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ARTICLE

Effectiveness of Balance and Functional Exercises in Enhancing Quality of Life among Older Adults with Physical Frailty

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Abstract

Older adults with physical frailty experience a decline in physical abilities such as muscle strength, balance, and functional activities, which directly impacts their quality of life. This condition requires appropriate physiotherapy intervention to support improved function and independence. This study aims to evaluate the impact of balance exercises and functional exercises on improving the quality of life of older adults with physical frailty. The study employs a case study design with one older adult participant undergoing 12 sessions of physical therapy intervention. The exercises provided include Standing Marching, Heel Raises, Chair Squats, and Sit-to-Stand, with a focus on muscle strengthening, improved coordination, and body stability. Evaluation was conducted using the WHOQOL-BREF before and after the intervention. The results showed an improvement in physical function and quality of life scores, from a value of 40 (poor category) to 45 (moderate category), although the improvement was not yet statistically significant within the short intervention period. This study provides an initial contribution to geriatric physiotherapy practice by integrating functional and balance exercises simultaneously into a single intervention protocol and using a case study approach to describe holistic changes in quality of life based on the WHOQOL-BREF instrument. Balance exercises and functional exercises have the potential to be effective in improving the quality of life of elderly people with physical frailty if performed consistently and over a longer period of time. This programme can be recommended as part of physiotherapy intervention for the elderly population.

Keywords: Physical frailty; Lansia; Balance Exercise; Functional Exercise; Quality of Life

1. Introduction

Increased life expectancy in various countries, including Indonesia, has led to an increase in the number of elderly people in the population. As they age, elderly people are prone to progressive physiological decline, one of which is physical frailty, characterised by muscle weakness, fatigue, slow walking speed, and low physical activity.(Fried et al. 2001)Physical frailty is closely related to an increased risk of falls, disability, hospitalisation, and a decline in quality of life.(Clegg et al.

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2013)Studies conducted in various regions of Indonesia show that the prevalence of frailty ranges from 25% to 40%, depending on location, measurement methods, and population characteristics.(Setiati et al. 2019)This situation poses a serious challenge to the elderly healthcare system and requires structured, evidence-based intervention.

The decline in quality of life among frail elderly people is largely due to limitations in performing daily activities independently, which has an impact on physical, psychological, and social aspects(Odaci Comertoglu et al. 2024).Therefore, interventions aimed at improving physical function are crucial in efforts to maintain and improve the quality of life of older adults experiencing physical frailty.(Dent et al. 2019). Various studies have shown that physical exercise plays an important role in reducing the degree of frailty. Balance exercises aim to improve postural control and body stability, thereby reducing the risk of falls(Sherrington et al. 2019), whereas functional exercises, such as sitting-standing exercises, climbing stairs, or walking, focus on movements required in daily activities, thereby improving independence and mobility(Morat and Mechling 2015).

There is still limited scientific evidence specifically evaluating the effectiveness of combining balance training and functional training on quality of life in older adults with physical frailty, particularly in local or community contexts. Most previous studies have focused primarily on improving physical performance without comprehensively assessing its impact on the multidimensional aspects of quality of life (physical, psychological, social). The combination of balance and functional exercises has been proven effective in improving physical performance and enhancing the quality of life of the elderly, particularly those experiencing frailty(Apostle et al. 2019).

However, further scientific evidence is still needed that specifically evaluates the effectiveness of combining these two types of exercise on the quality of life of elderly people with physical frailty, in order to support evidence-based interventions in physiotherapy practice and community health services. Based on this background, the aim of this study is to evaluate the effectiveness of a combined intervention of balance and functional exercises on improving the quality of life of older adults with physical frailty. This study is expected to make a significant contribution to strengthening evidence-based physiotherapy practice and serve as a reference for the development of integrated intervention programmes within community health services to enhance the holistic well-being of older adults.

2. Materials and Methods

This study uses a pre-experimental design with a case study approach. This design was chosen because it aims to evaluate changes in the dependent variable, namely quality of life, before and after the intervention, without using a comparison group(Wang and Liu 2023).The case study approach allows researchers to focus in depth on the effectiveness of balance training and functional training in improving the quality of life of elderly people with physical frailty, taking into account the physical, psychological, and social aspects experienced by participants(Lee et al. 2018). Interventions focusing on balance and functional training have been shown to significantly improve functional capacity and quality of life in frail older adults(Apostle et al. 2019).

