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Effect of Chair-Based Active and Passive Exercise on Activities of Daily Living Independence Among Older Adults: A One-Group Pretes-Posttest Study

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Abstrac: Ageing is accompanied by declines in muscle strength, balance, and joint flexibility that may reduce independence in activities of daily living (ADL). This one-group pretest-posttest study evaluated a four-week chair-based active and passive exercise programme among 15 older adults selected purposively at the Sabai Nan Aluih Sicincin Social Nursing Home. The intervention was delivered three times weekly for 12 sessions, and ADL independence was assessed with the Katz Index. The mean score increased from 3.13 (95% CI 2.78-3.48) to 4.00 (95% CI 3.58-4.42). The Wilcoxon signed-rank test showed a significant pre-post difference ($Z = -3.36$, $p < .001$) with a large effect size ($r = .867$). The programme was associated with improved functional independence and may be incorporated into supervised activity routines in residential care, while controlled studies are needed to confirm causality.

Keyword: Active Exercise, Chair-Based, Daily Living, Older Adults, Passive Exercise

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INTRODUCTION

Increased life expectancy is one indicator of successful health development; however, it also creates challenges due to the growing number of older adults and the need for services capable of maintaining their physical function and independence. Indonesia has entered an ageing population structure, as people aged 60 years and over now account for more than 10% of the total population. This condition indicates that efforts to preserve older adults' functional capacity should be positioned as an important component of health, physical activity, and social welfare services (Badan Pusat Statistik, 2024). Physical activity guidelines for older adults likewise emphasise the importance of exercises that combine muscle strength, balance, flexibility, and mobility to slow the age-related decline in functional capacity (Izquierdo et al., 2021; World Health Organisation, 2020).

The ageing process is characterised by gradual physiological changes, particularly in the musculoskeletal system. These changes include reduced muscle mass and strength, decreased joint flexibility, impaired balance, and restricted mobility. If not addressed appropriately, these conditions may increase the risk of falls and reduce older adults' ability to perform daily activities independently (Alimurdianis et al., 2024; Martono & Pranarka, 2019). Declining physical capacity affects not only health but may also increase dependence on family members, caregivers, and health professionals. Therefore, the ability to maintain daily functioning is an important indicator of quality of life and health status in older adults.

Older adults' functional independence is generally assessed through activities of daily living (ADL), referring to the ability to perform basic activities required in everyday life. These activities include bathing, dressing, toileting, transferring, bladder and bowel control, and eating. Impairment in one or more ADL components indicates a need for assistance from others and may be an early sign of more severe functional decline (Purba et al., 2022; Sunarti et al., 2019). A study by Rohaedi et al. (2016) showed that levels of independence among older adults living in social care facilities vary from independent to dependent. This variation is influenced by physical condition, comorbidities, cognitive ability, environmental support, and opportunities to perform activities independently (Ratmanasari et al., 2020).

One strategy for maintaining older adults' functional capacity is to provide regular, structured physical exercise that is tailored to individual conditions. Active exercise consists of movements performed using the older adult's own muscular strength, whereas passive exercise is performed with assistance from a health professional, caregiver, or instructor when the individual is unable to complete the movement independently. Active exercise helps maintain muscle strength, motor coordination, and joint mobility, while passive exercise helps preserve soft-tissue flexibility and range of motion (ROM) and prevents stiffness and contractures (Kisner & Colby, 2017). Combining these two types of exercise allows the programme to be adjusted to each participant's capacity, prioritising active participation without compromising safety (Anggraeni et al., 2023).

However, not all older adults can exercise in a standing position for prolonged periods. Lower-extremity muscle weakness, balance impairment, joint pain, and fear of falling often hinder conventional exercise. Chair-based exercise is a suitable alternative because it provides stability, reduces balance demands, and can be modified according to participants' physical capacity. It enables older adults to move the head, shoulders, arms, trunk, hips, knees, and ankles in a relatively safe and comfortable position. A systematic review by Klempel et al. (2021) indicated that chair-based exercise may improve several components of physical function in older adults, including strength, mobility, balance, and functional movement.

