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Effectiveness of Brandt-Daroff Exercises in Improving Postural Balance Among Older Adults With Recurrent Vertigo: A Quasi-Experimental Pretest-Posttest Study

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A B S T R A C T

Introduction: Recurrent vertigo in older adults is frequently associated with impaired postural control, unsteadiness, fear of falling, and reduced independence in daily activities. Brandt-Daroff exercises are a simple home-based vestibular rehabilitation approach that may support balance recovery through repeated positional stimulation and vestibular habituation. However, evidence regarding their use in community-based older adult populations in Indonesia remains limited. **Objective:** This study aimed to examine the effectiveness of Brandt-Daroff exercises in improving postural balance among older adults with recurrent vertigo. **Methods:** A quasi-experimental study with a one-group pretest-posttest design was conducted at the Pangudi Luhur Integrated Center, Bekasi, Indonesia. Thirty-three older adults with recurrent vertigo and impaired balance were recruited using total sampling. Postural balance was assessed before and after the intervention using the Romberg Test observation sheet. Participants were taught Brandt-Daroff exercises and performed the exercises three times daily for two consecutive weeks. Data were analyzed using descriptive statistics and the Wilcoxon signed-rank test. **Results:** Before the intervention, all participants demonstrated impaired postural balance based on the Romberg Test. After two weeks of Brandt-Daroff exercises, 24 participants (72.7%) showed improvement, while 9 participants (27.3%) continued to experience balance impairment. The Wilcoxon signed-rank test indicated a statistically significant improvement in postural balance after the intervention ($Z = -4.889$, $p < 0.001$). **Conclusion:** Brandt-Daroff exercises significantly improved postural balance among older adults with recurrent vertigo. These exercises may serve as a safe, low-cost, and feasible home-based vestibular rehabilitation strategy that can be integrated into community nursing practice. Further studies with control groups, larger samples, validated vertigo-specific outcome measures, and longer follow-up periods are recommended.

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1. INTRODUCTION

Vertigo is a common vestibular complaint that can substantially affect functional capacity, especially among older adults. Although vertigo is not a disease in itself, it reflects an underlying disturbance in the vestibular, visual, proprioceptive, or central nervous system pathways that regulate spatial orientation and balance (Chayati, 2017; Kumar et al., 2019; Luis et al., 2014). Older adults are particularly vulnerable because aging is accompanied by gradual decline in vestibular function, muscle strength, proprioception, visual acuity, and neuromuscular coordination. These physiological changes may increase unsteadiness, reduce mobility, and heighten the risk of falls (Kumar et al., 2019; Rahmayuli, 2023; Scocco & Barreiro, 2022) .

In later life, recurrent vertigo may have broader consequences than dizziness alone. Older adults who experience repeated vertigo episodes often report difficulty walking, reduced confidence in movement, avoidance of daily activities, and dependence on family members or caregivers. Balance impairment is therefore an important functional problem in this population. Although vertigo is usually described as a spinning sensation, its clinical impact is frequently observed through postural instability, gait disturbance, and increased fall risk. For this reason, assessment of balance is relevant when evaluating functional changes among older adults with recurrent vertigo (Elizabeth et al., 2022; Hall et al., 2022; RM Smith et al., 2024; Von Brevern et al., 2015) .

Benign paroxysmal positional vertigo (BPPV) is one of the most frequent vestibular conditions in older adults. It is commonly triggered by changes in head position and may recur after initial recovery. Several non-pharmacological strategies have been used to manage positional vertigo, including canalith repositioning maneuvers, vestibular rehabilitation, balance training, and habituation exercises. Among these approaches, Brandt-Daroff exercises are widely known as a simple and practical home-based intervention. The exercises involve repeated movements from sitting to side-lying positions on both sides, allowing patients to gradually adapt to provocative head and body positions (Hall et al., 2022; Shyam Sudhakar S, 2025; Si et al., 2025; Von Brevern et al., 2015; Xing et al., 2024).

The therapeutic mechanism of Brandt-Daroff exercises differs from canalith repositioning maneuvers such as the Epley maneuver. While repositioning maneuvers are primarily intended to move displaced otoconia out of the semicircular canal, Brandt-Daroff exercises mainly work through vestibular habituation and central adaptation. Repeated exposure to vertigo-provoking positions can reduce abnormal vestibular responses over time, improve tolerance to movement, and support postural control. This mechanism makes Brandt-Daroff exercises suitable for repeated home practice, particularly when older adults require a simple, low-cost, and easy-to-teach intervention.