2.1 Population and Sample

In this study, the target population was elderly people aged 55–65 years who experienced balance disorders. From this population, participants were selected using purposive sampling, taking into account specific inclusion and exclusion criteria to support the validity of the intervention. Inclusion criteria included being aged 55–65 years, having balance disorders based on initial examination results, being willing to participate in the intervention programme for 12 sessions, and having no history of medical conditions that could hinder exercise performance, such as severe musculoskeletal injuries. Exclusion criteria included older adults with progressive neurological diseases such as Parkinson's disease or severe stroke, unstable cardiovascular conditions such as angina or severe hypertension, and individuals unable to complete the therapy programme for medical or personal reasons. Based on these criteria, one participant who met all requirements was selected to participate in the intervention within the single-case study design.

2.2 Intervention Method

Participants were given a full explanation of the objectives and procedures of the study and signed a written consent form (informed consent) before participating in the intervention programme. The research design employed a single case study approach selected through purposive sampling. The use of a single participant was justified as an exploratory approach to gain a deep and holistic understanding of the intervention's impact on the quality of life of the elderly within the context of a physiotherapy-based exercise programme. The intervention was conducted at the participant's home located at Jl. Fajar, Komplek BTN Pandan Sakti, Pekanbaru City, with the intervention period running from 7 April 2025 to 2 May 2025 over four weeks. All therapy sessions were conducted by certified physiotherapists with expertise in geriatric physiotherapy services and who had received specialised training in balance and functional exercise interventions for frail elderly individuals.

In this exercise programme, several simple tools are used to support safe and effective exercise for older adults with physical frailty. Armless chairs are used as a medium for sit-to-stand exercises and as a balance support. Mats or rubber mats are provided to prevent the risk of injury during exercise. Sticks or handrails help participants perform balance exercises such as tandem stance. Mini stairs or step boards are used for stair-climbing exercises to strengthen and improve lower extremity muscle coordination. Additionally, lightweight objects such as small balls or water bottles are used as additional weights in functional exercises. A stopwatch is used to regulate exercise duration and rest periods, and an exercise monitoring sheet is provided to track participants' progress from session to session.

The programme begins with preparations by the physiotherapist and patient. The physiotherapist ensures an ergonomic body position during the exercises and wears neat and clean clothing to maintain professionalism and a comfortable therapeutic atmosphere. The patient is ensured to be in good health, without acute complaints such as pain, dizziness, or breathing difficulties, and is positioned comfortably. Patients are also advised to wear loose-fitting clothing and safe footwear to support smooth movement during exercises. Exercises are conducted three times a week at moderate intensity, which is 50–70% of the individual’s adjusted maximal aerobic capacity. It is important to note that exercise intensity is dynamically modified based on the patient’s response during and after each session. Signs of fatigue such as shortness of breath, muscle pain, or imbalance are closely monitored, and if a decrease in exercise tolerance is observed, the number of repetitions, duration, or exercise load will be gradually adjusted. Conversely, if the patient shows improved tolerance and stability, the intensity or complexity of the movements can be carefully increased.

Each training session lasts between 45 and 60 minutes, with six to eight repetitions of each movement. During training, the physiotherapist gives direct instructions, guides movements, and actively monitors the patient's posture, breathing, and body stability. Monitoring is conducted using a daily observation sheet that records the type of exercise, number of repetitions, duration, patient response, and any specific complaints. Additionally, blood pressure and pulse rate measurements are taken before and after the exercise as part of monitoring the patient's basic physiological condition.

The types of exercises provided consist of two main components, namely balance exercises and functional exercises. Balance exercises include Single Limb Stance, Tandem Stance, 3-Way Hip Kick, Lateral Stepping, Standing Marching, Mini Lunge, Calf Stretch, Heel Raises, Hamstring Stretch, and Foot Taps to Step. Functional exercises include Chair Squats, Standing Heel Raises, Sit-to-Stand, Side Leg Raises, and Wall Push-Up. All exercises are performed progressively, structurally, and tailored to the patient's abilities. This individualised approach aims to improve postural stability, muscle strength, and functional capacity, ultimately supporting sustained improvements in the quality of life of elderly individuals with physical frailty.

