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Improving Balance in Older Adults Through Gaze Stability Exercise: A Community-Based Physiotherapy Program

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ABSTRACT

Background: *The elderly population continues to grow with increased life expectancy, but healthcare services remain insufficient. As a result, many older adults face balance disorders and a higher risk of falls, worsened by limited access to physiotherapy. This community service program aims to train elderly people in efforts to improve their knowledge and skills in managing fall risks using gaze stability exercises taught by physiotherapists.*

Methods: *Participants' understanding of age-related balance problems improved markedly, with correct responses increasing from 18.3% pre-education to 86.7% post-intervention (a 68.4-point improvement). All participants successfully performed the main gaze stability exercises, although some needed assistance with vergencies. They also reported greater confidence during standing and walking and showed strong motivation to continue the exercises independently at home.*

Results: *Participants' understanding of age-related balance problems improved substantially, with the average level of correct responses increasing from 18.3% before the education session to 86.7% after the intervention, representing an average improvement of 68.4 percentage points. In addition, all participants were able to perform the main gaze stability exercise components correctly, although several required assistances with vergence movements. Participants reported increased confidence during standing and walking activities and expressed strong motivation to continue the exercises independently at home.*

Conclusion: *Gaze stability exercise education is a feasible and beneficial community-based physiotherapy approach to enhance balance awareness, confidence, and self-management among older adults. The program is recommended for routine implementation in elderly community health services with support from physiotherapists and local health cadres.*

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INTRODUCTION

The global increase in life expectancy has led to a growing proportion of older adults, including in Indonesia (1,2). According to national statistics, the proportion of individuals aged 60 years and above continues to rise, increasing the burden of age-related functional decline. The of the most common and serious problems experienced by older adults is balance impairment, which significantly increases the risk of falls, injuries, loss of independence, and reduced quality of life.

Balance is the ability to maintain the body's centre of mass within the base of support and is influenced by the integration of sensory systems, including visual, vestibular, and proprioceptive inputs, as well as musculoskeletal function (1,3–5). Age-related degeneration of these systems contributes to a decline in postural control and balance performance in older adults. In community settings, limited access to physiotherapy services and insufficient knowledge regarding balance training further exacerbate this problem.

Beyond its impact on mobility and independence, balance impairment in older adults may lead to falls that impose substantial burdens on families and healthcare systems. Fall-related injuries often require emergency care, hospitalization, prolonged rehabilitation, and, in severe cases, long-term institutional support, resulting in increased healthcare expenditure and resource utilization (1). At the family level, recurrent falls and fear of falling may increase caregiver burden, emotional stress, supervision demands, and dependence in daily activities (2). Recent evidence highlights that caregiver burden among families of community-dwelling older adults is strongly associated with mobility limitations and fall-related functional decline (6,7). Therefore, community-based fall prevention strategies are essential not only to preserve functional independence but also to reduce the psychosocial and economic burden on families and primary healthcare services (6).

From a preventive health perspective, early balance-focused interventions are increasingly recognized as more cost-effective than curative management of fall-related complications in older adults. Preventive balance training can reduce fall incidence, fall-related injuries, emergency visits, and hospitalization needs, thereby minimizing healthcare costs associated with fracture treatment, prolonged rehabilitation, and long-term dependency care (8). Recent evidence suggests that structured exercise and balance programs provide consistent reductions in fall events and offer better value for health systems when implemented at the community level, particularly among older adults with elevated fall risk (9). Therefore, integrating simple preventive physiotherapy interventions into routine elderly community services may represent a sustainable and economically efficient strategy to reduce the burden of falls and preserve functional independence (10).

The role of community health cadres is also critical in ensuring sustainability and wider dissemination of balance training practices in community-based elderly health services. As trusted local facilitators, cadres can reinforce exercise instructions, provide routine reminders, monitor adherence, and encourage peer participation during regular posyandu lansia activities. Their continuous engagement helps bridge the gap between one-time physiotherapy interventions and long-term exercise behavior change among older adults (11). Recent community-based ageing programs have highlighted that cadre involvement significantly strengthens program sustainability, supports knowledge transfer, and facilitates the integration of preventive exercises into routine community health practices (7). Therefore, empowering health cadres through targeted training is essential to maintain the continuity and scalability of balance-focused physiotherapy programs at the primary care and community levels (12).

In line with this preventive approach, vestibular-oriented balance exercises such as gaze stability training offer a practical, low-cost, and scalable physiotherapy option for community-dwelling older adults. In this context, preventive physiotherapy interventions that are simple, scalable, and community-based become increasingly important. Gaze stability exercise is a vestibular rehabilitation approach that focuses on improving the

vestibulo-ocular reflex (VOR), enabling individuals to maintain visual stability during head movements (9,13–15). Previous studies have demonstrated that gaze stability exercises can enhance balance, mobility, and confidence in older adults. However, the application of this evidence-based intervention in community-based elderly health services remains limited.