Several studies have demonstrated benefits of chair-based exercise for older adults living in care facilities. Kim and Park (2020) found that chair-based resistance-band exercise improved physical functioning among residents of long-term care facilities, while Furtado et al. (2021) reported improvements in functional fitness and psychological well-being among pre-frail older women. Evidence syntheses likewise indicate potential improvements in strength, mobility, and balance, but also emphasise heterogeneity in programme content and outcome selection (Anthony et al., 2013; Klempel et al., 2021). Carral et al. (2017) further showed that the response

of adults older than 80 years differed according to whether the seated programme prioritised aerobic, resistance, or joint-mobility exercise.

Despite this evidence, most previous studies have measured performance-based outcomes such as balance, muscle strength, flexibility, gait, or isolated mobility tasks. These measures describe physical capacity, but they do not directly establish whether an older adult can complete bathing, dressing, toileting, transferring, continence management, and feeding with less assistance. Translation from an improved physical component to ADL independence is not automatic because daily activities require the integration of strength, joint mobility, postural control, task sequencing, endurance, confidence, and interaction with the care environment. In addition, earlier reviews identified small samples, varied protocols, and inconsistent functional outcomes, limiting conclusions about independence in everyday activities (Anthony et al., 2013). Direct assessment of ADL is therefore necessary to determine whether a feasible chair-based programme produces functionally meaningful change rather than improvement only on impairment-level tests.

The Sabai Nan Aluih Sicincin Social Nursing Home is a social care facility accommodating older adults with varying levels of physical ability and independence. Preliminary observations indicated that several residents in the care unit continued to experience difficulty performing basic activities, such as bathing, dressing, maintaining personal hygiene, and transferring, and therefore required assistance from caregivers or staff. Physical activities, including routine group exercise and walking, had been implemented; however, these programmes were not specifically designed to train functional movements that support ADL components. This condition highlights the need for a simple, safe, structured exercise programme suitable for older adults with mobility limitations.

The novelty of this study lies in implementing a four-week combination of chair-based active and passive exercises and directly assessing six components of basic independence using the Katz Index. Active movement was prioritised according to each participant's ability, while passive assistance was provided when the participant could not achieve a full and comfortable range of motion. This approach was expected to maintain joint mobility, stimulate muscular activity, and support the ability to perform basic activities. Therefore, this study aimed to analyse the effect of active and passive exercises on older adults' independence in performing ADL at the Sabai Nan Aluih Sicincin Social Nursing Home. The research hypothesis stated that ADL independence would be higher after participation in the active and passive exercise programme than before participation.

METHOD

Research Design

This study employed a quantitative pre-experimental approach using a one-group pretest-posttest design without a control group. The design was selected as a preliminary within-facility evaluation because only a small number of residents met the safety and functional eligibility criteria, and random allocation to a non-exercise group was not operationally feasible within the routine care programme. Each participant therefore served as his or her own reference through measurements before and after the intervention. This design can identify within-participant change but cannot exclude maturation, routine care, repeated testing, or other concurrent influences; consequently, causal interpretation was made cautiously.

$$O_1 \text{———} X \text{———} O_2$$

Description:
O_1 = Measurement of ADL independence before the intervention
X = Chair-based active and passive exercise intervention
O_2 = Measurement of ADL independence after the intervention.

This design was used to analyse changes in older adults' independence scores before and after participation in the active and passive exercise programme (Sugiyono, 2023). The

independent variable was chair-based active and passive exercise. Active exercise referred to movements performed by participants using their own ability and muscular strength. Passive exercise referred to movements assisted by the researcher when participants were unable to achieve the range of motion independently. The dependent variable was older adults' independence in performing activities of daily living (ADL). ADL independence was defined as the ability to perform basic daily activities without assistance or with only minimal assistance from another person. The assessed activities were bathing, dressing, toileting, transferring, bladder and bowel control, and eating.

The study was conducted at the Sabai Nan Aluih Sicincin Social Nursing Home, Padang Pariaman Regency, West Sumatra, from May to June 2026. The research activities included preparation, participant selection, baseline measurement, implementation of the four-week intervention, and final measurement.

Participant

The study population comprised all 110 older adults residing at the Sabai Nan Aluih Sicincin Social Nursing Home. Participants were selected purposively using predetermined clinical and functional criteria. Fifteen residents met all criteria during the study period, agreed to participate, and were enrolled. The sample size was therefore determined by the total number of eligible and consenting residents rather than by a formal power calculation. This census of eligible residents was appropriate for the preliminary, single-facility objective, although it limits statistical precision and generalisability.