2.3 Analisis Data

The data obtained was analysed descriptively and quantitatively by calculating the average score for each parameter and component. The results of the analysis describe the level of digital maturity of

hospitals in each component and overall. This study also presents a mapping of the strengths and weaknesses of each component as a basis for recommendations for improvement and development of the hospital information system in the future. The data analysis in this study aims to evaluate changes in the quality of life of elderly people with physical frailty after being given balance exercise and functional exercise interventions. The method used is pre-test and post-test data analysis to compare quality of life scores before and after the intervention, using relevant instruments such as the WHOQOL-BREF. The WHOQOL-BREF is a validated and reliable measurement tool for assessing quality of life in the elderly population(Tim, Gibson, and Skordis-Worrall 2012).

This instrument consists of 26 items covering four main domains, namely: The WHOQOL-BREF instrument measures quality of life based on four main domains relevant to the daily lives of older adults. The Physical Domain comprises seven items reflecting physical aspects of life, including energy levels, mobility, sleep and rest quality, ability to perform daily activities, dependence on medication or medical aids, and work capacity. The Psychological Domain includes six items that assess the emotional and mental condition of the elderly, such as positive feelings, self-esteem, concentration ability, body image perception, and spiritual beliefs that can influence psychological well-being.

The Social Relationships domain consists of three items that evaluate the quality of interpersonal relationships, social support received, and satisfaction with sexual activity. Meanwhile, the Environment domain includes eight items that assess external aspects that affect the daily lives of older adults, such as sense of security, financial conditions, access to health and social services, recreational opportunities, comfort of living arrangements, transportation accessibility, and the physical environment in general. These four domains provide a comprehensive overview of the key dimensions that shape an individual's quality of life, particularly among the elderly population with physical frailty.

Each item was measured using a 1–5 Likert scale. The scores for each domain were summed and converted to a 0–100 scale using a WHO formula adjusted for each domain, allowing for comparisons between domains and over time. The higher the score, the better the quality of life of the respondent in that domain. After 12 intervention sessions, comparisons were made between the WHOQOL-BREF scores for each domain before and after therapy. Changes in scores were analysed descriptively, as the single-case study design did not permit inferential statistical tests. The analysis focused on the direction of score changes and clinical significance, particularly in the physical domain directly relevant to the intervention's objectives.

3. Results and Discussion

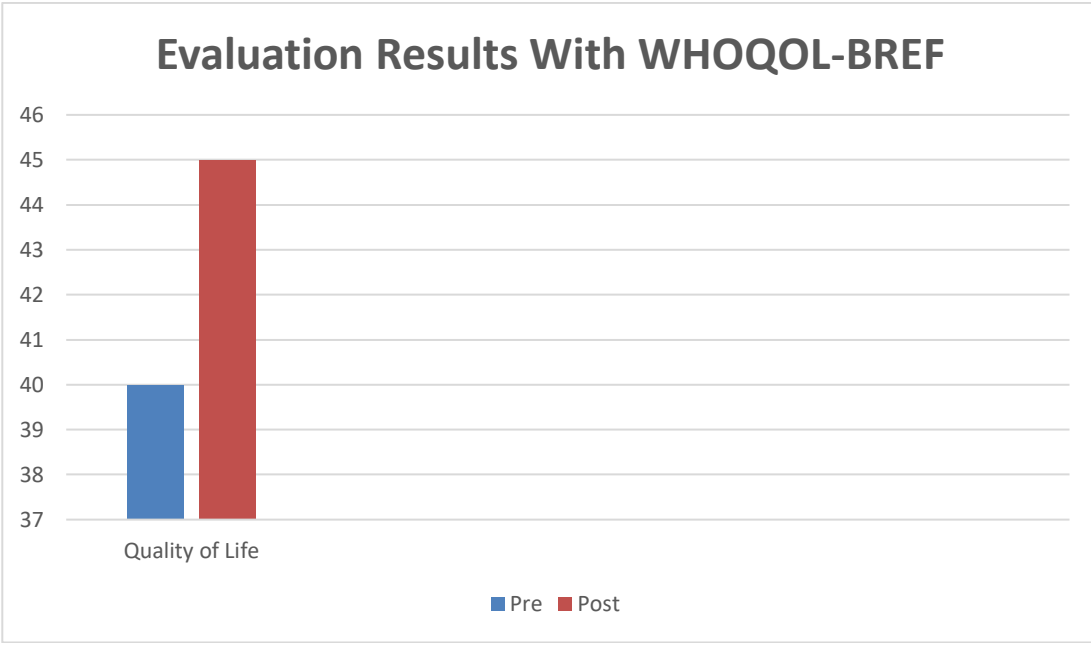
The sample in this case study is a 70-year-old woman named Mrs. Erma, who has physical frailty characteristics. Mrs. Erma has expressed her willingness to cooperate during the research process to support the maintenance and improvement of her health. This study was conducted for approximately four weeks, from 7 April 2025 to 2 May 2025. During this period, the intervention was administered over 12 sessions, with a frequency of three times per week. Prior to the intervention, an initial assessment was conducted to evaluate the patient's condition. Subsequently, the researcher provided an intervention programme consisting of balance exercises and functional exercises aimed at improving the patient's quality of life.

