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Effects of a Pedometer-Based Exercise Intervention on Step Counts Among Older Adults

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Abstract
Objectives: This community service program aimed to increase physical activity levels among older adults through a structured exercise intervention monitored using pedometers.
Materials and Methods: The program used a participatory community-based intervention with a descriptive quantitative approach. It consisted of eight weekly moderate-intensity exercise sessions, each lasting 45 minutes. A total of 52 older adults in Sleman, Yogyakarta, wore digital pedometers during the sessions. Step-count values below 1,000 were excluded, and the data were summarized using means, standard deviations, minimums, and maximums.
Results: The participants' valid average step count was 2,995 ± 1,105 steps per session, with values ranging from 1,103 to 6,045 steps.
Conclusions: Moderate-intensity community exercise supported meaningful physical activity among older adults, while pedometers provided an easy-to-use, low-cost, and practical monitoring method for community-based programs.
Keywords: older adults; physical activity; pedometer; exercise; community service

Introduction

Physical activity plays an important role in maintaining health and functional capacity among older adults. Previous studies have shown that regular physical activity can reduce the risk of chronic diseases, improve cognitive function, and preserve independence in activities of daily living (Delas-Kalinski et al., 2025; Piotrowski et al., 2025; Valle-Muñoz et al., 2025). The World Health Organization's global guidelines also recommend that older adults engage in at least 150 minutes of moderate-intensity aerobic physical activity per week to achieve optimal health benefits (Abusleme-Allimant et al., 2023; Cochon Drouet et al., 2023; Qu et al., 2025; Ruiz-Montero et al., 2023). Nevertheless, physical activity levels among older adults in many countries, including Indonesia, remain relatively low due to health-related limitations, lack of motivation, insufficient environmental support, and limited access to structured exercise programmes.

Exercise programmes specifically designed for older adults are widely recommended as community-based interventions to improve physical fitness and quality of life in this population (El-Rajab et al., 2025; Morales-Belando et al., 2022; Wang et al., 2026). Regular exercise has been shown to improve balance, muscular strength, and functional capacity while reducing the risk of falls (Carvalho Souza et al., 2023; Kumar & Vinayakan, 2024; Oliveira et al., 2025). In addition to being easy to follow and involving a relatively low risk of injury, group exercise also provides psychosocial benefits by promoting social interaction and emotional well-being (Bores-García et al., 2021; Brazier et al., 2025; Mödinger et al., 2022). Therefore, community-based exercise programmes are frequently implemented as a strategy to empower communities and support healthy ageing.

In the context of physical activity monitoring, pedometers have become a practical and reliable method for measuring step counts as an indicator of daily bodily movement. Pedometers have demonstrated adequate validity for monitoring changes in step counts resulting from physical activity interventions and are commonly used in studies involving older populations because they are lightweight, affordable, and easy to use (De La Rubia et al., 2025; Mahmood et al., 2025; Penggalih et al., 2025). Step-based monitoring also enables participants to understand their physical activity targets more easily than complex intensity-based measurements.

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Accordingly, pedometers represent an appropriate evaluation tool for community service programmes involving large numbers of participants.

This community service programme aimed to increase physical activity among older adults through a structured exercise intervention and to monitor participants' physical responses using pedometers. By analysing the average number of steps recorded during eight exercise sessions, this programme was expected to provide empirical evidence regarding the effectiveness of structured exercise in increasing physical activity among older adults. Furthermore, the findings may serve as a measurable and replicable model for implementing community-based exercise programmes in other community service settings and geographical areas.

Materials and Methods

Study Design

This community service programme employed a participatory community-based intervention design with a descriptive quantitative approach. The intervention consisted of a structured exercise programme for older adults aimed at increasing participants' physical activity levels. Programme effectiveness was evaluated by monitoring the number of steps recorded during each exercise session using pedometers.

Study Participants

The participants were 52 older adults residing in Sleman, Yogyakarta, Indonesia. The inclusion criteria were: (1) being 55 years of age or older; (2) being physically able to participate in moderate-intensity exercise; (3) being willing to attend at least part of the intervention programme; and (4) being able to use a pedometer. Participants with incomplete data were retained in the analysis provided that they had at least one session with a valid step-count measurement.

Study Organization

Intervention Procedures. The exercise intervention was conducted over eight weeks, with one 45-minute session held each week. Each session was led by a certified instructor and performed at a moderate intensity in accordance with exercise recommendations for older adults. During each session, participants wore a pedometer attached to the waist or placed in a pocket to record the total number of steps completed.