Previous studies have reported that vestibular rehabilitation and positional exercises may reduce dizziness symptoms and improve balance-related function in patients with vestibular disorders. However, much of the available evidence has been generated from clinical or hospital-based populations, younger adults, or patients with specific BPPV diagnoses confirmed through positional tests. In contrast, evidence from community-based older adult settings, particularly in Indonesia, remains limited. This gap is important because older adults in community settings may

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have different characteristics, including frailty, limited access to specialist care, lower health literacy, and greater need for family or nurse-supported home exercise programs.

Another important gap concerns the outcome measured in studies of Brandt-Daroff exercises. Many studies focus on symptom reduction or vertigo resolution, while fewer examine functional balance outcomes in older adults. In community nursing practice, balance improvement is highly relevant because it is closely related to fall prevention, independence, and quality of life. Therefore, evaluating postural balance after Brandt-Daroff exercises may provide practical evidence for nurses and community health workers who support older adults with recurrent vertigo.

The novelty of this study lies in its focus on community-dwelling older adults in an Indonesian integrated care setting and its practical emphasis on postural balance as a functional outcome. Rather than evaluating vertigo diagnosis or symptom severity alone, this study examines whether a structured two-week Brandt-Daroff exercise program can improve balance performance among older adults with recurrent vertigo. The findings are expected to contribute to geriatric and community nursing practice by providing evidence for a feasible home-based vestibular rehabilitation strategy.

Therefore, this study aimed to examine the effectiveness of Brandt-Daroff exercises in improving postural balance among older adults with recurrent vertigo at the Pangudi Luhur Integrated Center, Bekasi, Indonesia.

2. METHOD

Study Design

This study employed a quantitative approach using a quasi-experimental one-group pretest-posttest design. This design was selected to evaluate changes in postural balance before and after a structured Brandt-Daroff exercise program among older adults with recurrent vertigo. Since the intervention was implemented as a community-based rehabilitation program within an integrated elderly care service, randomization and allocation to a control group were not feasible.

Study Setting

The study was conducted at the Pangudi Luhur Integrated Center, Bekasi, West Java, Indonesia, between June and July 2025. This community-based elderly service center was selected because it routinely provides preventive and rehabilitative health services for older adults and had identified a relatively high number of older adults experiencing recurrent vertigo and balance impairment during routine health screening. Furthermore, the center provides continuous supervision by nurses and health volunteers, making it an appropriate setting for implementing and monitoring a structured home-based vestibular rehabilitation program.

Participants and Sample

The target population consisted of community-dwelling older adults attending the Pangudi Luhur Integrated Center. Participants were recruited using a total sampling technique after routine health screening. Thirty-three older adults fulfilled the eligibility criteria and agreed to participate.

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Inclusion criteria

Participants were eligible if they:

- were aged ≥60 years;
- experienced recurrent vertigo symptoms based on clinical screening;
- demonstrated impaired postural balance during the initial Romberg assessment;
- were able to communicate effectively;
- were physically capable of performing the exercise protocol; and
- provided written informed consent.
- Exclusion criteria

Participants were excluded if they:

- had severe neurological disorders (e.g., stroke, Parkinson's disease);
- had severe musculoskeletal disorders limiting movement;
- had severe visual impairment that prevented balance assessment;
- had cognitive impairment affecting their ability to follow instructions;
- discontinued the intervention before completion.

Instrument

Postural balance was evaluated using the Romberg Test observation sheet. The Romberg Test is a widely used clinical assessment for detecting postural instability associated with vestibular and proprioceptive dysfunction. Although it is not intended as a diagnostic tool for vertigo itself, the test is commonly applied to evaluate functional balance impairment among individuals with vestibular disorders. Previous studies have demonstrated acceptable clinical reliability and validity of the Romberg Test for balance assessment in older adults and patients with vestibular dysfunction (Forbes & Munakomi, 2023; Anagnostou et al., 2025).In the present study, the Romberg Test was used as the primary outcome measure to evaluate changes in postural balance following vestibular rehabilitation rather than to diagnose vertigo severity. (Anagnostou et al., 2025; Fitriyani, 2024; Forbes J, Munakomi S, 2023; Jain PS, Mitra S, 2021; Sartika, Mila., 2025; Setiawati et al., 2016; Sivanandam et al., 2019).

