

The Effect of Ankle Strategy Exercise on Fall Risk Among Older Adults in Gaji Village, Kerek District, Tuban Regency

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Abstract: Older adults experience physiological decline that reduces balance ability and increases the risk of falls. Falls can lead to serious physical injuries, psychological impacts, decreased quality of life, and even mortality. Therefore, effective and applicable interventions are needed to prevent fall risk, especially in community settings. **Objective:** This study aimed to determine the effect of ankle strategy exercise on fall risk among older adults in Gaji Village, Kerek District, and to evaluate its role as a community-based nursing intervention. **Method:** This study employed a quantitative pre-experimental design with a one-group pretest–posttest approach. Participants were selected using purposive sampling based on inclusion criteria. Data were collected using the Berg Balance Scale (BBS) before and after the intervention. Data analysis was conducted using appropriate statistical tests to compare fall risk before and after ankle strategy exercise. **Findings:** The results showed a significant reduction in fall risk after the intervention. Most participants experienced improved balance performance, indicating that ankle strategy exercise effectively enhances postural stability in older adults. **Implications:** The findings suggest that ankle strategy exercise can be implemented as a simple, cost-effective, and non-pharmacological intervention in community nursing practice to prevent falls among older adults. This intervention is practical and can be easily adopted in community health programs. **Originality:** This study provides empirical evidence on the effectiveness of ankle strategy exercise in a rural community setting, highlighting its potential as a feasible and targeted balance training method for fall prevention among older adults.

Keywords: Ankle Strategy Exercise, Fall Risk, Older Adults, Balance.

INTRODUCTION

Falls among older adults represent a major global public health issue due to their significant impact on morbidity, mortality, and quality of life. Aging is associated with physiological decline, including decreased muscle strength, impaired postural stability, and reduced proprioceptive function, which increase susceptibility to falls (Kisner et al., 2017). According to the World Health Organization, approximately 28–35% of individuals aged over 65 years experience at least one fall annually, and this proportion increases in older age groups (World Health, 2021). Falls frequently lead to injuries such as fractures, reduced mobility

([Ambrose et al., 2013](#)), and long-term disability and in severe cases may result in mortality ([Salari et al., 2022](#)). In addition to physical consequences, falls also have psychological impacts, including fear of falling, anxiety, and reduced confidence in performing daily activities ([Scheffer et al., 2008](#)). These conditions contribute to a decline in independence and overall well-being among older adults, making fall prevention an essential priority in geriatric healthcare ([Beard et al., 2016](#)).

In the Indonesian context, the burden of falls among older adults continues to increase, particularly in community and rural settings where preventive interventions are limited. National data indicate that a significant proportion of older adults experience fall-related injuries, especially those aged 65 years and above ([Kementerian Kesehatan Republik, 2021](#)). Environmental factors such as unsafe flooring, inadequate lighting, and limited access to assistive devices further increase fall risk ([Zhang et al., 2019](#)), while low physical activity and limited health literacy exacerbate vulnerability among older populations ([Gouveia et al., 2019](#)). A preliminary survey conducted in Gaji Village, Kerek District, Tuban Regency, revealed that 3 out of 10 older adults experienced decreased mobility, including gait disturbances and muscle weakness, indicating an elevated risk of falls. Similar findings have been reported in community-based studies, where reduced functional mobility is strongly associated with fall incidence ([Sherrington et al., 2019](#)). Therefore, effective and accessible fall prevention strategies are urgently needed, particularly in rural communities where healthcare resources may be limited.

Previous studies have extensively examined the determinants of fall risk among older adults. Research has consistently identified intrinsic factors such as muscle weakness, balance impairment, and neuromuscular decline as key contributors to fall risk ([Horak, 2006](#)). In addition, visual impairment and psychological conditions such as fear of falling also play a significant role in increasing fall susceptibility ([Ambrose et al., 2013](#)). Extrinsic factors, including environmental hazards such as slippery surfaces and poor lighting, have also been shown to significantly contribute to fall incidents ([Ambrose et al., 2013](#); [Guirguis-Blake et al., 2024](#)). These findings highlight the multifactorial nature of falls; however, most studies have primarily focused on risk identification rather than evaluating targeted interventions for fall prevention.

