

Original Research

Functional Balance Following Chair-Based Exercise Among Older Women in a Jakarta Social Care Institution

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ABSTRACT

Introduction: Age-related changes in postural control can affect mobility and independence in institutionalized older adults.

Objective: To describe short-term changes in Berg Balance Scale (BBS) scores after chair-based exercise among older women at Panti Sosial Tresna Werdha Budi Mulia 2, Jakarta.

Method: This single-group pretest–posttest study included 44 older women. Eight chair-based exercise sessions were planned over four weeks. Functional balance was assessed using the BBS, and paired scores were compared using the Wilcoxon signed-rank test.

Result: Mean BBS scores increased from 37.27 ± 2.46 to 39.16 ± 2.93 (difference, 1.89 points). Forty-two participants had higher scores, two had unchanged scores, and none had lower scores ($Z = -5.752$; $p < 0.001$).

Conclusion: BBS scores increased over the observation period. Without a comparison group or fall-incidence outcomes, causality, clinical importance, and fall prevention cannot be established.

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INTRODUCTION

Population ageing has increased demand for interventions that preserve independence and functional mobility in later life (1,3). Falls are a major public-health problem: a systematic review estimated a pooled global fall prevalence of 26.5% among older adults (2), and falls in long-term care can lead to serious injury (4). International guidelines recommend multidomain fall-risk assessment and individually tailored programmes that include balance and strength training (6–8). In Indonesia, demographic ageing heightens the importance of feasible preventive and rehabilitative services in residential care (3). WHO additionally identifies reduced mobility and balance, particularly in institutional settings, as important factors in falls (24).

Functional balance depends on coordinated sensory input, lower-limb muscle performance, anticipatory postural adjustments, and the ability to control the centre of mass during activities (5). Physical decline and comorbidities may make standing exercise difficult for some institutionalized older adults. Nonetheless, exercise interventions can enhance mobility and physical function in residential care, with programme content and supervision influencing the outcomes (9,17,21). Older women are an important population for balance-focused rehabilitation, although biological and environmental factors should not be assumed to explain differences without direct measurement (14). Research on physical activity and skeletal health in older adults provides a separate rationale for maintaining activity, although bone outcomes were not measured here (25).

Chair-Based Exercise (CBE) involves exercises performed while seated or with support from a stable chair. Compared with standing-only activities, this format may increase accessibility for residents with limited mobility. Reviews of nursing-home programmes suggest that chair-based exercise is feasible and can improve selected strength or functional outcomes, especially when the intervention is multicomponent and suitably supervised (12,13,15). However, the 2021 meta-analysis by Klempel et al. found no significant pooled between-group advantage for Berg Balance Scale scores, despite benefits for limb strength, demonstrating that the evidence for balance-specific effects remains mixed (15).

Evidence from residential-care trials also differs from community-based fall-prevention evidence. Structured balance and functional training can reduce falls in community-dwelling older adults (7,16), whereas effectiveness in long-term care depends on continued delivery, adequate exercise dose, and appropriate resident selection (17,19–21). Thus, an improvement in a balance score should not automatically be interpreted as a reduction in observed falls. The specific contribution of the present study is to describe within-participant BBS changes following a brief, supervised chair-assisted exercise programme in older women residing in one Jakarta social care institution; this is context-specific feasibility and functional-outcome evidence rather than proof of an independent treatment effect. Systematic reviews of Otago exercise describe additional balance benefits in frail or nursing-home populations; those exercise protocols are distinct from the programme studied here (10,11,18).

This study aimed to compare BBS functional-balance scores before and after four weeks of Chair-Based Exercise among older women at Panti Sosial Tresna Werdha Budi Mulia 2 Jakarta. The hypothesis was that post-intervention BBS scores would differ from baseline scores. Given the absence of a control group, the findings are interpreted as within-group change and used to inform further controlled research and cautious institutional programme planning.

The study focuses on short-term functional balance, not on measured falls, fractures, or long-term independent mobility. Its clinical interpretation therefore requires consideration of both the absolute score difference and the limitations of the pre-experimental design.