Preliminary examination results indicate that the patient experienced a decline in quality of life related to physical frailty, particularly in terms of physical and functional daily activities. Based on these findings, interventions in the form of balance exercises and functional exercises were implemented as an effort to improve the patient's overall quality of life. After all intervention sessions were completed, a re-evaluation was conducted using the WHOQOL-BREF instrument to assess changes in various domains of quality of life. The evaluation results showed significant improvements in the physical, psychological, social, and environmental domains, indicating that the intervention provided was effective in positively impacting the quality of life of elderly individuals with physical frailty.

Table 1. Comparison of Evaluation Results

	WHOQOL-BREF	
	Skor	**Kategori**
Before	40	Poor Quality of Life
After	45	Moderate Quality of Life

This table shows the results of quality of life evaluation using the WHOQOL-BREF instrument, indicating an increase in scores after intervention in the form of balance exercises and functional exercises. Before the intervention, patients scored 40, which falls into the category of poor quality of life. After undergoing 12 therapy sessions over four weeks, the score increased to 45, indicating a shift to the moderate quality of life category. This improvement reflects the positive impact of the exercise programme on the quality of life of elderly patients with physical frailty, although the improvement remains at a moderate level.



Gambar 1. Comparison of Evaluation Results

The results of the patient's quality of life evaluation using the WHOQOL-BREF instrument showed improvement after four weeks of balance and functional exercises. Before the intervention, the patient scored 40, which falls into the "poor quality of life" category. This indicates that the patient experienced various limitations in physical, psychological, social, and environmental aspects, which affected their daily life. After undergoing 12 intervention sessions at a frequency of three times per week, the WHOQOL-BREF score increased to 45. This score places the patient in the "moderate quality of life" category, reflecting improvements in several functional aspects and overall well-being perception. This change in category indicates that the intervention provided was able to positively influence the improvement in the quality of life of elderly patients with physical frailty. Therefore, it can be concluded that structured and consistently performed balance and functional exercises have the potential to effectively improve the quality of life in the elderly population experiencing physical frailty.

An increase in the WHOQOL-BREF score from 40 to 45 in elderly patients with physical frailty indicates an improvement in quality of life from the "poor" category to the "moderate" category. This change reflects a significant improvement in individuals' perceptions of their physical, psychological, social, and environmental conditions after undergoing 12 exercise-based intervention sessions. Although the numerical increase in scores is relatively small, the shift in quality of life categories indicates clinically meaningful benefits. The WHOQOL-BREF, as a multidimensional instrument, has been widely used to evaluate changes in quality of life in the elderly population and has proven to be

valid and sensitive in detecting clinically significant changes(Castro, Driusso, and Oishi 2014). This change in quality of life categories shows that the intervention provided not only had a temporary effect, but also created a real impact on the subjective well-being of the elderly(Sánchez-Roa et al. 2024). These findings are consistent with the literature highlighting the effectiveness of functional and balance training interventions in improving the function and well-being of older adults.(Giné-Garriga et al. 2014). The intervention targets improving physical performance through activities oriented towards activities of daily living (ADL), and contributes to increasing confidence and independence in performing daily activities(Kulmala et al. 2019).