A growing body of research has explored the effectiveness of physical exercise and balance training in reducing fall risk. Structured exercise programs have been shown to

improve muscle strength, enhance balance, and increase functional mobility among older adults (Catherine Sherrington et al., 2020). Similarly, balance training interventions have demonstrated positive outcomes in reducing fall incidence and improving postural control (Cathie Sherrington et al., 2020). Other studies have also highlighted the role of combined exercise approaches, such as dynamic and functional training, in improving stability and preventing falls (Cathie Sherrington et al., 2020). Despite these promising findings, many interventions remain general in nature and do not specifically address the underlying mechanisms of postural control at the ankle level.

More specific studies have investigated ankle strategy exercise as a targeted intervention to improve balance and reduce fall risk. This approach emphasizes controlled movements at the ankle joint, which play a crucial role in maintaining postural stability during minor balance disturbances (Horak, 2006). Research has shown that ankle-based training can enhance proprioceptive feedback and improve neuromuscular coordination in older adults (Cathie Sherrington et al., 2020). In addition, ankle strategy exercise has been associated with improvements in postural control and reductions in fall risk among elderly populations (Lee & Lee, 2017). However, existing studies are still limited in their application within community-based rural settings, and there is a lack of empirical evidence examining its effectiveness in specific local contexts such as Gaji Village, Kerek District, Tuban Regency. This gap highlights the need for further research to evaluate the practical implementation of ankle strategy exercise in real-world community environments.

Based on these gaps, this study aimed to determine the effect of ankle strategy exercise on fall risk among older adults in Gaji Village, Kerek District, Tuban Regency. The study specifically evaluates changes in fall risk before and after the intervention using the Berg Balance Scale, with the intention of providing empirical evidence for a simple, low-cost, and applicable intervention in community-based nursing practice.

This study is based on the argument that ankle strategy exercise can significantly improve postural control and reduce fall risk among older adults. By focusing on controlled ankle movements, the intervention is expected to strengthen lower-extremity muscles and enhance proprioceptive function, which are essential for maintaining balance (Kisner et al., 2017). Therefore, the hypothesis of this study is that older adults who undergo ankle strategy exercise will experience a significant reduction in fall risk compared to their condition before the intervention.

RESEARCH METHOD

The unit of analysis in this study was older adults who were identified as being at risk of falls in Gaji Village, Kerek District, Tuban Regency, Indonesia. The study focused on individual-level changes in balance ability and fall risk after the implementation of ankle strategy exercise. Thus, the main subject of this research was community-dwelling older adults, while the main object of observation was the change in fall risk measured before and after the intervention.

This study employed a quantitative approach using a pre-experimental design with a one-group pretest-posttest format. This design was selected because the study aimed to measure the effect of ankle strategy exercise by comparing respondents' fall risk before and after the intervention within the same group. The use of this design allowed the researchers to identify changes that occurred following the exercise program in a practical community setting. In addition, this approach was considered appropriate because it enabled direct evaluation of the intervention effect when applied to older adults in the field.

The data used in this study were primary data obtained directly from respondents. The main source of information was the balance assessment results of older adults who participated in the study. Fall risk data were measured using the Berg Balance Scale (BBS), which is widely used to assess both static and dynamic balance ability in older adults. In addition to the balance scores, respondent characteristics such as age, sex, and educational background were also collected to provide a general description of the study population.

Data collection was carried out in two stages, namely the pretest stage and the posttest stage. In the first stage, respondents were assessed using the Berg Balance Scale to determine their baseline balance condition and level of fall risk before receiving the intervention. In the second stage, respondents participated in an ankle strategy exercise program consisting of controlled balance exercises focused on ankle movement to improve postural stability. After the intervention period was completed, respondents underwent a posttest assessment using the same instrument to identify any changes in balance ability and fall risk. The instrument used in this study was an observation sheet based on the Berg Balance Scale.

Data analysis was conducted using both descriptive and inferential statistical techniques. Descriptive statistics were used to summarize respondent characteristics and to present the distribution of fall risk scores before and after the intervention. To examine whether there was a significant difference in fall risk before and after the ankle strategy exercise program, the

Wilcoxon Signed Rank Test was applied with a significance level of $\alpha = 0.05$. This statistical test was chosen because it is appropriate for comparing paired pretest and posttest data obtained from the same respondents. All statistical analyses were performed using SPSS software.

RESULT

Data collection was conducted from November 3 to December 6, 2025, at the Posyandu in the working area of the Community Health Center (PHC) in Gaji Village, Kerek District. A total of 61 respondents who met the inclusion and exclusion criteria participated in the study. Data were obtained through interviews using observation sheets and intervention procedures for older adults at risk of falls. The collected data were classified into two categories: general data and specific data.