The scientific contribution is limited to a locally observed short-term paired BBS-score pattern among institutionalized older women. This design did not measure implementation feasibility, participant acceptance, recorded falls, or comparative effectiveness; therefore, neither the intervention mechanism nor its ability to prevent falls can be established from these data.

METHOD

This quantitative, single-site pre-experimental study used a one-group pretest–posttest design. BBS scores were measured before and after a four-week Chair-Based Exercise programme. The absence of random allocation and a comparison group limits causal inference because maturation, testing effects, concurrent activities, or other changes cannot be excluded.

The study population comprised older women residing at Panti Sosial Tresna Werdha Budi Mulia 2 Jakarta. Total sampling yielded 44 consenting participants. The reported inclusion criteria were female sex, older-adult status, ability to communicate, and willingness to participate.

The study was conducted at Panti Sosial Tresna Werdha Budi Mulia 2 Jakarta, Indonesia, from 4 March to 5 April 2026. The intervention was delivered twice weekly for four weeks, corresponding to eight planned sessions per participant.

Functional balance was assessed using the Berg Balance Scale (BBS), comprising 14 performance-based tasks scored from 0 to 4, with total scores ranging from 0 to 56; higher totals indicate better performance (5). The same instrument was used before and after the programme.

Participants completed supervised Chair-Based Exercise twice weekly over four weeks. The original report describes movements intended to support muscle strength, mobility, coordination, and postural control while seated or using a chair for support. Post-intervention BBS assessment was conducted after programme completion. No individual exercise doses or fall-event outcomes were reported.

Descriptive analyses summarized participants, BBS scores, and score-direction changes. The Shapiro–Wilk test was reported separately for pretest and posttest scores ($p = 0.016$ and $p = 0.067$, respectively); however, normality of paired difference scores would be the more relevant assumption for a paired t-test. The authors used the Wilcoxon signed-rank test for paired comparisons, with $\alpha = 0.05$. Exact p-values less than 0.001 are reported as $p < 0.001$, not $p = 0.000$. Mean difference was calculated from the reported summary means; no confidence interval or minimal clinically important difference could be verified from the available aggregate data.

For descriptive interpretation, a standardized Wilcoxon effect size may be calculated from the reported Z and 42 non-zero paired changes as $r = |-5.752|/\sqrt{42} = 0.89$. This does not establish causality or clinical importance. A median paired difference, its 95% confidence interval, measurement error, and population-appropriate MCID/MDC cannot be reconstructed from group summaries; individual paired BBS data and analysis output must be verified.

Ethical approval was reported from the Research Ethics Committee of Universitas Yatsi Madani (No. 044/UYM/LPPM-ETIK/III/2026). The source manuscript states that written informed consent was obtained and that confidentiality, voluntary participation, and the right to withdraw were maintained.

RESULTS

a. Participant Characteristics

All 44 participants were older women. Age-group counts were 8 aged 60–64 years (18.2%), 24 aged 65–69 years (54.5%), and 12 aged 70–74 years (27.3%), calculated from $n = 44$.

The age profile alone does not establish which residents can safely undertake the programme. No frailty, medication burden, cognition, sensory function, assistance needs or baseline fall-history distributions were available for analysis; this limits clinical transferability and leaves the women-only sampling rationale unverified.

Table 1. Age Distribution of Participants ($n = 44$)

Age Group	Frequency	Percentage (%)
60-64	8	18.2
65-69	24	54.5
70-74	12	27.3
Total	44	100

b. Functional Balance Before and After Intervention

The manuscript reports that all participants were classified as having “moderate” balance at baseline, while 16 (36.4%) were described as “good” after exercise and 28 (63.6%) as “moderate.” These categories are reproduced from the original source but require verification of the cutoff rules against individual BBS scores; their frequencies should not be treated as validated risk groups until that check is completed.

