

The Otago Exercise Training Program for Patients with Moderate Fall Risk Problems: A Case Report

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Abstract: *The elderly are vulnerable because they have experienced various setbacks. Degenerative disorders are physiological processes that occur in the elderly; one that often occurs is a decrease in the function of the musculoskeletal system, such as complaints of joint pain, decreased muscle strength, and decreased balance, which can cause the risk of falling. The management that can be done to prevent falls while minimizing side effects is using non-pharmacological therapies, one of which is the Otago Exercise. This case study aims to explain how the impact of Otago Exercise is to prevent the risk of falling in the elderly. The writing method used in this study is a case study conducted on the elderly Mrs. S. The results of nursing care after carrying out the Otago Exercise Program showed an increase in the risk of falling in the elderly from 32 to 39. This Otago Exercise has been proven to be effective and can be done to prevent the risk of losing. The elderly can implement the Otago Exercise Program on an ongoing basis accompanied by officers at the orphanage to avoid falls and maintain a balance so that joint function and posture remain good.*

Keywords: balance, elderly, Otago exercise program, risk of falling, fall prevention

INTRODUCTION

Elderly age is a natural process of growth and development that will be passed on by all humans, marked by a decrease in anatomy, physiology, and psychological abilities (Segita et al., 2021). In general, the elderly stage begins when a person reaches the age of 60 and over, goes through the aging process, and experiences changes and declines in bodily functions (Aprilia et al., 2023).

According to the [World Health Organization \(WHO\)](#), the elderly population in 2020 is 28,000,000 (11.3%) of the total population in the world. It is estimated that the total population in 2050 will continue to increase 3-fold each year to reach 426 million ([World Health Organization, 2022](#)). According to the Central Statistics Agency, in 2021, the elderly population in Indonesia aged 60 years and over will reach 29.3 million elderly people or as much as 10.8% of the total population in Indonesia. This number is expected to continue to increase by 40 million people (13.8%) in 2035 ([Central Bureau of Statistics, 2021](#)).

Degenerative disorders are physiological processes in the elderly ([Hannan et al., 2019](#)). One of the degenerative disorders that often occurs in the elderly is a decrease in balance function and muscle strength, especially in the lower extremities (Segita et al., 2021). Factors that can cause balance disorders in the elderly are the decline in the neurological system, sensory system, and musculoskeletal system, where there is a decrease in muscle mass, decreased muscle strength, changes in posture, fat levels that accumulate in certain areas, pain in joints and reduced joint motion ([Jahanpeyma et al., 2021](#)).

Physiological changes in the musculoskeletal system can weaken lower extremity muscle strength. Disorders of the musculoskeletal system that occur in the elderly can cause an increased risk of falling ([Nasri & Widarti, 2020](#)). The risk of falling in the elderly is a geriatric syndrome that most often occurs in the elderly ([Djoar & Argarani, 2021](#)). Falls and injuries in the elderly population are an important public health problem worldwide. A fall is characterized as a situation or event in which a person suddenly sits or lies down in a lowered position with or without damage or loss of consciousness.

([Davis et al., 2022](#)). The risk factors for falling in the elderly are multifactorial and caused by several factors such as socio-demographic (age, gender, and socio-economic), physiological factors (musculoskeletal, neurosensory, biomechanics, balance, sarcopenia), pathological or specific medical conditions, psychological disorders (depression, anxiety, cognitive status), history of previous falls, use of drugs or polypharmacy, mobilization factors, and environmental conditions ([Thakkar et al., 2022](#)).

According to the WHO Report on Falls Prevention in Older Age, 28-35% of individuals aged 65 and over have a history of falls, and as many as 32-42% of individuals aged 70 or over have a history of falls. As well as reported, as many as 30-50% of the elderly fall at least once a year, and 40% of the elderly population experience repeated falls ([World Health Organization, 2008](#)). According to the Indonesian Ministry of Health, 49.4% of people aged over 55 years have experienced falls, and 67.1% of those over 65 have experienced falls. As well as the elderly who live in the community each year experience a fall of around 30% ([Noorratri et al., 2020](#)).

Based on a survey conducted by the author at one of the social institutions in West Java, out of a total population of 147 elderly, 76.9% or 113 elderly are at risk of falling. Several factors, including slippery floors, the use of walkers, stairs without handrails, and others, cause this. In addition, as many as 83 elderly (49%) had musculoskeletal problems such as joint pain and muscle strength problems. As well as some elderly with vision problems, as many as 52 elderly (72.2%), 45 elderly (62.5%) have hearing problems, 36 elderly (24.4%) have a history of hypertension, and 15 elderly (10.2%) suffer from osteoarthritis which can increase the risk of falling in the elderly.

