03.002

World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. Geneva: WHO.

World Health Organization. (2021). *Global report on ageism*. Geneva: WHO.

Application of Balance and Coordination Training for the Elderly through Light Exercise in Medan

ORIGINALITY REPORT

12%	%	12%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Karen Probst, Constance Lewis. "Fall Risk Prediction in Adults Using Durable Medical Equipment: A Comparative Analysis of STEADI and 3-Key Question STEADI", Journal of Rehabilitation Practices and Research, 2025 Publication	2%
2	Shidin Balakrishnan, Walid El Ansari, Sarada Prasad Dakua. "Emerging technologies for in-home care for the elderly, frail, and vulnerable adults", Elsevier BV, 2024 Publication	1%
3	Akbar Alvian Sitorus, Aris Simaremare, Arjuna Arjuna, Boisandi Buulolo et al. "Learning Outcomes Associated with the Execution of Short Service in Badminton Among Junior High School Students: The Proficiency of Eye-Hand Coordination in Motor Activities", Journal of Foundational Learning and Child Development, 2025 Publication	1%
4	Anggi Audina, Dewi Maya Sary, Awansyah Putra Karo Purba, Bebi Putra Sentosa Halawa. "Long Jump Ability: Analyze of Leg Explosive Power and Running Speed for Junior High School Students", INSPIREE: Indonesian Sport Innovation Review, 2024 Publication	1%
5	Garry Tew, Laura Wiley, Lesley Ward, Jess Hugill-Jones et al. "Effectiveness and cost-	1%

effectiveness of offering a chair-based yoga programme in addition to usual care in older adults with multiple long-term conditions: a pragmatic, parallel group, open label, randomised controlled trial", NIHR Open Research, 2024
Publication

6	Pablo Tomas-Carus, Hugo Rosado, Catarina Pereira, José Marmeleira, Guida Veiga, Daniel Collado-Mateo. "Differences between two types of dual tasks according to the educational level in older adults", Archives of Gerontology and Geriatrics, 2020 Publication	1 %
7	Zougar, Mohammad J.. "Can Exergames be Used to Improve the Physical Abilities of Older Male Care Home Residents in Saudi Arabia?", The University of Manchester (United Kingdom), 2024 Publication	1 %
8	"Surgical Decision Making in Geriatrics", Springer Science and Business Media LLC, 2020 Publication	1 %
9	Chantanachai, Thanwarat. "Understanding and Addressing Fall Risk in Older People With Cognitive Impairment.", University of New South Wales (Australia) Publication	1 %
10	Olokunlade, Temitope Adegbayi. "An Examination of Incident and Recurrent Fall Risk Among Older Adult Males in the United States", Texas A&M University, 2023 Publication	1 %
11	Rostampour, Sorour. "Association of Fall-Related Injuries and Different Diagnoses in	<1 %

Older Adults of Ontario: A Machine Learning Approach", The University of Western Ontario (Canada), 2024
Publication

12 Ben Sidaway. "Beam walking increases gait velocity and reduces falls risk in older adults", Experimental Gerontology, 2025 <1%
Publication

13 Kaur, Shabnampreet. "Implementation of Tai Chi Fall Prevention Program in a Community-Based Setting", Grand Canyon University, 2024 <1%
Publication

14 Visnjevic, Nicolas Ty. "Physical and Cognitive Dual-Task Intervention for Fall Risk Reduction in Community Dwelling Older Adults with Varying Degrees of Cognitive Impairment", California State University, Long Beach, 2023 <1%
Publication

15 Denis Čaušević, Cristina Ioana Alexe, Nedim Čović, Elena Adelina Panaet et al. "Supplement Use Among Athletes: Insights from Gyms in Sarajevo", Applied Sciences, 2025 <1%
Publication

16 Susan M. Friedman. "Geriatrics, Lifestyle Medicine and Healthy Aging - A Practical Guide", CRC Press, 2025 <1%
Publication

Exclude quotes	On	Exclude matches	< 1 words
Exclude bibliography	On		