Table 2. Functional Balance Category Before and After Chair-Based Exercise

Balance Category	Pretest (%)	Posttest (%)
Low	0 (0.0)	0 (0.0)
Moderate	44 (100.0)	28 (63.6)
Good	0 (0.0)	16 (36.4)
Total	44 (100.0)	44 (100)

c. Normality Test

The Shapiro–Wilk tests yielded $p = 0.016$ for pretest scores and $p = 0.067$ for posttest scores. Wilcoxon signed-rank testing was used for the paired comparison; the distribution of paired differences was not available for an assumption check. The distribution of paired differences and the original analysis output should be checked to confirm all reporting details.

The normality of within-participant BBS differences, not either marginal pretest/posttest distribution alone, is relevant when considering a paired t-test. The reported Wilcoxon signed-rank result is retained as originally supplied, but its handling of ties and the full paired-rank output require independent verification.

Table 3. Shapiro-Wilk Normality Test Results

Variable	p-value	Interpretation
Pretest Balance	0.016	Not Normally Distributed
Posttest Balance	0.067	Normally Distributed

d. Effect of Chair-Based Exercise on Functional Balance

Mean BBS score increased from 37.27 ± 2.462 before the programme to 39.16 ± 2.925 afterward (difference between reported means: 1.89 points). The Wilcoxon signed-rank result

was $Z = -5.752$, $p < 0.001$, indicating a statistically significant within-group change. This test does not establish that the programme independently caused the change.

Table 4. Comparison of Functional Balance Scores Before and After Intervention

Variable	Mean $\pm$ SD	Min	Max	Z	p-value
Pretest	37.27 $\pm$ 2.462	31	42	-5.752	<0.001
Posttest	39.16 $\pm$ 2.925	32	44		

Wilcoxon rank-direction counts showed higher posttest scores for 42 participants, unchanged scores for two, and lower scores for none. This pattern is compatible with improved BBS performance during the observation period, although the clinical relevance of the magnitude of change and whether it persisted were not evaluated.

The rank-based estimate $|Z|/\sqrt{42} = 0.89$ is reported only as a within-sample standardized effect-size descriptor (42 pairs had non-zero differences). Median (IQR), Hodges–Lehmann paired shift and a 95% confidence interval cannot be obtained from the aggregate table and should be computed from the original paired dataset if available. No item-level BBS change can be inferred from total scores alone.

DISCUSSION

This study observed a statistically significant increase in BBS scores after four weeks of Chair-Based Exercise among 44 older women in a Jakarta residential care setting. The mean increased by 1.89 points, and 42 participants had higher posttest scores. The magnitude should be interpreted cautiously: statistical significance does not establish that the difference is clinically important, and neither fall incidence nor performance retention was assessed. Without a control group, causal attribution is not possible.

A mean score increase of 1.89 BBS points is statistically detectable in the submitted analysis, but its clinical importance remains unresolved without a comparable institutional-geriatric MCID/MDC and measurement-reliability evidence. Because the same performance instrument was repeated and assessor masking is undocumented, task familiarity and rater expectancy are plausible alternative explanations, rather than confirmed mechanisms.

The finding is biologically plausible because seated and chair-assisted movements may encourage repeated lower-extremity activation, trunk control, joint movement, and motor-task rehearsal. However, muscle strength, proprioception, neuromuscular adaptation, and exercise dose were not directly measured here; they are candidate mechanisms, not demonstrated mediators. The BBS includes functional standing and transfer tasks, so purely seated exercise and programmes incorporating chair-supported standing may produce different outcomes. This distinction makes a detailed exercise protocol essential for replication (12,13,15). Evidence from yoga-based exercise also suggests possible gains in selected physical performance domains, although programme mechanisms and participant populations differ (22).

The hypothesized pathway should be tested prospectively: chair-assisted transfers and upright postural challenges could plausibly relate to BBS transfer, reach and standing items, whereas purely seated mobilization may transfer differently. No intervention component or item-level score data in this submission allow attribution of observed total-score change to particular exercises or physiological adaptations.