This fall in the elderly can threaten the mental safety of the elderly ([Johnson et al., 2021](#)). Falls can result in physical impact or physical injury (most often head injuries), psychological disturbances such as shock as a result of the fall experienced, and the fear of falling again, causing limited daily activities and financial impacts that can be related to long treatment ([Shubert et al., 2017](#); [Zarah & Djunawan, 2022](#)).

The risk of falling is very closely related to the ability of the elderly to maintain body balance ([Jehaman et al., 2021](#)). Prevention that can be done in the elderly with a risk of falling is using balance training, which will improve body balance, increase muscle strength in the extremities, and improve the vestibular system ([Rostikasari et al., 2021](#)). Several types of balance exercises that can be done to prevent falls in the elderly include the Otago Exercise Program, Balance Exercise, Square Stepping Exercise, Strength Training Exercise, and Exercise ([Martins et al., 2018](#)).

Otago Exercise is a balance training program specifically designed to reduce the incidence of falls in the elderly by improving body balance, increasing muscle strength in the lower extremities, and providing walking exercises ([Waters et al., 2022](#)). [Johnson et al. \(2021\)](#) stated that the Otago Exercise program meets the recommended criteria for strength, balance, and endurance for the type of exercise. The Otago Exercise is also individually designed, progressive, well-structured, and can be done independently at home. The Otago Exercise is an exercise program developed by a research team led by Professor John Campbell at the University of Otago Medical School, New Zealand. This exercise program has been evaluated in research and routine health care services in 1,016 elderly people aged 65-97 years. It is considered effective in reducing the number of falls and the number of injuries due to falls by up to 35% ([Jehaman et al., 2021](#)).

Otago Exercise is useful for training the muscles of the lower limbs, which play a role in functional movement and walking, improving and maintaining balance in the elderly so that the function of the joints and posture of the elderly is maintained and increases blood flow ([Poveda-López et al., 2022](#)). Research conducted by [Waters et al. \(2022\)](#) states that the Otago Exercise effectively prevents the risk of falling in the elderly. In contrast, in their research, it is proven that there is a 32% reduction in the risk of falling in the elderly who have performed the Otago Exercise. A study by [Jahanpeyma et al. \(2021\)](#) also stated that Otago Exercise can improve balance and physical performance, reduce falls in the elderly, and be effective as a fall prevention intervention. Otago Exercise adapts to daily functional movements in the elderly so that the elderly can optimize their ability to carry out daily activities ([Kiik et al., 2020](#)). The Otago Exercise incorporates several movements, such as muscle strengthening, balance, gait, coordination, and functional exercises, providing a more significant beneficial effect on

balance than a regular exercise program. Improved balance and muscle strength will increase dynamic control related to gait and locomotion, thereby increasing all components that reduce the risk of falling ([Shubert et al., 2017](#)).

The risk of falling in the elderly must be considered so that there is no increase in cases of falling. So, efforts are needed to overcome this problem, including practicing the Otago Exercise. This paper focused on implementing the Otago Exercise program for the elderly with moderate fall-risk categories and with fall-risk nursing diagnoses. This article aims to find out the application of the Otago Exercise training program as a nursing intervention to reduce the risk of falling in the elderly.

METHOD

The method of writing scientific articles uses the case report approach. In this case report, the author discusses one particular aspect and an application of the Otago Exercise program for moderate fall risk, similar to the method used by previous researchers ([Kamila et al., 2023](#)). This article uses data analysis using the nursing process approach model, which consists of several stages: nursing assessment, problem formulation analysis, diagnosis formulation, intervention, implementation, evaluation, and nursing documentation.

This article was written from May 28-10, 2023, at a social institution in West Java. The subject of writing this scientific paper is the elderly with problems such as pain and the risk of falling, which are then made into detailed and in-depth management. In obtaining detailed information regarding the case, the researcher collects data through interviews, observation, physical assessment, document study, and evaluates every action taken during the treatment period.

The ethical principle that must be considered in this paper is informed consent. Informed consent is an agreement by the patient and/or family to accept an action or procedure after obtaining complete information, including the risks of the action and the facts associated with the action provided by the health worker. Previously, the patient was given an explanation in advance about the things or information that would be asked, how the data would be used, what actions would be taken, and the benefits and risks that would occur. Then, the subject of the case report was asked to sign the consent sheet provided before implementation. The data in the implementation of this case report is used to determine the effect of Otago Exercise on reducing the risk of falling in the elderly.

Intervention based on Evidence-Based Nursing is by teaching non-pharmacological techniques to reduce pain with deep breathing relaxation therapy ([Lestari et al., 2022](#)) and Otago Exercise exercises to increase muscle strength, reduce the risk of falling in the elderly, and improve balance ([Waters et al., 2022](#)). In addition, interventions for the risk of falling on Mrs. S, namely by modifying the environment, paying attention to the use of non-slippery footwear, recommending concentration to maintain balance, and recommending widening both feet to maintain balance when standing.