At Posyandu Lansia Ngudi Waras 7, Tohudan, routine activities such as group exercises and blood pressure monitoring are conducted; however, specific education and training related to balance impairment are lacking. Therefore, this community service program aims to empower older adults by increasing their knowledge and practical skills related to balance improvement through gaze stability exercise, as an accessible and low-cost physiotherapy intervention. The distinctive feature of this program lies in the integration of vestibular-based gaze stability exercises into routine community elderly health services (posyandu lansia), which traditionally focus on general physical activity and health monitoring.

This approach emphasises self-management, feasibility, and sustainability in a low-resource community setting, while actively involving health cadres and older adults in the learning process (16). Therefore, this community service program aimed to empower community-dwelling older adults by improving their knowledge and practical ability to perform gaze stability exercises, with the ultimate goal of enhancing balance confidence, reducing fall risk awareness, and supporting sustainable self-management within routine elderly community health services. This program also contributes to strengthening community-based fall prevention strategies through practical, easily implementable vestibular exercise education at the primary community level.

METHODS

This community service program was conducted at Posyandu Lansia Ngudi Waras 7, Tohudan, Colomadu, Karanganyar, Indonesia, from 4 to 6 August 2025. The target participants were community-dwelling older adults aged 60 years and above who routinely attended posyandu activities. A total of 30 older adults participated in the program. The program was implemented through several stages. The activities were carried out using participatory and interactive approaches to encourage active engagement of older adults during the program. Local health cadres were also involved to facilitate communication and support the sustainability of the program within routine community health services.

Stage 1: Preparation and Coordination

The preparation stage began with coordination meetings involving the posyandu management team and local health cadres to align program objectives and implementation strategies. Activity schedules were arranged collaboratively to ensure maximum participation of older adults who routinely attended posyandu services. Facilities and equipment required for education and exercise sessions were prepared in advance to support safe and effective implementation. Health cadres were briefed regarding their roles in assisting participant engagement and communication during activities. This preparatory phase aims to strengthen community collaboration and create a supportive environment for successful program delivery.

Stage 2: Education and Exercise Implementation

Second, health education sessions were delivered to participants, focusing on age-related balance problems, fall risks, and the importance of balance training. Participants received hands-on training in gaze stability exercises under the supervision of physiotherapy lecturers and assisted by students. To ensure the accuracy and safety of the intervention, all educational and practical sessions were led by a licensed physiotherapy educator with clinical expertise in geriatric balance rehabilitation and vestibular exercise, supported by trained final-year physiotherapy students under direct supervision.

The gaze stability exercise program consisted of saccadic eye movement, pursuit eye movement, vestibulo-ocular reflex exercise, and vergence eye movement. Each exercise was demonstrated and practised with ten repetitions per movement. Participants were encouraged to perform the exercises safely and according to their individual tolerance. Participants were also advised to integrate the exercises into their daily routine to support continuous balance and fall prevention.

Stage 3: Evaluation and Follow-up

The evaluation stage focused on assessing participants' understanding and practical ability following program implementation. Qualitative evaluation methods included direct observation of exercise performance, interactive discussions, and question-and-answer sessions to explore participants' comprehension and experiences. Participants were encouraged to share feedback regarding exercise difficulty, perceived benefits, and confidence during daily mobility activities. Health cadres were involved in monitoring participants' engagement and reinforcing key exercise principles. Follow-up communication with posyandu staff was arranged to support continued home practice and promote sustainability of gaze stability exercises within routine elderly community health services.

RESULTS

The community service activity was attended by 30 older adults who actively participated throughout the program. The educational session resulted in increased awareness and understanding of balance problems associated with ageing. Participants demonstrated high engagement during discussions and practical sessions, indicating strong interest in fall prevention strategies. Many participants also expressed willingness to continue practising the exercises independently as part of their daily routine.

Table 1. Outcomes of Knowledge Improvement, Exercise Performance, and Participant Confidence Following the Community Service Program

Indicator	Result (n = 30)
Total participants	30
Attendance completion	30 (100%)
Adequate understanding after education	26 (86.7%)
Able to perform saccadic eye movement	30 (100%)
Able to perform vestibulo-ocular reflex (VOR) exercise	30 (100%)
Required assistance in vergence eye movement	8 (26.7%)
Reported improved balance confidence	24 (80.0%)

Table 1 presents the evaluation outcomes of the community service program involving 30 older adults. All participants completed the program with a 100% attendance rate, indicating strong engagement and acceptance of the activity. Following the educational session, 86.7% of participants demonstrated adequate understanding of age-related balance problems, showing the effectiveness of the education provided in improving awareness and knowledge.

In terms of practical performance, all participants were able to correctly perform saccadic eye movement and vestibulo-ocular reflex (VOR) exercises. However, 26.7% of participants still required assistance during verge of eye movements, suggesting a higher level of difficulty for this component. Additionally, 80.0% of participants reported increased confidence in maintaining balance during standing and walking activities, indicating positive functional and psychological benefits of the program.