Comparison with previous research indicates both convergence and important differences. Reviews of chair-based programmes in institutionalized older adults described possible gains in task-specific physical performance (12,13). Klempel et al. found improvements

in several strength-related outcomes but not significant pooled differences in BBS, Timed Up and Go, or gait speed versus control (15). Thus, the present within-group BBS change cannot resolve that uncertainty. Larger residential-care syntheses suggest that the benefit depends on exercise content, individual tailoring, supervision, and adequate dose (9,17,21), factors that are not yet sufficiently documented in this manuscript.

The clinical meaning of the score change also warrants scrutiny. Assessing balance performance with BBS is reasonable in residential care; reliability and fall-status discrimination have been studied in nursing-home residents (5). Nonetheless, the initial and final BBS scores overlap considerably and the original manuscript does not specify classification cutoffs. It reports that every participant was initially in a moderate group despite a pretest maximum of 42, making verification of category thresholds essential before the categorical changes are emphasized. A statistically significant rise in BBS alone should not be interpreted as proof of fewer falls or injuries.

For geriatric nursing and residential-care management, supervised chair-based exercise could be explored as an accessible adjunct to tailored strengthening, transfer practice, environmental risk management, medication review, and clinical evaluation. International guidelines favor individualized multicomponent programmes including balance and resistance components, rather than stand-alone education or a single low-dose activity (6–8,20). Evidence from care homes suggests that fall-prevention benefits may diminish after an exercise programme stops, supporting ongoing monitored provision if subsequently demonstrated effective (17,21). Before routine implementation, facilities should document eligibility, session length, movement content, attendance, safety and any adverse events.

In a multidisciplinary residential-care pathway, nurses may screen residents for symptoms and fall-risk concerns, document attendance and exercise tolerance, implement agreed safety checks, and refer to physiotherapy/medical staff for individualized exercise prescription when indicated. However, staff time, training, equipment, acceptability, compliance and adverse-event information were not measured; readiness for routine deployment cannot be inferred.

The principal limitations were the one-group design, a single institution, the small sample, lack of a validated categorical threshold description, and absent information about intervention minutes, fidelity and safety events. The brief follow-up provides no evidence on sustained functional gains. Future studies should adopt randomized or controlled designs; preregister a reproducible intervention protocol; consider blinded BBS assessors and clinically interpretable change thresholds; and measure actual falls, adverse events, adherence and long-term outcomes. These steps would test whether short-term BBS change translates into meaningful geriatric benefit. Broad syntheses of community-based fall-prevention exercise reach conclusions across numerous controlled trials; they cannot substitute for a control group in the present study (23).

Additional sources of bias include regression to the mean, testing and practice effects, possible Hawthorne effects, concurrent care/physical activity, unreported assessor blinding, and uncertain adherence/fidelity. The women-only sample and missing clinical characterization further constrain generalizability. A prospective study should incorporate intervention logs, follow-up at 4–12 weeks, BBS item scores, incident falls, adverse events and participant/staff acceptability, preferably with controlled allocation and blinded assessment.

CONCLUSION

Among 44 older women residing in a Jakarta social care institution, BBS scores were higher after a four-week Chair-Based Exercise programme. This provides preliminary, context-specific evidence of short-term improvement in functional balance performance, but not definitive proof of intervention effectiveness or reduced fall incidence. Geriatric nurses and care-home managers may consider carefully supervised chair-assisted activities as part of broader individualized mobility services, subject to standardized protocols and safety monitoring. Randomized controlled studies with longer follow-up, clinically meaningful outcome thresholds, and recorded falls are needed to establish effectiveness and guide implementation.

AUTHOR'S CONTRIBUTION STATEMENT

MC (Melisa Chintya): study conceptualization, data collection, data analysis, and initial manuscript drafting. L (Lindawati): study-design advice, research supervision, critical manuscript review, and approval of the original manuscript, as reported in the submission.

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CONFLICTS OF INTEREST

The authors declare no financial, personal, or institutional relationships known to have influenced the design, conduct, analysis, or reporting of this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

AI-assisted tools were used for language and structural editing. The authors are responsible for verifying all scientific statements, references, statistical outputs, and final wording, and must confirm this declaration accurately reflects the manuscript preparation process.

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