Intervention

Participants received standardized instruction regarding Brandt-Daroff exercises from the principal investigator and trained research assistants.

Each exercise session consisted of five complete cycles performed according to the original Brandt-Daroff protocol.

One cycle included:

1. sitting upright on the edge of the bed;
2. rapidly moving into a side-lying position while turning the head approximately 45° upward;
3. maintaining the position for approximately 30 seconds or until dizziness subsided;
4. returning to the sitting position for approximately 30 seconds;
5. repeating the procedure on the opposite side.

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Participants performed the exercises three times daily (morning, afternoon, and evening) for two consecutive weeks.

To enhance adherence, participants received illustrated instruction sheets, direct supervision during the first training session, and regular monitoring by the research team throughout the intervention period.

Data Collection

Baseline assessment was performed before the intervention. Participant characteristics including age and sex were recorded. The Romberg Test was subsequently conducted to evaluate baseline postural balance. After completing the two-week exercise program, participants underwent a second Romberg assessment using the same standardized procedure.

To minimize measurement bias, both assessments were conducted by trained researchers using identical assessment procedures.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 23. Descriptive statistics were used to summarize participant characteristics. Categorical variables were presented as frequencies and percentages.The normality of p aired observations was assessed before inferent ial analysis.Since the data were not normally distributed, differences between pretest and posttest balance outcomes were analyzed using the Wilcoxon signed-rank test. Statistical significance was established at $p < 0.05$.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee, Faculty of Nursing, Universitas Muhammadiyah Purwokerto (Approval No. KEPK/UMP/111/VI/2025). All participants received verbal and written information regarding the study objectives, procedures, potential risks, and expected benefits. Written informed consent was obtained prior to data collection. Participation was voluntary, and participants were informed that they could withdraw from the study at any time without consequences. Participant confidentiality and anonymity were maintained throughout the research process.

3. RESULTS

Participant Characteristics

Thirty-three community-dwelling older adults completed the study and were included in the final analysis. No participants withdrew during the intervention period, resulting in a 100% completion rate.

Most participants were female (n = 19, 57.6%), while 14 participants (42.4%) were male. Regarding age, the majority were classified as young-old adults (60–74 years) (n = 31, 93.9%), whereas two participants (6.1%) were aged 75 years or older.

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Table 1. Baseline Characteristics of Participants (n = 33)

Variable	n	%
Sex		
Male	14	42.4
Female	19	57.6
Age Group		
Young-old (60–74 years)	31	93.9
Old-old (≥75 years)	2	6.1

Changes in Postural Balance Following Brandt-Daroff Exercises

Before the intervention, all participants (100%) demonstrated impaired postural balance based on the Romberg Test.

Following the two-week Brandt-Daroff exercise program, improvement in postural balance was observed in 24 participants (72.7%), whereas 9 participants (27.3%) continued to demonstrate impaired balance.

Table 2. Distribution of Postural Balance Before and After the Intervention

Balance Status	Pretest n (%)	Posttest n (%)
Impaired balance	33 (100.0)	9 (27.3)
Improved balance	0 (0.0)	24 (72.7)

Effect of Brandt-Daroff Exercises on Postural Balance

The Wilcoxon signed-rank test demonstrated a statistically significant difference between pretest and posttest balance outcomes.

The analysis yielded a test statistic of Z = –4.889 with a significance level of **$p < 0.001$**, indicating that participants experienced significant improvement in postural balance following completion of the two-week Brandt-Daroff exercise program.

Table 3. Wilcoxon Signed-Rank Test Comparing Pretest and Posttest Balance Outcomes

Variable	Z	p value
Postural balance	–4.889	<0.001

The findings indicate that Brandt-Daroff exercises were associated with significant improvements in functional postural balance among older adults with recurrent vertigo.

4. DISCUSSION

The present study demonstrated that a two-week Brandt-Daroff exercise program significantly improved postural balance among community-dwelling older adults with recurrent vertigo. After the intervention, nearly three-quarters of participants exhibited better balance performance, and the Wilcoxon signed-rank test confirmed a statistically significant improvement between pretest and posttest assessments. These findings indicate that regular Brandt-Daroff exercises can enhance balance function by promoting vestibular adaptation and reducing

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dizziness-related instability. Repeated head and body movements during the exercises likely facilitate central vestibular compensation, enabling participants to maintain postural control more effectively during daily activities. Improved balance is particularly important in older adults because it may reduce the risk of falls, enhance mobility, and support greater independence. Overall, the results provide evidence that Brandt-Daroff exercises represent a simple, low-cost, and feasible non-pharmacological intervention for improving balance in older adults with recurrent vestibular symptoms, highlighting their potential role in community-based rehabilitation and fall prevention programs.