Nursing intervention based on Evidence-Based Practice focuses on preventing falls with the Otago Exercise. Otago Exercise is an exercise that consists of several movement components, including warming up-flexibility, muscle strength (strengthening), balance (balance exercise), and walking exercises. This exercise is given to the elderly thrice a week for 30-40 minutes. The training begins with deep breathing relaxation therapy and warming up for 5 minutes, 30 minutes of core movement, and 5 minutes of cooling down. Before and after the intervention is given, vital signs will be examined, and the risk of falling will be measured using the BBS (Berg Balance Scale) instrument. Nurses in the orphanage monitor the implementation of the Otago Exercise, the person in charge of the room, and the gymnastics instructor.

RESULTS

Mrs. S is 66 years old and frequently complains of knee joint pain. Complaints of pain have been felt since two years ago; pain is felt when the client walks a lot or sits for too long. To reduce pain, the client usually rests or uses a patch on his knee and sometimes uses a special brace when going to exercises or walking long distances to reduce pain and so as not to stiff; the client feels pain on a scale of 6 (1-10) using NRS, pain is felt radiating to the lower leg so that sometimes it cannot walk. Observation results

in Mrs. S walking slowly and unbalanced. The client said that five years ago, he had experienced a fairly severe fall, and since then, the client had had some difficulty walking and had fallen several times. Mrs. S said he had no history of previous illness and had no hereditary history from his parents.

The objective data found Mrs. S's blood pressure was 155/85 mmHg, pulse rate 75x/minute, and respiratory rate 19 x/minute. Anthropometric examination Mrs. S weighs 55 kg, LLA 25 cm, height 145 cm, and BMI 26.7 (overweight). Mrs. S has cataracts and has had surgery. Mrs. S does not use a walking aid. On examination of the upper extremities, the left and right hands were asymmetrical due to fall marks. The muscle strength in the upper extremities was 4 in the right hand and 5 in the left hand. The results of the lower extremity examination were symmetrical; the muscle strength in the lower extremities was three right and five left, and there was joint stiffness. The client says he can't sit for long with his legs folded. The results of the frailty questionnaire study found fragility; the results of the balance assessment with Tinetti obtained nine results with a moderate risk of falling, and the results of the risk of falling using the BBS (Berg Balance Test) were 32 in the intermediate fall risk category. Based on the study results obtained, the researchers enforced nursing diagnoses concerning the Indonesian Nursing Diagnosis Standards [PPNI \(2017\)](#), namely chronic pain associated with musculoskeletal conditions and the risk of falling associated with the aging process.

Based on observations during three days of treatment, after implementing the Otago Exercise program using video media and direct demonstrations with clients, the patient's pain scale decreased from 6 on the first day to 3 on the third day. The client's fall risk score went from 32 on the first day to 39 on day 3. Although the fall risk examination results after the Otago Exercise were still in the moderate fall risk category, they experienced an increased score. Mrs. S said feeling comfortable and relaxed; Mrs. S also said the pain had decreased. In addition, after doing the exercise, the level of balance and muscle strength increases, and there is a decrease in pain in the knee joint.

DISCUSSION

The elderly are an age group that is very at risk. With increasing age, there is a decrease in function in the elderly, which causes them to be very susceptible to health problems. One of the declines in function that often occurs in the musculoskeletal system is decreased muscle strength, reduced joint flexibility, decreased balance, decreased joint movement, and erosion of the joint capsule, which can cause joint pain, especially in the lower extremities ([Firmansyah & Suprayitno, 2018](#); [Rostikasari et al., 2021](#)). Complaints of pain experienced by Mrs. S cause frequent disturbances in daily activities. Complaints of joint pain in the elderly occur in almost all elderly people due to degenerative disorders in joints and bones ([Firmansyah & Suprayitno, 2018](#)). As a result of the complaints experienced by the elderly, they are very at risk of falling in the elderly.

One of the interventions that can be done is to do exercises with Otago Exercise, which is useful for training the muscles of the lower limbs which play a role in functional movement and walking, improving and maintaining balance in the elderly so that the function of the joints and posture of the elderly is maintained, improving muscle strength and increase blood flow ([Poveda-López et al., 2022](#)). The implementation of the Otago Exercise is given by using video media and by doing demonstrations with Mrs. S. The Otago Exercise training activities were carried out well; it's just that at the beginning of the training, there were obstacles where there were several movements that Mrs. could not practice optimally. S because of a little trouble. However, Mrs. S was enthusiastic about participating in the Otago Exercise until the activity ended. In addition, before and after exercise, vital signs were examined. Where the results of vital signs before and after exercise were in the range of systolic blood pressure 133-130 mmHg and diastolic blood pressure in the range of 70-80 mmHg, and HR was in the range of 75 -88x/minute, and respiratory rate 19x/minute.