Figure 1. Documentation of Community Service Activities

All participants were able to perform gaze stability exercises, particularly saccadic and pursuit eye movements, with good adherence to instructions. Some participants required additional guidance when performing vergence eye movement exercises. Participants expressed high enthusiasm and motivation, with many indicating their intention to continue the exercises independently at home.

Several participants reported subjective improvements, including increased confidence during standing and walking activities. Although quantitative balance measurements were not conducted, these self-reported outcomes suggest a positive perceived impact of the program. Documentation of the activities was disseminated through the official social media account of Poltekkes Kemenkes Surakarta.

DISCUSSION

This community service program demonstrated that gaze stability exercise education is well accepted and feasible for older adults in a community setting. Improved understanding and active participation indicate that older adults are capable of learning and performing vestibular-based exercises when appropriate guidance is provided. The involvement of a physiotherapy educator with vestibular rehabilitation expertise contributed to the high participant adherence and correct execution of the exercises.

The positive perceived outcomes may be explained by improved vestibulo-ocular reflex (VOR) adaptation and enhanced sensory reweighting mechanisms (4,15,17). Repeated gaze stability practice helps older adults maintain visual fixation during head movement, thereby improving visual-vestibular integration and postural control (14,15,17).

In addition, repetitive eye-head coordination tasks may stimulate central vestibular compensation, which contributes to better balanced confidence during standing and walking activities (15).

The findings are consistent with previous studies reporting that gaze stability exercises improve balance performance and confidence in older adults (1,3,7,14) by focusing on vestibulo-ocular reflex adaptation, these exercises address one of the key sensory components of balance control (4). The high level of participant engagement highlights the importance of practical, directly applicable interventions in community-based elderly health programs. These results suggest that integrating vestibular-based exercises into routine community services can serve as an effective strategy for sustainable fall prevention among older adults.

From a community impact perspective, this program demonstrates that vestibular-based balance interventions can be successfully translated into routine elderly health services at the community level. The active involvement of older adults and health cadres supports capacity building and promotes exercise adherence beyond the intervention period. The simplicity and low cost of gaze stability exercises make them highly feasible for implementation in similar community settings, particularly in areas with limited access to specialised physiotherapy services. This approach also contributes to fall prevention strategies by increasing balance awareness, confidence, and self-efficacy among older adults, which are essential factors for maintaining functional independence and quality of life (1–3,18).

The implementation of gaze stability exercises in this program also reflects a task-shifting approach, where basic preventive and promotive balance exercises can be supervised by trained health cadres under the guidance of physiotherapists. Task shifting has been increasingly recognised as an effective strategy to address limited access to rehabilitation services, particularly in community and primary health care settings, without compromising intervention safety or effectiveness (15,17). This approach allows physiotherapists to focus on assessment and program planning, while cadres support routine exercise supervision and monitoring.

In terms of sustainability, simplicity, low cost, and minimal equipment requirements of gaze stability exercises make them highly suitable for long-term integration into routine elderly health programs, such as posyandu lansia (19). Sustainable community-based interventions require alignment with existing health service structures and active engagement of local stakeholders, including older adults, cadres, and primary health care providers (7,20,21). By embedding vestibular-based balance exercises into regular community activities, this program supports sustainable fall prevention efforts and contributes to maintaining functional independence and quality of life among older adults.

The implications of this community service initiative suggest that education and training in gaze stability exercises can serve as a promotive–preventive intervention that is easily implemented within elderly health posts. The integration of vestibular-based exercises into routine community activities has the potential to strengthen ongoing fall prevention efforts with minimal resource requirements. The involvement of community health workers supports the programme's sustainability through knowledge transfer and guidance on independent practice within the community. Consequently, this programme can serve as a model for the development of community-based elderly care services that enhance the independence and quality of life of older adults.

A limitation of this program is the absence of quantitative balance outcome measures. Future programs should incorporate standardised balance assessments to strengthen the

evidence of effectiveness. Additionally, long-term follow-up is needed to evaluate the sustainability of exercise adherence and functional outcomes. Future community service activities are also recommended to include regular monitoring through routine posyandu sessions to ensure continued practice and program sustainability.

CONCLUSIONS AND SUGGESTIONS

This community-based physiotherapy program successfully increased knowledge and practical skills related to balance improvement among older adults through gaze stability exercise. From a practice perspective, gaze stability exercise can be integrated into routine community elderly health services such as posyandu lansia, with cadre support enabling safe supervision and independent home practice by older adults. From a policy perspective, this program supports the inclusion of vestibular-based balance exercises in community-level elderly health promotion and fall prevention programs. Collaboration between physiotherapists, primary health care providers, and local government is essential to ensure sustainability and scalability. Future community service activities are recommended to incorporate standardised balance assessments and long-term monitoring to strengthen evidence and support policy adoption at the local and regional levels.

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DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

AI tools were used solely for grammar and language editing. The authors take full responsibility for the content and integrity of the manuscript.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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