Instruments. The primary instrument was a digital pedometer used to record step counts during the exercise sessions. Pedometers were selected because of their reliability, ease of use among older adults, and ability to provide an objective estimate of physical activity through step-count measurement. In addition, attendance sheets and participant monitoring forms were used to record attendance and participants' physical condition during each session.

Data Collection. Step-count data were collected during each of the eight exercise sessions. Step-count values below 1,000 steps were considered invalid because they were likely to reflect incorrect pedometer placement, device malfunction, or recording errors. These values were therefore treated as missing data. Only step-count values of 1,000 steps or more were included in the analysis.

Statistical Analysis

The data were analysed descriptively using the mean, standard deviation, minimum value, maximum value, and number of valid sessions. Each participant's mean step count was calculated using the mean of available sessions, meaning that only sessions with valid step-count data were included in the calculation. The overall mean was then calculated from the individual mean step counts of all participants. Data processing and analysis were conducted using spreadsheet software and Python to ensure accuracy and consistency.

Results

After step-count data were screened and values below 1,000 steps were excluded, descriptive analysis was conducted on the valid measurements. A total of 52 older adults

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participated in the programme, with a mean age of 64.27 ± 5.89 years. The mean valid step count per participant was 2,995 steps per session, with a standard deviation of 1,105 steps. The lowest valid step count recorded was 1,103 steps, whereas the highest was 6,045 steps. These findings indicate that the structured exercise sessions generated approximately 3,000 steps per participant per session. However, step counts alone do not directly represent exercise intensity because intensity also depends on factors such as cadence, exercise duration, and individual functional capacity.

Table 1. Participant Characteristics and Step-Count Statistics

Indicator	Value
Number of participants	52
Number of women	*To be verified*
Number of men	*To be verified*
Age, mean ± SD (years)	64.27 ± 5.89
Steps per participant per session, mean	2,995
Standard deviation of step counts	1,105
Minimum step count	1,103
Maximum step count	6,045

As presented in Table 1, participants accumulated an average of nearly 3,000 steps during each exercise session. The standard deviation of 1,105 steps indicates considerable variability in step accumulation among participants. This variation may reflect differences in physical capacity, movement speed, participation level, and the ability to follow the exercise movements.

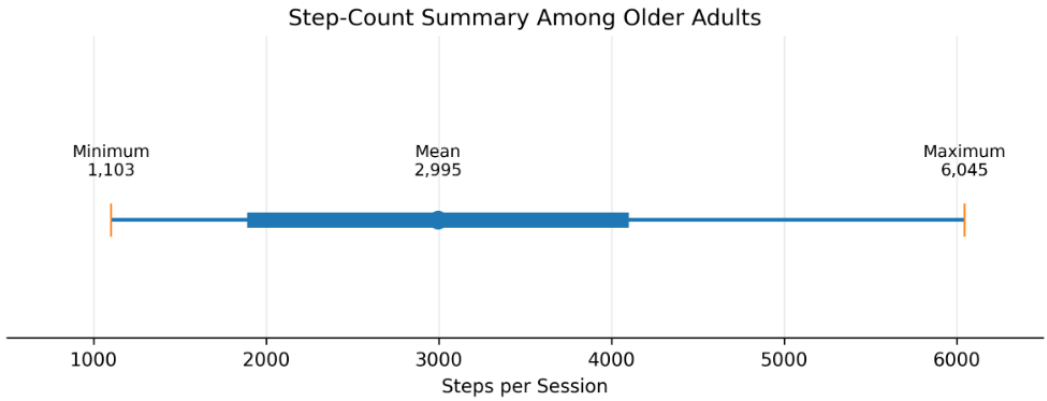

Figure 1. Distribution of Step Counts Among Older Adults

Figure 1 shows that most step-count values were concentrated between approximately 2,000 and 4,000 steps per session. Relatively few observations were located at the lower and upper ends of the distribution. This pattern indicates that most participants accumulated a moderate number of steps during the structured exercise sessions, although substantial individual variation remained.

Discussion

The findings showed that participants accumulated approximately 3,000 steps during each structured exercise session. This result indicates that the programme provided older adults with a meaningful opportunity to engage in ambulatory movement within a supervised community setting. Nevertheless, step count alone cannot be used to determine exercise intensity because intensity is also influenced by cadence, session duration, movement type, and individual functional capacity. The observed step accumulation is broadly consistent with recommendations that encourage older adults to participate regularly in aerobic and movement-based activities to maintain physical function and metabolic health (Guo, 2025; Jianjun et al., 2025; Lopez, 2024) (Nelson et al., 2007).