The inclusion criteria were: (1) registered as a resident of the Sabai Nan Aluih Sicincin Social Nursing Home during the study period; (2) aged 60–74 years; (3) having mild to moderate dependence while remaining able to follow exercise instructions; (4) being conscious and able to communicate effectively; (5) having no severe hearing impairment; (6) having no medical contraindication to exercise; and (7) agreeing to complete the study procedures by signing an informed consent form. The exclusion criteria were: (1) an active fracture or a history of joint surgery within the previous three months; (2) severe cardiovascular disease, such as New York Heart Association class III–IV congestive heart failure; (3) severe cognitive impairment or advanced dementia; (4) intensive medical treatment or complete bed rest due to acute illness; (5) an open wound or infection in the body area to be exercised; and (6) absence from more than three exercise sessions during the intervention period.

Research permission was obtained from the Faculty of Sports Science, Universitas Negeri Padang, the West Sumatra Provincial Social Service, and the management of the Sabai Nan Aluih Sicincin Social Nursing Home. Before enrolment, prospective participants received an explanation of the study objectives, data-collection procedures, exercise programme, potential benefits and discomfort, confidentiality safeguards, and the right to decline or withdraw without affecting the services they received. All 15 participants voluntarily signed informed consent authorising participation and collection of their study data. Participant identities were replaced with codes, and the data were used solely for scientific purposes.

Instruments

Older adults' independence was measured using the Katz Index, or Katz Index of Independence in Activities of Daily Living. The instrument assesses six basic activities: bathing, dressing, toileting, transferring, continence, and feeding. Each activity performed independently was scored 1, whereas an activity requiring assistance was scored 0. The total score ranged from 0 to 6.

In this study, Katz Index scores were interpreted as follows: a score of 6 indicated independence; scores of 4–5 indicated mild dependence; scores of 2–3 indicated moderate dependence; and scores of 0–1 indicated severe dependence. The Katz Index is a standard instrument widely used to assess functional independence in older adults (Purba et al., 2022; Sunarti et al., 2019). The Katz Index was not retested for construct validity because it is a standardised instrument. However, a readability assessment, or face validity test, was conducted to ensure that each item was understandable to participants and appropriate for the conditions

of older adults at the study site. The assessment indicated that all items were suitable for data collection. The instrument had a reliability coefficient of α = 0.94, indicating excellent reliability.

In addition to the ADL assessment instrument, the study used an operational guide for chair-based active and passive exercises. The intervention guide was reviewed by a physiotherapy expert with consideration of movement sequence, exercise safety, frequency, duration, number of repetitions, and suitability for the characteristics of older adults. The expert concluded that the exercise procedure was appropriate for use as the study intervention.

Research Procedures and Data Collection

The study was implemented in four stages: preparation, baseline measurement, intervention delivery, and final measurement. After the institutional permissions and participant-consent procedures described in the Population and Sample section had been completed, a preliminary observation was conducted to confirm prospective participants' physical condition, communication ability, and level of independence.

The exercise schedule was then arranged to accommodate the residents' routine activities at the facility and to provide consistent spacing between the three weekly sessions. The baseline measurement, or pretest, was conducted before the intervention. Independence was assessed using the Katz Index through direct observation and structured interviews. The researcher evaluated participants' ability to perform six basic activities: bathing, dressing, toileting, transferring, continence, and eating.

Each activity performed independently was scored 1, whereas an activity requiring assistance was scored 0. The scores were summed to obtain each participant's baseline independence score. The chair-based active and passive exercise intervention was delivered three times per week for four weeks, totalling 12 sessions. Each session lasted 15–20 minutes. Each movement was performed in two sets of eight repetitions, or adjusted according to the participant's ability. The standardised exercise protocol is summarised in Table 1.

Table 1. Chair-based Active and Passive Exercise Protocol

No.	Movement	Primary area	Execution
1	Cervical rotation	Head and neck	Turn the head slowly to each side within a comfortable range.
2	Shoulder circles	Shoulders	Perform controlled circular shoulder movements.
3	Wrist rotation	Wrists and forearms	Rotate both wrists slowly in each direction.
4	Chest opening	Scapular and shoulder complex	Retract the scapulae with horizontal shoulder abduction.
5	Thoracolumbar rotation	Trunk	Rotate the trunk to each side while maintaining seated stability.
6	Trunk flexion	Trunk and hips	Bend forward gradually without forcing the range.
7	Lumbar lateral flexion	Lateral trunk	Bend the trunk to each side in a controlled manner.
8	Hip and knee flexion	Hip and knee	Bring the knee toward the chest as tolerated.
9	Hip rotation	Hip joint	Rotate the hip within a pain-free range.
10	Ankle dorsiflexion and plantar flexion	Ankle	Move the foot upward and downward rhythmically.

