

The Effect of Otago Home Exercise Programme on Decreasing the Risk of Falling in the Elderly

Asita Rohmah Mutnawasitoh^{1*}, Muhammad Pamungkas Adi Surya²,
Rina Sri Widayati³

^{1*} Universitas Udayana

² Poltekes Surakarta

³ Universitas Aisyiyah Surakarta

*E-mail: asitarohmah@gmail.com

<https://doi.org/10.30787/gaster.v19i1.586>

ARTICLE INFO

Keywords; *Elderly, Balance, Fall, Exercise, OHEP.*

ABSTRACT

Background; *Decreased physiological function in the elderly results in degenerative disorders, namely decreased balance function and increased risk of falling. The incidence of falls in patients over 65 years of age is 30%, and the age of more than 80 years is 50% annually. Otago Home Exercise Programme is an exercise program for the elderly that is specifically designed to reduce the incidence of falls, by increasing the strength of the lower limbs, improving balance and providing walking exercises. Purpose;* *Knowing an influence practice otago home exercise program against a reduced risk of falling in the elderly. Method;* *Quantitative research type of pre-experimental design with technique of one group pre-test and post-test design. The sampling technique uses simple random sampling, with 17 elderly respondents. Research instrument uses TUG (Time Up and Go test). Result;* *Wilcoxon Test results note that the data from the value TUG before and after given otago home exercise program obtained a significance of $p = 0.025$ ($p < 0.05$). Conclusion;* *The positive result of the effect of otago home exercise program against a reduced risk of falling in the elderly is confirmed.*

INTRODUCTION

In old age, people experience physical decline, meaning that they experience development in the form of changes that

lead to negative changes. One of them is the anatomical changes in the musculoskeletal system that occur during the aging process, namely reduced muscle mass, degeneration

of myofibrils, tendons to shrink, and muscle fiber atrophy (Rudy & Setyanto, 2019). These anatomical changes have an impact on decreasing muscle strength, resulting in a decrease in the ability of the elderly to maintain body balance and an increase in the risk of falls which will increase dependence on the elderly in carrying out daily activities (Ibrahim *et al*, 2018).

The incidence of falls in Indonesia was recorded from 115 residents of the orphanage, as many as 30 elderly people or around 43.47% experienced falls (Ashar, 2016). Various complications of falls that can occur in the elderly, include anxiety syndrome after falling, injury to soft tissue or fractures, hospital care, disability (decreased mobility), decreased functional status/decreased independence, increased use of health care facilities, and even it can happen that the patient dies (Faidah *et al*, 2020)

The main preventive measures in the management of the risk of falls aimed at preventing injury from occurring early are very important, so that the risk of injury and death can be avoided. The method is by facilitating Otago Home Exercise Program to improve balance in the elderly (Kiik *et al*, 2020). Otago Home Exercise Programme is an exercise program for the elderly that is

specifically designed to reduce the incidence of falls, by increasing the strength of the lower limbs, improving balance and providing walking exercises (Jin Lee *et al*, 2017)

Otago Home Exercise Program (OHEP) is a program to reduce falls in the elderly. The exercise program consists of 30 minutes, an exercise program consisting of balance exercises and leg strengthening exercises that are done at home at least 3 times per week and are complemented by a walking plan (Manohare & Hande, 2020). Otago Home Exercise Program practice adapting to daily functional movements so that they can optimize the ability of the elderly to carry out their functional movements (Caderbom & Arkkukangs, 2019).

In a study conducted by Jin Lee (2017), the otago home exercise program with the program objectives of increasing muscle strength, exercises focused on knee flexion exercises, walking backwards, walking and turning around, walking in a straight line, standing on one leg, walking on heels, walking on toes, walking, backwards on toes and on heels, standing up from sitting position, and walking up stairs. This exercise focuses on walking exercises and strengthening the lower extremities associated with functional motion in the elderly so that this exercise can

be used as an economical exercise because it can be done independently at home and is beneficial for the balance of the elderly.

In connection with the above problems, the purpose of this study is to test the effectiveness of Otago Home Exercise Program against a reduced risk of falling in the elderly.