Before the intervention, Mrs. S was taught to do deep breathing relaxation therapy to be more relaxed when doing the exercises and to reduce pain in her knee joints. Deep breathing relaxation is one of the non-pharmacological strategies known as breathing relaxation, which is considered useful for relieving pain ([Lestari et al., 2022](#)). Relaxation is an action to reduce mental and physical tension and stress and increase pain tolerance. Deep breathing relaxation can improve alveolar ventilation,

maintain gas exchange, prevent lung atelectasis, and reduce levels of physical and emotional stress to reduce the severity of pain experienced by individuals.

After implementing the Otago Exercise for three meetings, the patient's pain scale decreased from 6 on the first day to 3 on the third day. Research conducted by Firmansyah & Suprayitno (2018) mentioned that gradually moving joints can reduce joint pain due to the production of synovial fluid, which lubricates the joint area. By doing movement exercises, blood flow will increase into the joint capsule because the cartilage surfaces between the two bones will rub together. This cartilage contains a lot of proteoglycans attached to hyaluronic acid and is hydrophilic or contains a lot of water. An emphasis on cartilage will force the water out of the matrix cartilage to the synovial fluid, lubricating the joint area.

After implementing the Otago Exercise, the client's fall risk score went from 32 on the first day to 39 on day 3. Research conducted by [Waters et al. \(2022\)](#) states that the Otago Exercise effectively prevents the risk of falling in the elderly. their research proves a reduced risk of falling in the elderly who have performed the Otago Exercise. 32%. In line with research conducted by [Jahanpeyma et al. \(2021\)](#), they also stated that Otago Exercise can improve balance and physical performance, reduce falls in the elderly, and be an effective fall prevention intervention. In addition, another study stated that one of the benefits of Otago Exercise is increasing muscle strength to support the load on the joint area and keep the body in a balanced condition ([Jehaman et al., 2021](#)). According to [Nasri & Widarti \(2020\)](#) and [Segita et al. \(2021\)](#), the movement system in the Otago Exercise program will focus on maintaining a balanced body posture, wherein the exercise can provide stimulation to increase muscle strength and endurance due to isotonic contractions. The components of an isotonic contraction will be stronger and longer if you use a heavy load. An increase in dynamic strength and endurance will be obtained together, causing biochemical, anatomical, and physiological changes in the muscles, leading to increased muscle strength ([Nasri & Widarti, 2020](#)).

Evaluation of the Otago Exercise given to Mrs. S provides a change in score on the risk of falling. The fall risk score examination results showed that it was still in the moderate fall category. Still, there was a decrease in symptoms of fall risk in several components of the BBS (Berg Balance Scale) examination. This is due to limited time in conducting research, and these conditions can be influenced by several things, one of which is the aging process. Some things that happen in the aging process are when proteins undergo abnormal metabolism, which will cause waste production in cells. Tissue performance cannot work effectively and efficiently ([Segita et al., 2021](#)).

The results of the evaluation of the risk of falling after the exercise were carried out on Ny. S obtained balance and increased muscle strength, as evidenced by Mrs. S being able to move from sitting to standing without using her hands, which she at first had to use hands Mrs. S was also able to stand for a longer duration with her eyes open and closed, Mrs. S was able to do a tandem walk even though it was not consistent to the specified distance but improved from before the exercise was carried out, and Mrs. S was also able to lift one leg and hold it which he couldn't do at first. Increasing muscle strength and balance is one condition that prevents the risk of falling in the elderly ([Jahanpeyma et al., 2021](#)). Otago Exercise adapts to daily functional movements in the elderly so that the elderly can optimize their ability to carry out daily activities ([Kiik et al., 2020](#)). Supporting factors at the implementation time up to the evaluation, namely Ny. S is very cooperative in implementation, so implementation and evaluation can be carried out properly. In this Otago Exercise, a consistent training process is needed to ensure optimal effect.

CONCLUSION

Based on a case study regarding the application of the Otago Exercise exercise performed on the elderly with a risk of falling, it was found that this exercise was beneficial and effective in reducing the risk of falling as evidenced by an increase in the risk score of falling from an initial score of 32 to 39 after doing the exercise. In addition, prevention of the risk of falling needs to be supported by taking into account the principles of physical activity training and consistency in doing the exercises to achieve optimal

effectiveness. Exercise is a physical exercise intervention that can be done to prevent falls in the elderly. For health workers at information institutions and Otago, Exercise training given to the elderly should be carried out on an ongoing basis accompanied by officers and become a reference and initial step to improve balance and prevent falls in the elderly.

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