During active exercise, participants performed the movements independently according to their ability and within a comfortable range of motion. During passive exercise, the researcher slowly assisted the movement of the relevant body part to the limit of the participant's pain-free range of motion. Passive assistance was provided according to each participant's physical condition and ability. Each session began with an assessment of the participant's general condition. Participants were instructed to sit on a sturdy chair, place both feet on the floor,

maintain a stable body position, and wear clothing that did not restrict movement. The researcher demonstrated each movement and ensured that participants understood the instructions before exercise began.

During exercise, the researcher observed facial expressions, breathing patterns, ability to follow instructions, sitting balance, and any complaints reported by participants. Exercise was stopped immediately if a participant experienced severe pain, dizziness, shortness of breath, sudden weakness, loss of balance, or any other complaint that could compromise safety. Intervention fidelity was supported by using the same written movement sequence, chair setup, session frequency, duration target, repetition target, safety criteria, and lead researcher throughout the programme. The researcher demonstrated each movement consistently, recorded attendance and session completion, documented any modification required by participant ability, and ensured that passive assistance remained within a pain-free range. All participants completed the 12 planned sessions, indicating full adherence to the scheduled intervention dose.

The final measurement, or posttest, was conducted after participants had completed all 12 exercise sessions. The same instrument and procedures used at baseline were applied. Post-intervention ADL scores were then compared with pre-intervention scores to determine changes in independence. Primary data were obtained from Katz Index measurements before and after the intervention. Participant characteristics included age and sex. Data were collected through direct observation, structured interviews, and documentation of measurements on the study record form. Collected data were processed through completeness checking (editing), coding, entry into statistical software (data entry), and organisation into tables (tabulation). Participant identities were replaced with codes to maintain confidentiality.

Data Analysis

Data were analysed using SPSS. Univariate analysis was used to describe participant characteristics and the distribution of ADL independence scores. Categorical data were presented as frequencies and percentages, while numerical data were presented as means, standard deviations, minimum values, and maximum values. Data normality was assessed using the Shapiro–Wilk test because the sample comprised fewer than 50 participants. The results indicated that the data did not meet the assumption of normality. Therefore, differences in ADL independence scores before and after the intervention were analysed using the Wilcoxon signed-rank test. This test was selected because the data consisted of two paired measurements from the same participants. The research hypothesis was accepted when the significance value was $p < 0.05$. Effect sizes were interpreted as $r = 0.10$ for a small effect, $r = 0.30$ for a medium effect, and $r \geq 0.50$ for a large effect. The magnitude of the intervention effect was calculated using the following effect-size formula (1):

$$r = \frac{Z}{\sqrt{N}} \quad (1)$$

Where:
r = Effect-size value;
Z = Test statistic from the Wilcoxon signed-rank test;
N = Number of paired observations.

RESULT

This study involved 15 older adults at the Sabai Nan Aluih Sicincin Social Nursing Home. All participants completed the baseline assessment (pretest), the four-week active and passive exercise intervention, and the final assessment (posttest). The results are presented in terms of participant characteristics, descriptive univariate analysis, and bivariate analysis.

Participant Characteristics

Participant characteristics included sex and age group. The distribution by sex is presented in Table 2.

Table 2. Frequency Distribution of Participants by Gender

Gender	Frequency (n)	Percentage (%)
Male	9	60.0
Female	6	40.0
Total	15	100.0

Source: Primary data, 2026.

As shown in Table 2, 9 of the 15 participants (60.0%) were male and 6 (40.0%) were female. Thus, male participants constituted the majority.

Table 3. Frequency Distribution of Participants by Age Group

Age group	Frequency (n)	Percentage (%)
60–74 years	15	100.0
Total	15	100.0

Source: Primary data based on WHO age categories, 2026.

All 15 participants (100.0%) were aged 60–74 years. Based on the age classification used in this study, all participants were categorised as young-old adults. Thus, the age characteristics of the sample were relatively homogeneous.