Physiologically, balance training plays an important role in improving postural stability through proprioceptive stimulation, vestibular system integration, and strengthening of the body's stabilising muscles(Rani, Archana, and Kumari 2018). This exercise can reduce the risk of falling and increase the confidence of elderly people in performing daily activities(Rusminingsih et al. 2021)Balance exercises also activate the body's stabilising muscles, particularly in the ankles, hips and core muscles, which are important for maintaining posture when standing or changing position(Lesinski et al. 2015)Meanwhile, functional training focuses on movements that mimic daily activities such as sitting, standing, walking, and climbing stairs. Such training is effective in improving lower extremity muscle strength, functional endurance, and mobility capacity, all of which are important components in maintaining independence(Liu et al. 2014). This functional exercise also encourages the involvement of the central nervous system in regulating movement, thereby improving motor coordination and reaction time to changes in position or environmental disturbances(Perrey 2013). Thus, older adults not only benefit from the biomechanical aspects, but also from the neurological and functional aspects that support independence and overall quality of life(From Labra et al. 2015).

Physical exercise also has systemic effects that support improvements in quality of life. One of the main mechanisms is the reduction of low-grade inflammation, which is often found in frail elderly people(Antonelli Rossi et al. 2023). Structured exercise can reduce levels of proinflammatory cytokines such as IL-6 and TNF-α, and increase levels of BDNF, which plays a role in maintaining cognitive function(Janot et al. 2013). In addition, physical exercise improves neuroplasticity and cardiovascular health, which has a positive impact on psychological and physical domains in the WHOQOL-BREF measurement(Dołęga, Maciejczyk, and Sieńko 2024). From a psychosocial perspective, participation in the training programme also provides benefits in terms of improving self-esteem, self-confidence, and social integration(Zimmer et al. 2021). Structured group physical activities provide opportunities for older adults to socialise and form support networks, which are important for emotional well-being(Ruescas-Nicolau et al. 2021). This explains the improvement in the social and environmental domains after the intervention.

However, the results of this study should be interpreted with caution given several methodological limitations. First, the use of a single case study design without a comparison group limits the inferential power of these findings. Without a control or comparison group, it is difficult to ascertain that changes in quality of life were actually caused by the intervention and not by other external factors such as mood changes, family support, or the placebo effect. Second, the use of the WHOQOL-BREF, a self-reported measurement tool, introduces the possibility of subjective perception bias, especially since participants were aware that they were undergoing an intervention aimed at improving their quality of life. This subjective perception may be influenced by positive expectations or pleasant interactions with therapists, which do not always reflect deep objective changes. Third, the relatively short duration of the intervention, four weeks, may not be sufficient to produce maximal or sustained changes, particularly in the cognitive and social domains(From Labra et al. 2015b).

For this reason, further research is recommended using a quasi-experimental or randomised controlled trial design with a larger sample size, appropriate comparison groups, and a longer intervention duration, at least 8 to 12 weeks. Additionally, a multidimensional approach encompassing physical exercise, nutritional intervention, cognitive stimulation, and social support is believed to yield more comprehensive effects in frailty management(Dent and Hoogendijk 2014). Long-term evaluation through longitudinal studies is also important to assess the sustainability of the impact of interventions on the quality of life of older adults in the community context.

4. Conclusion

This study proves that balance exercises and functional exercises have the potential to be effective in improving the quality of life of elderly people with physical frailty. After undergoing 12 intervention sessions over four weeks, there was an increase in the quality of life score based on the WHOQOL-BREF from the poor category (score 40) to the moderate category (score 45), especially in the physical function domain. Exercises such as Standing Marching, Heel Raises, Chair Squats, and Sit-to-Stand were found to support muscle strengthening, improved coordination, and body stability in the elderly, which indirectly contribute to increased independence and confidence in performing daily activities. These findings suggest that exercises with a functional and balance-focused approach can be an effective strategy for addressing physical frailty-related declines in physical ability.

The success of this intervention emphasises the importance of integrating balance exercises and functional exercises into physiotherapy programmes for the elderly. For future research, it is recommended to involve a larger number of participants and a longer intervention duration in order to observe the sustainability and statistical significance of the results. Additionally, combining this approach with other rehabilitation methods is worth exploring as part of a comprehensive therapy development for the elderly population at risk of frailty.

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