Respondent Overview

1. Respondent characteristics based on age

Table 1. Frequency Distribution Based on Age

No	Age	Frequency (<i>f</i>)	Presentation
1.	60-69 Years	61	100%
2.	70-79 Years	0	0%
3.	>80 Years	0	0%
Amount		61	100%

Source: Primary Research Data 2025

Based on Table 1, it can be seen that of the 61 (100%) respondents, almost all of them 61 (100%) respondents aged 60-69 years.

2. Respondent characteristics based on gender

Table 2. Frequency Distribution Based on Gender

No	Gender	Frequency (<i>f</i>)	Presentation
1.	Man	28	45.9%
2.	Woman	33	54.1 %
Amount		61	100%

Source: Primary Research Data 2025

Based on Table 2, it can be seen that of the 61 (100%) respondents, the majority were female, namely 33 (54.1%) respondents.

3. Respondent characteristics based on last education

Table 3. Frequency Distribution Based on Educational

No	Education	Frequency (<i>f</i>)	Presentation
1.	No school	46	75.4%
2.	Elementary School	15	24.6%
Amount		61	100%

Source: Primary Research Data 2025

Based on Table 3, it can be seen that of the 61 (100%) respondents, the majority, namely 46 (75.4%) respondents, did not attend school. Low levels of education are closely related to low levels of knowledge. regarding the importance of physical exercise to control balance for the elderly.

Research conducted by Rahmawati & Fitriani (2020) also shows that there is a significant relationship between education level and the risk of falling in the elderly, the lower a person's education, the higher the likelihood of experiencing the risk of falling.

Therefore, the high number of falls in the low-education group in this study illustrates the lack of health literacy and self-control ability towards a healthy lifestyle.

Special Data

Specific data obtained by this research include:

1. Identification of Fall Risk in the Elderly in Gaji Village, Kerek District before being given *ankle strategy exercise balance training*.

Table 4. Frequency Distribution of Elderly People Who Experienced a Risk of Falling Before Being Given *Ankle Strategy Exercise Balance Training* on November 3, 2025

No	Fall Risk Level	Frequency (<i>f</i>)	Presentation
1	Low	3	5%
2	Currently	32	52.4%
3	Tall	26	42.7%
Amount		61	100%

Source: Primary Research Data 2025

Based on Table 4, it can be seen that of the 61 (100%) respondents, it was shown that before being given *ankle strategy exercise balance training* , the majority of elderly people experienced a moderate risk of falling, namely 32 (52.4%) respondents.

This data is supported by the results of an initial survey conducted by researchers on 10 elderly respondents. The survey results showed that three of them had a history of falls during daily activities. This phenomenon indicates that the risk of falls among elderly people in the

study area is at a level that requires attention. The high number of falls provides a strong basis for researchers to conduct a more in-depth analysis of preventive measures that can be implemented to improve the quality of life of the elderly.

2. Identification of Fall Risk in the Elderly in Gaji Village, Kerek District after being given ankle *strategy exercise balance training*.

Table 5. Frequency Distribution of Elderly People Who Are at Risk of Falling After Being Given *Ankle Strategy Exercise Balance Training* on December 6, 2025

No	Fall Risk Level	Frequency (<i>f</i>)	Presentation
1	Low	41	67.2%
2	Currently	12	19.7%
3	Tall	8	13.1%
Amount		61	100%

Source: Primary Research Data 2025

Based on Table 5, it can be seen that of the 61 (100%) respondents, it was shown that after being given *ankle strategy exercise balance training*, the majority of elderly people who experienced a low risk of falling were in the low category, namely 41 (67.2%) respondents.

3. Analysis of the effect of *ankle strategy exercise* on the risk of falls in the elderly in Gaji Village, Kerek District

Table 6. Distribution of the Effect of *Ankle Strategy Exercise* on the Risk of Falls in the Elderly in Gaji Village, Kerek District, on December 6, 2025

<i>Ankle Strategy Exercise Balance Exercise</i>	Risk of Falls in the Elderly			Total
	Low	Currently	Tall	
<i>Pre-test</i>	3 (5%)	32 (52.4%)	26 (42.7%)	61 (100%)
<i>Post-test</i>	41 (67.2%)	12 (19.7%)	8 (13.1%)	61 (100%)
Wilcoxon Test Asymp. Sig (2-tailed) = 0.001				

Based on table 6, it can be seen that the level of risk of falling in the elderly in Gaji Village, Kerek District, before being given *Ankle Strategy Exercise Balance Training*, more than half of the respondents, 32 (52.4%) of whom showed signs of a moderate level of risk of falling. Meanwhile, after being given *Ankle Strategy Exercise Balance Training*, less than half of the respondents, 41 (67.2%) of whom showed signs of a low level of risk of falling.