Descriptive Univariate Analysis

Univariate analysis was conducted to describe older adults' independence scores in performing activities of daily living (ADL) before and after the active and passive exercise intervention. The descriptive statistical results are presented in Table 4.

Table 4. Descriptive statistics of ADL independence before and after the intervention

Assessment	n	Mean	SD	95% CI for mean	Range	Mean change
Pre-intervention	15	3.13	0.640	2.78-3.48	2-4	-
Post-intervention	15	4.00	0.756	3.58-4.42	3-5	0.87

Note. Confidence intervals are descriptive 95% t-based intervals for the mean. Source: Primary data, 2026.

Before the intervention, the mean ADL independence score was 3.13 (SD = 0.640; 95% CI 2.78-3.48), with scores ranging from 2 to 4. This level corresponded to moderate dependence on the Katz Index classification. After the intervention, the mean score increased to 4.00 (SD = 0.756; 95% CI 3.58-4.42), with scores ranging from 3 to 5. This level corresponded to mild dependence. The increase in the mean score from 3.13 to 4.00 represented an improvement of 0.87 points. The minimum score also increased from 2 to 3, while the maximum score increased from 4 to 5. Descriptively, these results indicate improved ADL performance after participation in the active and passive exercise programme.

Bivariate Analysis

Bivariate analysis examined differences in ADL independence scores before and after the intervention. Because the data were not normally distributed, the Wilcoxon signed-rank test was used (Table 5).

Table 5. Wilcoxon Signed-Rank Test of Pre-Post ADL Independence Scores (N = 15)

Comparison	n	Rank distribution	Z	p	Effect size (r)
Pre- vs post-intervention	15	12 positive; 0 negative; 3 ties	-3.36	< .001	.867 (large)

Note. Two-tailed Wilcoxon signed-rank test; $r = |Z|/\sqrt{N}$. Source: Processed primary data, 2026.

Table 5 shows that 12 participants had higher post-intervention scores, three had unchanged scores, and none had a lower score. This rank distribution indicates that improvement occurred in most participants rather than being driven by a small subset. The Wilcoxon signed-

rank test showed a statistically significant difference between pre- and post-intervention ADL scores (Z = -3.36, p < .001). The null hypothesis was therefore rejected.

The effect size was large (r = .867), indicating that the observed within-participant change was substantial in magnitude. This estimate should nevertheless be interpreted cautiously because of the small sample and absence of a control group.

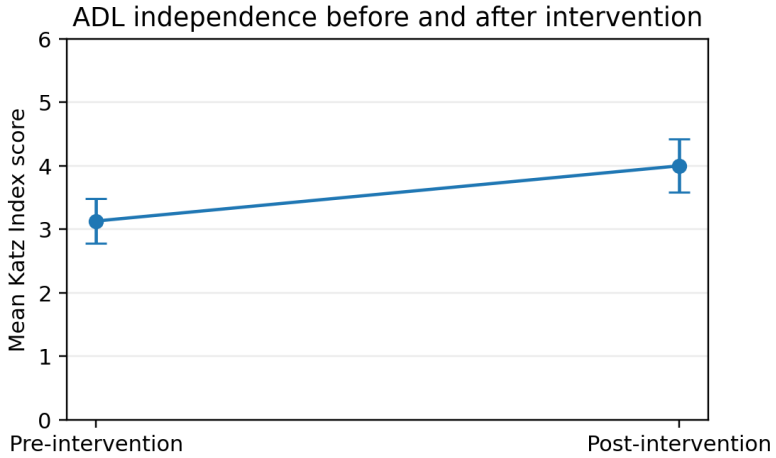

Figure 1. Mean Katz Index scores before and after the Intervention

DISCUSSION

The findings showed that a four-week chair-based active and passive exercise programme was associated with improved independence in performing activities of daily living (ADL). The mean ADL score increased from 3.13 ± 0.640 before the intervention to 4.00 ± 0.756 after the intervention, an improvement of 0.87 points. According to the Katz Index classification, the mean pre-intervention score represented moderate dependence, whereas the post-intervention score represented mild dependence. These results indicate a shift towards better functional independence after 12 active and passive exercise sessions.