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Group-based exercise may be particularly beneficial for older adults because it combines physical activity with social interaction, instructor support, and a structured schedule (Brazo-Sayavera et al., 2021; El-Rajab et al., 2025; Madu et al., 2025; ZelenoviĆ et al., 2021). Previous evidence has suggested that group exercise can strengthen motivation, discipline, and adherence by creating an enjoyable and socially supportive environment (Alnaqeeb, 2025; Kuswoyo et al., 2017; Mariana Lolowang et al., 2025). In the present programme, the community-based format may have encouraged participants to remain actively involved during the sessions. Therefore, the findings support the practical value of structured community exercise as an accessible strategy for increasing opportunities for movement among older adults.

The step counts recorded during the sessions are also consistent with evidence indicating that rhythmic exercise can support aerobic capacity, movement efficiency, and physical functioning in older populations (Barzouka et al., 2020; Riyadi et al., 2025; Van Der Niet et al., 2014; Wang et al., 2026). Regular moderate-intensity physical activity has been associated with improved cardiovascular function, reduced fall risk, and maintenance of the functional abilities required for daily living (Hanssen et al., 2023; Kumanyika et al., 2008; Rosselli et al., 2020). Although the present programme did not directly measure cardiovascular fitness, muscular strength, balance, or functional performance, repeated participation in structured movement activities may contribute to maintaining lower-extremity function and physical endurance. Further assessments would be required to determine whether these physiological and functional adaptations occurred among the participants.

The use of pedometers was an important practical feature of the programme because these devices provided an objective and easily interpretable measure of movement during each session. Pedometers have been recognised as valid and reliable tools for monitoring step-based physical activity, including among older adults (Delas-Kalinski et al., 2025; Piotrowski et al., 2025). Their affordability, portability, and ease of use make them particularly suitable for large-scale community programmes. Pedometer-based monitoring may also promote self-monitoring by enabling participants to observe their own activity levels, which may enhance motivation and continued participation in physical activity (Hamzah et al., 2025; Rumpoko et al., 2025; Sharma, 2025).

In this programme, values below 1,000 steps were excluded because they were considered likely to reflect incorrect device placement, recording errors, or incomplete participation. Although this procedure helped reduce the influence of potentially inaccurate observations, the selected threshold should be interpreted cautiously because very low values may also represent genuine activity among participants with restricted mobility. Future programmes should combine step-count screening with session attendance records, device checks, wearing-time information, and observations of participant involvement to distinguish technical errors from genuinely low physical activity.

Several limitations should be considered when interpreting the findings. First, variation in participant attendance resulted in an unequal number of valid sessions, with an average of only 2.2 valid sessions per participant across the eight-week programme. Absence, health-related conditions, incomplete session participation, and unfamiliarity with pedometer use may have contributed to the amount of missing data. Consequently, the calculated participant means may not fully represent activity throughout the entire intervention. Second, the absence of baseline measurements and a comparison group prevents conclusions regarding increases in step counts or causal intervention effects. The results describe the amount of movement accumulated during the exercise sessions rather than changes attributable exclusively to the programme.

Despite these limitations, the programme demonstrated that community-based exercise monitored using pedometers is a feasible, relatively inexpensive, and easily implemented approach to encouraging physical activity among older adults. Future implementation should include more intensive instruction on pedometer placement, routine device checks, strategies to improve attendance, and systematic monitoring across all sessions. The inclusion of baseline and post-intervention measurements, a comparison group, and additional outcomes such as balance,

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lower-limb strength, functional capacity, quality of life, and exercise adherence would provide stronger evidence regarding the effectiveness and broader benefits of the programme.

Conclusions

The structured exercise programme monitored using pedometers enabled older adults to accumulate an average of approximately 3,000 steps per session. Pedometer-based monitoring provided an objective, simple, and affordable approach to evaluating participants' movement during the programme. These findings demonstrate the practical feasibility of community-based exercise as a strategy for promoting physical activity and supporting healthy ageing.

However, because the programme did not include baseline measurements or a comparison group, the findings should not be interpreted as definitive evidence of increased physical activity or causal intervention effectiveness. Rather, the results indicate that structured community exercise can provide meaningful opportunities for older adults to remain physically active. With improved attendance monitoring, more complete step-count data, and additional functional assessments, this intervention model has the potential to be adapted and replicated in other community-based physical activity programmes.

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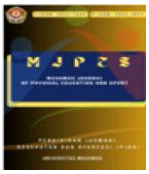

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