METHODS AND MATERIALS

This research was conducted for four weeks at the 'Aisyiyah Sumber Surakarta nursing home. Research method used was Pre-experimental by design one group pre-test and post-test. The number of samples in this study were 31 elderly people. Sampling technique with simple random sampling. The inclusion criteria in this study were willingness to be respondents, aged 60-75 years, had a low risk of falling, and the exclusion criteria were elderly who had bedrest, had fractures, used assistive devices, had a history of hypertension, diabetes and heart disease. To find out whether the otago home exercise program has an effect on the risk of falling, Wilcoxon test was employed.

The measuring instrument used is Time Up and Go test (TUG) transition test to assess dynamic balance. The necessary equipment is chairs stopwatch. Measure three meters (10

feet) from the chair and mark this spot with tape. What will be counted is the amount of time to get up from the chair, walk at normal speed to the mark, turn, and return to the chair (Nurmalasari *et al*, 2018).

The intervention given is Otago Home Exercise Program that consisting of a 30-minute balance training program and leg strengthening exercises with an added load of 0.5-1kg on both legs, carried out at home at least 3 times per week for 4 weeks (Kurnianingsih, 2017). As for training on Otago Home Exercise Program namely knee bends and sit to stand exercises, side hip strengthening, the front knee strengthening, the back knee strengthening exercises, calf raises and toe raises exercises, tandem walking, walking around and back, walk heel, and walk backward (Martins *et al*, 2020).

RESULTS AND DISCUSSION

a. Characteristics of Respondents by Age

Table 1 Characteristics of Respondents by Age

Age	Frequency	Percent/%
60	2	11.8%
66	1	5.9%
67	1	5.9%

Age	Frequency	Percent/%
68	1	5.9%
69	4	23.5%
71	1	5.9%
72	2	11.8%
73	3	17.6%
74	1	5.9%
75	1	5.9%
Total	17	100.0%

Based on table 1 regarding the characteristics of respondents according to age, it can be seen that the age of respondents who is at most 69 years old is 4 elderly. The elderly will experience a decrease in the ability to carry out daily life activities. Older people experience a decline or morphological changes in muscles that cause changes in muscle function, namely a decrease in muscle strength and contraction, muscle elasticity and flexibility, and speed in any case (Deniro *et al*, 2017). This is in accordance with research conducted by Gupta *et al* (2016), of 265 elderly patients who stated that 23.4% of all patients experienced a decrease in the ability to carry out daily activities, 70% of them were aged 60-69 years, and aged > 80 years had a decrease in the ability to carry out daily activities which is more significant.

There are several things that can cause disruption of the postural balance or balance of the human body, including the effects of aging, accidents, and due to disease factors. Of the three things, aging is the main factor causing postural balance disorders in old age (Deniro *et al*, 2017). Apart from the age factor, gender can affect a person's risk of falling, although it is not very significant (Munawarah & Triariani, 2019). Clinically women are more likely to fall than men. This is because the lack of estrogen in elderly women causes osteoclast genesis to decrease and bone loss occurs. Losing bone mass can cause posture changes that affect the risk of falling (Susilo *et al*, 2017).

b. Characteristics of Respondents based on value *pre* and *post* Time Up and Go Test

Table 2 Measurement Values *time up and go test* before the intervention (*Pre-Test*)

Clarifying	Pre	
	Frequency	Percent/%
Normal	0	0%
Low risk of falling	0	0%
High risk of falling	17	100%
Total	17	100%

Table 3 Measurement Value time up and go test After Intervention (Post-Test)

Classification	Frequency	Percent/%
Normal	0	0%
The risk is far low	5	29.4%
High risk of falling	12	70.6%
Total	17	100.0%

Based on Table 2 and Table 3 after giving Otago Home Exercise Program by adding weight to the legs, There are changes where there are elderly people with a high risk of falling into a low risk of falling as many as 5 seniors, but there are still elderly people who still experience the risk of heavy falls, which is 12 out of a total of 17 seniors, this is related to factors that can affect a person's balance such as gravity earth, center of gravity, fulcrum (Fitri & Berawi, 2019).