Before the intervention, most participants experienced limitations in performing basic daily activities. These limitations may be associated with the ageing process, which causes physiological decline, particularly in the musculoskeletal system. Advancing age is associated with reduced muscle mass and strength, decreased tissue elasticity, restricted joint range of motion, and impaired balance. These changes may affect older adults' ability to bathe, dress, transfer, use the toilet, and eat independently. Physical limitations in the elderly are a major factor that increases dependence on caregivers for daily needs, while the increase in ADL scores after intervention indicates that active and passive exercises can provide stimulation that supports the maintenance of motor function in the elderly (Martono & Pranarka, 2019; Rohaedi et al., 2016; Sunarti et al., 2019)

Active exercise involves independent muscle contractions and may help maintain muscle strength, coordination, motor control, and joint mobility. In contrast, passive exercise is provided with assistance when participants cannot complete a movement fully. Passive exercise helps maintain soft-tissue flexibility, reduce joint stiffness, and preserve range of motion within a comfortable limit (Kisner & Colby, 2017). Combining both exercise types enables participants to remain actively engaged according to their abilities while receiving assistance for movements they cannot complete independently. Anggraeni et al. (2023) stated that active and passive exercises may be used as an approach to maintain and improve muscle strength in older adults. Age-related loss of muscle mass may make it difficult for older adults to stand, walk, change position, or maintain posture. When muscle strength and joint mobility are preserved, older adults are more likely to perform daily activities with less assistance. Therefore, the improvement in ADL scores observed in this study may theoretically be explained by enhanced movement capacity required for basic activities.

The intervention used chair-based exercise. This model offers the advantage of being performed in a seated position, thereby placing lower demands on balance than standing exercise. The chair provides stability for older adults with lower-extremity weakness, impaired balance, or fear of falling. It therefore allows exercises involving the head, shoulders, wrists, trunk, hips, knees, and ankles to be performed more safely and comfortably. Upper-extremity movements, such as shoulder circles, wrist rotation, chest opening, and trunk rotation, functionally support activities that require reaching, grasping, lifting, and moving the arms. These abilities are needed for dressing, bathing, combing the hair, holding eating utensils, and managing clothing during toileting. Lower-extremity exercises, including knee-to-chest movements, hip rotation, and ankle dorsiflexion and plantar flexion, support hip, knee, and ankle mobility required to rise from a chair, walk, transfer, and maintain stable foot placement. Although this study did not analyse changes in each ADL component separately, the increase in the total Katz Index score indicates an overall improvement in functional ability. However, the result should be interpreted as a change in overall independence and cannot establish that all ADL components improved equally. Future studies should analyse each component bathing, dressing, toileting, transferring, continence, and eating to identify which activities respond most strongly to the intervention.

The findings are consistent with those of Ayuningtias (2022), who reported that 12 chair-based exercise sessions over four weeks significantly improved balance in older adults ($p = 0.001$). Although the measured outcome differed, balance is an important component supporting safe transfers and daily activity performance. Better balance may reduce fear of falling and increase older adults' confidence in moving independently. The findings are also supported by Lum (2024), who showed that chair-based exercise significantly improved lumbar flexibility and dynamic balance in older adults. Trunk flexibility is required when bending, turning, reaching for objects, or changing body position. Dynamic balance is needed when transferring from a bed to a chair, walking to the toilet, or obtaining food. Therefore, improvements in flexibility and balance resulting from chair-based exercise may contribute to better functional ability in ADL performance.

The findings are consistent with the broader chair-based exercise literature. Anthony et al. (2013) reported possible benefits across mobility, functional, cardiorespiratory, and mental-health domains but highlighted the low quality and heterogeneity of early studies. Carral et al. (2017) found that programme content mattered, with resistance-oriented chair exercise producing clearer gains in strength and balance than other seated formats among adults older than 80 years. Klempel et al. (2021) subsequently reported improvements in upper- and lower-extremity function across chair-based programmes. The present study extends this evidence by assessing ADL independence directly rather than assuming that improvement in an isolated physical component necessarily translates into reduced assistance in everyday activities.