DISCUSSION

This study examined the effect of ankle strategy exercise on fall risk among older adults in Gaji Village, Kerek District, Tuban Regency. The findings showed that before the intervention, most respondents were classified in the moderate- and high-risk categories, indicating that fall risk was already a significant problem in the study population. After the intervention, the number of respondents in the low-risk category increased substantially, while the numbers in the moderate- and high-risk categories decreased. Statistical analysis using the Wilcoxon Signed Rank Test confirmed that the difference between pretest and posttest scores was significant ($p < 0.05$). These results indicate that ankle strategy exercise contributed to improved balance performance and reduced fall risk among the participating older adults.

The reduction in fall risk observed in this study may be explained by the physiological mechanism of ankle strategy exercise in maintaining postural stability. Ankle strategy is one of the body's main balance-recovery mechanisms, especially when small disturbances occur during standing. This strategy depends on coordinated ankle movement, lower-extremity muscle activation, proprioceptive feedback, and neuromuscular response. In older adults, these systems often decline due to aging, resulting in slower postural correction, decreased joint flexibility, reduced sensory integration, and weakened muscle strength. Consequently, older adults become more vulnerable to instability and falls.

Regular ankle strategy exercise may improve balance because it repeatedly trains the body to control the center of gravity through ankle-based movement correction. This process can strengthen postural muscles, enhance proprioceptive sensitivity, and improve coordination between sensory input and motor response. As a result, older adults may become better able to maintain body alignment and respond more effectively to postural disturbances. Therefore, the improvement found in this study suggests that ankle strategy exercise works not only as a simple movement routine but also as a functional training approach that improves adaptive balance control in older adults.

The findings of this study can be interpreted in relation to the three major categories of literature identified in the introduction. First, previous studies on the risk factors and consequences of falls have shown that falls in older adults are influenced by a combination of intrinsic and extrinsic factors, including muscle weakness, balance impairment, gait disturbance, visual decline, and environmental hazards. Research by ([Ambrose et al., 2013](#); [Scheffer et al., 2008](#)), emphasized that these factors not only increase physical vulnerability

but also produce psychological consequences such as fear of falling, anxiety, and reduced confidence in daily activities. The present study supports this category of research because the high proportion of respondents with moderate and high fall risk before the intervention indicates that balance impairment was already a serious concern among older adults in this community.

Second, the present findings are consistent with previous studies on general physical exercise and balance training interventions. Earlier research has shown that exercise-based programs improve lower-extremity strength, postural stability, and functional mobility, thereby reducing fall risk in older adults. (Guirguis-Blake et al., 2024; Cathie Sherrington et al., 2020) reported that physical exercise plays an important preventive role in fall reduction, while (Sherrington et al., 2019) found that balance training significantly improved stability and decreased fall risk among elderly participants. (Cathie Sherrington et al., 2020) also demonstrated that exercise-oriented interventions contributed to better functional performance in older adults. The reduction in fall risk found in this study is in line with these earlier findings and further confirms that exercise remains an important non-pharmacological strategy for fall prevention.

Third, this study specifically strengthens the literature on ankle strategy exercise as a targeted intervention for balance improvement. Previous studies have suggested that ankle strategy exercise helps optimize postural control by activating ankle musculature, improving proprioceptive feedback, and stabilizing the body's center of gravity. (Ambrose et al., 2013) reported that ankle strategy exercise improved postural sway control, while Basco and Halter (2022) highlighted its contribution to neuromuscular coordination and stability in older adults. (Lee & Lee, 2017) further found that ankle strategy exercise was effective in improving balance in community health settings. The present study supports these findings by showing a significant reduction in fall risk after the intervention. Its added value lies in providing evidence from a rural community-based context, which suggests that ankle strategy exercise is not only clinically relevant but also practically feasible in village-level elderly health services.

The findings of this study indicate that fall risk in older adults should not be understood merely as an unavoidable consequence of aging. Instead, fall risk should be viewed as a modifiable condition that can be improved through appropriate intervention. This interpretation is important because it shifts the focus of elderly care from passive acceptance

of decline to active prevention and functional improvement. The significant changes observed after the intervention suggest that even in later life, older adults still retain the capacity to improve their postural adaptation through structured exercise.