The observed improvement is consistent with previous studies reporting beneficial effects of Brandt-Daroff exercises as a component of vestibular rehabilitation. Von Brevern et al. (2015) established internationally accepted diagnostic criteria for benign paroxysmal positional vertigo (BPPV), providing the clinical basis for positional rehabilitation strategies. A randomized controlled trial by Homero et al. (2022) demonstrated that Brandt-Daroff exercises significantly reduced vertigo symptoms and improved functional recovery among patients with BPPV treated in hospital settings. More recently, Goto et al. (2025) reported favorable clinical outcomes following vestibular rehabilitation, while Bagri and Joshi (2025) proposed Brandt-Daroff exercises as a practical, safe, and low-cost home-based intervention. Similar findings have also been reported in Indonesia by Rahmayuli (2023) and Setiawati et al. (2016), indicating that Brandt-Daroff exercises can be successfully incorporated into routine nursing care. Unlike previous studies conducted primarily in specialist clinics or hospitals, the present study demonstrates that the intervention is also feasible within a community-based elderly care setting.

An important finding of this study is the improvement in postural balance rather than merely a reduction in vertigo complaints. This distinction is clinically relevant because recurrent vertigo among older adults frequently manifests as impaired balance, gait instability, and increased fall risk. According to Fernández et al. (2015), dizziness and vertigo become increasingly prevalent with advancing age because of progressive vestibular degeneration and multisensory decline. Likewise, Fancello et al. (2023) concluded in their systematic review that vestibular disorders are among the leading causes of balance impairment in older adults. National survey data from BKKBN (2024) further indicate that falls among Indonesian older adults substantially reduce quality of life and functional independence. Therefore, improving postural stability represents an important clinical outcome in geriatric care because it is directly associated with mobility, confidence, and independence in performing daily activities.

The physiological mechanism underlying Brandt-Daroff exercises differs fundamentally from that of canalith repositioning maneuvers such as the Epley maneuver. Whereas the Epley maneuver primarily aims to reposition displaced otoconia within the semicircular canals, Brandt-Daroff exercises are believed to exert their therapeutic effect through vestibular habituation and central vestibular adaptation. Repeated exposure to head positions that provoke dizziness gradually reduces abnormal vestibular responses, allowing the central nervous system to adapt to conflicting sensory inputs. Over time, this adaptive process improves postural control, movement tolerance, and balance performance. Recent evidence supports vestibular rehabilitation as an effective approach for promoting central compensation in patients with vestibular dysfunction (Smith et al., 2024; Xing et al., 2024). Clinical guidance from the University Hospital Southampton NHS

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Foundation Trust (2024) also recommends Brandt-Daroff exercises as an appropriate home-based rehabilitation strategy for selected patients with positional vertigo.

The intervention duration used in the present study was two consecutive weeks, during which participants performed the exercises three times daily. This duration is comparable to several previous investigations evaluating Brandt-Daroff exercises in patients with vestibular disorders. Teixido et al. (2021) demonstrated meaningful clinical improvement after repeated home exercises, whereas Homero et al. (2022) implemented a structured rehabilitation protocol over several weeks and reported significant symptom reduction. Indonesian studies conducted by Masruroh (2022), Rahmayuli (2023), and Monoarfa et al. (2024) similarly reported improvements following intervention periods ranging from two to five weeks. More recent publications by Goto et al. (2025) and Bagri and Joshi (2025) further support repeated Brandt-Daroff exercises as an effective self-management strategy. Collectively, these findings suggest that consistent exercise performed over at least two weeks may be sufficient to initiate vestibular adaptation and produce measurable improvements in functional balance.