The Wilcoxon signed-rank test yielded $p < 0.001$, indicating a significant difference in ADL independence scores before and after the intervention. Of the 15 participants, 12 had higher scores, 3 had unchanged scores, and none had lower scores. This pattern indicates that most participants responded positively to the exercise programme. The unchanged scores in three participants may be attributable to individual factors, including health status, baseline muscle strength, comorbidities, motivation, ability to follow instructions, and consistency in performing movements. Responses to exercise are not uniform because ageing occurs individually and is influenced by biological, psychological, and environmental conditions. Changes in mood may also affect participation. Participants with lower motivation or discomfort may perform movements through a more limited range, thereby receiving less benefit from the exercise. The effect size of $r = 0.867$ indicates a large intervention effect.

This finding means that the pre–post difference was not only statistically significant but also of substantial practical importance. Reporting effect size is important because a p value indicates whether a difference exists, whereas effect size provides information about the magnitude of change (Sullivan & Feinn, 2012). The large r value suggests that active and passive exercises may be a relevant programme for supporting independence among older adults in social care facilities.

Nevertheless, the large effect size should be interpreted cautiously because the study included only 15 participants. In a small sample, the estimated effect may be influenced by the relatively homogeneous characteristics of the group. All participants were aged 60–74 years and remained able to follow exercise instructions. Consequently, the findings may not be directly generalisable to older age groups, individuals with severe dependence or cognitive impairment, or those confined to bed rest. In practice, chair-based active and passive exercises may be incorporated into routine physical activity at the Sabai Nan Aluih Sicincin Social Nursing Home. The programme is relatively easy to implement, requires no specialised equipment, can be conducted in a limited space, and can be modified according to each participant's physical ability. Health professionals and caregivers may prioritise active movement so that older adults use their own muscular capacity, then provide passive assistance for movements that cannot yet be completed fully.

Programme implementation must continue to prioritise safety. Participants' general condition should be assessed before exercise, and pain, dizziness, shortness of breath, excessive fatigue, and balance disturbances should be monitored throughout the session. Movements should not be forced beyond a comfortable range. Adequate supervision is particularly important for older adults with muscle weakness, a history of falls, or mobility limitations. This study contributes to the literature by using ADL independence as the primary outcome. Previous studies have more often measured changes in balance, flexibility, muscle strength, or movement capacity. However, the ultimate goal of exercise for older adults is not only to improve physical components but also to maintain the ability to perform basic activities independently. The Katz Index enabled the benefits of the exercise programme to be evaluated through functions closely related to everyday life. However, the one-group pretest–posttest design without a control group prevents definitive causal conclusions. The improvement in ADL scores may have been influenced not only by the intervention but also by routine activities at the facility, caregiver support, participant motivation, familiarity with the instrument, or other health-related factors during the study. Therefore, the term effect should be interpreted within the context of pre–post changes in the same group. Other limitations include the small sample, purposive sampling, the relatively short intervention period, and the absence of follow-up measurement. The study could not determine whether the improvement in independence was maintained after the programme ended. In addition, comorbidities, cognitive status, physical activity level, social support, and nutritional intake were not analysed as variables that might influence changes in ADL.

Future research should use an experimental design with a control group, a larger sample, more diverse age groups, and a longer intervention period. Measurements may be supplemented with physical-function assessments, such as muscle strength, balance, flexibility, and walking speed. Analysis of each Katz Index component and follow-up measurement are also needed to identify the activities showing the greatest improvement and the sustainability of the exercise benefits. Overall, 12 sessions of chair-based active and passive exercise were significantly associated with improved ADL independence in older adults. The increase in mean scores, shift in dependence category, $p < 0.001$, and large effect size indicate that the programme may serve as a simple intervention to help maintain and improve functional ability among older adults in social care facilities.

CONCLUSION

The four-week chair-based active and passive exercise programme was associated with a meaningful improvement in older adults' independence in basic activities of daily living. The combination allowed participants to perform movements actively whenever possible while receiving assistance when full movement could not be completed safely, making the programme adaptable to varied functional capacity. For practice, residential care facilities may integrate this programme into supervised routines after screening participants for contraindications and monitoring pain, dizziness, breathing difficulty, fatigue, and balance. Caregivers should prioritise active participation, provide passive assistance only within a comfortable range, document attendance and progression, and link exercise goals to specific daily activities such as dressing, transferring, toileting, and feeding.

The findings should be regarded as preliminary because the study used a small purposive sample and no control group. Future research should use adequately powered controlled trials, analyse individual Katz Index components, record adverse events and intervention fidelity prospectively, and include follow-up assessment to determine whether functional gains are sustained.

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