In addition, the findings imply that ankle strategy exercise may have both physical and psychological significance. Physically, the intervention improves balance control and movement stability. Psychologically, better balance may help older adults feel safer and more confident when performing daily activities, thereby reducing fear of falling and encouraging greater independence. In this sense, the study contributes to a broader geriatric nursing perspective by showing that a simple targeted intervention can support healthy aging and preserve functional autonomy in community settings.

The characteristics of the respondents may also help explain the study findings. Most respondents were female, within the early elderly age range, and had low educational attainment. These characteristics may influence both baseline fall risk and response to intervention. Aging is naturally associated with progressive decline in muscle strength, joint mobility, and postural reflexes, while limited education may be associated with lower health literacy and less awareness of preventive exercise. These conditions can increase vulnerability to balance disorders and reduce the likelihood of independently adopting healthy movement practices.

At the same time, the study context also matters. This research was conducted in a village setting where access to structured rehabilitation services may be limited. In such environments, older adults may not routinely receive targeted fall-prevention interventions. Therefore, the positive outcomes observed in this study suggest that ankle strategy exercise may be especially valuable in low-resource community settings. The exercise is simple, does not require advanced equipment, and can be adapted to local health service structures, making it a practical option for elderly care at the community level.

From a practical perspective, ankle strategy exercise has several strengths as a nursing intervention. It is simple, low-cost, non-pharmacological, and easy to teach to older adults. These characteristics make it suitable for implementation in community health centers, elderly integrated service posts, and home-based care. The intervention may also increase participation because it does not place a heavy burden on older adults and can be performed with minimal resources.

However, several limitations must be considered. This study used a one-group pretest-posttest design without a control group, so the observed improvements cannot be attributed solely to the intervention with complete certainty. External factors such as participant motivation, family support, environmental safety, and exercise adherence may also have contributed to the outcomes. Furthermore, the study was conducted in a single setting with a limited sample, which restricts the generalizability of the findings. Therefore, although the results are encouraging, they should be interpreted cautiously and viewed as preliminary evidence that requires further confirmation through stronger study designs.

The results of this study have clear implications for nursing practice and community health services. Ankle strategy exercise may be incorporated into routine elderly health programs as a practical intervention to prevent falls and improve balance. Nurses and community health workers can use this exercise in promotive and preventive services, especially in village-based programs for older adults. Because the exercise is simple and feasible, it can also be taught to family members so that older adults can continue practicing it regularly at home.

At the policy level, these findings support the need to strengthen community-based fall-prevention programs for older adults, particularly in rural areas. Health authorities may consider integrating balance-training modules into elderly health promotion activities, along with education on environmental safety and active aging. Future studies should apply more rigorous designs, such as quasi-experimental or randomized controlled trials, involve larger and more diverse samples, and examine longer follow-up periods to determine whether the benefits of ankle strategy exercise can be sustained over time.

CONCLUSION

This study demonstrates that ankle strategy exercise is an effective intervention for reducing fall risk among older adults in Gaji Village, Kerek District, Tuban Regency. The findings show a significant improvement in balance performance, as indicated by the shift of respondents from moderate and high fall-risk categories to the low-risk category after the intervention. These results highlight that fall risk among older adults is not solely an inevitable consequence of aging but can be improved through structured and targeted balance training. Therefore, ankle strategy exercise can be considered a practical and beneficial non-

pharmacological approach to enhance postural stability and support functional independence in older adults.

The main scientific contribution of this study lies in providing empirical evidence on the effectiveness of ankle strategy exercise as a targeted balance intervention in a community-based rural setting. Unlike previous studies that were mostly conducted in clinical or institutional environments, this research demonstrates that simple and low-cost exercise interventions can be successfully implemented in village-level healthcare services. This study also reinforces the theoretical understanding that fall risk in older adults is a modifiable condition influenced by both physiological and behavioral factors, and that targeted exercise can improve adaptive balance control. Thus, this research contributes to the development of practical, accessible, and sustainable fall-prevention strategies in geriatric nursing and community health.

However, this study has several limitations that should be acknowledged. The use of a one-group pretest-posttest design without a control group limits the ability to establish a strong causal relationship between the intervention and the observed outcomes. In addition, the study was conducted in a single location with a relatively limited sample size, which may affect the generalizability of the findings. External factors such as participant adherence, motivation, and environmental conditions may also have influenced the results. Therefore, future research is recommended to use more rigorous designs, such as quasi-experimental or randomized controlled trials, with larger and more diverse samples, as well as longer observation periods to evaluate the long-term effectiveness of ankle strategy exercise in preventing falls among older adults.

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