Participant characteristics may also have influenced the observed outcomes. Most participants in this study were women and belonged to the young-old age group (60–74 years). Previous epidemiological studies have shown that vertigo occurs more frequently among women than men, possibly because hormonal factors influence vestibular function (Neuhauser, 2007; Smith et al., 2019; Corazzi et al., 2020). Furthermore, advancing age is associated with deterioration of vestibular hair cells, proprioceptive function, muscle strength, and visual acuity, all of which contribute to impaired postural stability (Dio et al., 2023; Jain & Mitra, 2021; Fitriyani, 2024). Consequently, interventions targeting balance rehabilitation may be particularly beneficial for older adults experiencing recurrent vestibular symptoms.

The present study offers several important contributions to nursing practice. Unlike previous investigations conducted predominantly in hospital environments, this study demonstrates the feasibility of implementing Brandt-Daroff exercises within a community-based elderly care program. Because the exercises are inexpensive, require no specialized equipment, and can be performed independently after appropriate instruction, they may represent an accessible intervention for community nurses, primary healthcare providers, and family caregivers. Integrating Brandt-Daroff exercises into community nursing programs may support fall prevention initiatives, improve functional independence, and promote healthy ageing among older adults with recurrent vestibular disorders.

The novelty of this study lies in its focus on community-dwelling Indonesian older adults and its emphasis on postural balance as a functional outcome of vestibular rehabilitation. Whereas many previous studies have primarily evaluated symptom resolution among patients diagnosed with BPPV in clinical settings, the present study assessed functional balance improvement within an integrated community care service. This perspective broadens the evidence regarding the practical application of Brandt-Daroff exercises beyond specialist vestibular clinics and highlights their potential role in community and geriatric nursing practice.

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Study Limitations

Several limitations should be considered when interpreting the findings of this study. First, the use of a one-group pretest-posttest design without a comparison group limits the ability to attribute the observed improvements solely to the intervention, as potential confounding factors cannot be completely excluded. Second, the relatively small sample size recruited from a single community-based elderly care center may limit the generalizability of the findings to other older adult populations or healthcare settings. Third, postural balance was assessed using the Romberg Test, which evaluates functional balance impairment rather than the severity of vertigo symptoms. Consequently, the present findings should be interpreted as improvements in balance performance associated with recurrent vertigo rather than direct reductions in vertigo severity. Finally, the intervention and follow-up period lasted only two weeks; therefore, the long-term sustainability of the observed improvements remains uncertain. Future randomized controlled trials involving larger and more diverse populations, longer follow-up periods, and validated vertigo-specific outcome measures, such as the Dizziness Handicap Inventory or Vertigo Symptom Scale, are recommended to strengthen the evidence for community-based vestibular rehabilitation.

Implications for Nursing Practice

The findings of this study have important implications for community nursing and geriatric nursing practice. Brandt-Daroff exercises represent a simple, low-cost, and non-pharmacological vestibular rehabilitation strategy that can be taught by nurses and performed independently by older adults at home. Incorporating this exercise into community health programs may help improve postural balance, enhance functional independence, reduce mobility limitations, and potentially decrease the risk of falls among older adults experiencing recurrent vertigo. Community nurses, primary healthcare providers, and family caregivers may also use this intervention as part of routine health education and home-based rehabilitation programs. Given its feasibility and minimal resource requirements, Brandt-Daroff exercises may be particularly valuable in primary healthcare and community settings where access to specialized vestibular rehabilitation services is limited.

5. CONCLUSION

This study demonstrated that participation in a structured two-week Brandt-Daroff exercise program was associated with significant improvement in postural balance among community-dwelling older adults with recurrent vertigo. The findings support the potential role of Brandt-Daroff exercises as a feasible home-based vestibular rehabilitation intervention that may enhance balance performance and functional mobility in older adults. Although further randomized controlled studies with larger samples and longer follow-up are required, the present findings provide preliminary evidence supporting the integration of Brandt-Daroff exercises into community and geriatric nursing programs to promote healthy ageing and improve functional outcomes among older adults with recurrent vestibular disorders.

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8. Author Contributions

MS: Conceptualization, study design, data collection, data analysis, interpretation of findings, manuscript drafting, and final manuscript preparation.
RSP: Data collection, participant recruitment, data management, manuscript review, and editing.
RTT: Methodological support, statistical analysis, interpretation of results, and critical revision of the manuscript.
HPFS: Supervision, scientific review, critical revision of the manuscript, and approval of the final version.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

9. CONFLICT OF INTEREST

The authors declare that they have no competing interests or conflicts of interest related to this study.

10. DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain information that could compromise participant privacy and confidentiality.

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