The perception of a person's position and gestures in a room requires a combination of information from peripheral receptors in a variety of sensory systems including the visual, somatosensory, and vestibular systems. (Kisner & Lynn, 2017). Mobility, gait, walking speed and balance that can be

seen and measured by the TUG test can be used as an initial screening tool in an effort to prevent falls in the elderly so that complications that occur due to falls can be prevented, thereby improving the quality of life of the elderly (Nurmalasari *et al*, 2018).

c. Effect of Giving Otago Home Exercise Program Against the Risk of Fall

Table 4 Analysis of the Effect of Giving Otago Home Exercise Program Test Against the Risk of Fall

Wilcoxon Test	P	Z
Pre-Post Influence	0.025	-2,236 ^a

Based on table 4 regarding the results of the effect test using the Wilcoxon test shows that before treatment and after Otago Home Exercise Program (OHEP) treatment has a significance of $p=0.025$ which means $p<0.05$ means, there is a giving effect practice of Otago Home Exercise Program against a reduced risk of falling in the elderly. This is in accordance with the research conducted by Dadgari *et al* (2016) on the elderly in Iran with a training dose of 45 to 60 minutes three times a week for 6 months, this study shows the results that OHEP can improve physical performance and

can significantly reduce the risk of falls in the elderly seen from the increase in balance value and functional capacity.

Another study conducted by Johnson *et al* (2020), OHEP training is very helpful in walking, standing upright, controlling the body when moving in a narrow area, and regaining balance when moving unconsciously, hip strategies are used when the body is moving faster because speed increases with distance. OHEP exercises aid in walking posture with respect to the correction of movement and muscle activation patterns and assist with balance control with respect to the fulcrum (State *et al*, 2020). Elderly who received OHEP training for 6 months experienced a decreased risk of falling which was accompanied by an increase in aspects of balance, walking speed and stride length (Hager *et al*, 2019).

OHEP training is divided into 3 stages of training, namely strengthening exercises, balance exercise and walking programs, which are designed for the elderly where before and after exercise there is stretching in preparation for pre-training, avoiding injury during and after exercise (Johnson *et al*, 2020).

OHEP exercise adapts to daily functional movements so that it can

optimize the elderly's ability to perform functional movements, thereby reducing the risk of falling. OHEP exercises activate the body's system of voluntary movement and automatic postural response. When doing training, the body sends sensory information through mechanoreceptors related to changes in sensation of body position from the joints to the large myelinated nervous system. This information is passed into the dorsal lemniscus medial column system and ends in the postcentral gyrus of the cerebral cortex (somatosensory area) to be processed in the cerebral cortex (State *et al*, 2020).

The central nervous system uses automatic postural response reflexes, and voluntary movements. Voluntary movements are mediated by the cortical system with the longest latency rate compared to other movements such as automatic postural response mediated by the brainstem or subcortical sections with intermediate latency, and reflex movements mediated by the medulla. This movement system will integrate in maintaining the postural balance of the body (Kisner & Lynn, 2017).

Exercise provides stimulation to increase the strength and dynamic

endurance of muscles due to isotonic contractions (components). The isotonic contraction component will get stronger and longer if a heavy enough load is used. Increased dynamic strength and endurance are obtained together. So that it causes anatomical, biochemical, and physiological changes in muscles that lead to increased muscle strength (Giriwijoyo, 2017).

A recent systematic literature review concluding that an OHEP exercise program that combines muscle strengthening, gait, balance, coordination, and functional exercises provides a greater beneficial effect on balance than a regular exercise program. (Kisner & Lynn, 2017). Increasing balance and muscle strength will increase dynamic control related to gait and locomotion, so that increasing all of these components will reduce the risk of falling (Mahendra *et al*, 2016).

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research that has been carried out, it can be concluded that the provision of Otago Home Exercise Program training can reduce the risk of falling significantly using wilcoxon analysis for the

elderly in 'aisyiyah nursing home Sumber baluarti Surakarta, it is recommended that the managers of the orphanage provide education and information to the elderly about the effect of giving Otago Home exercise program can reduce the risk of falling. Future researchers are expected to use the case and control groups or by increasing the number of samples more.

REFERENCES

- Cederbom, S & Arkkukangas, M 2019, "Impact of the fall prevention Otago Exercise Programme on pain among". *Clinical Interventions in Aging*.
- Deniro, N, Sulistiawati, N & Widajanti, N 2017, "The Relationship between Age and Activity of Daily Living with the Fall Risk of Patients in Geriatric Outpatient Installation". *Jurnal Penyakit Dalam Indonesia*, Vol. 4, No. 4
- Dadgari, A, Hamid, A, Hakim, A, Chaman, R, Mousavi, Hin, P & Dadvar. L 2016, "Randomized Control Trials on Otago Exercise Program (OEP) to Reduce Falls Among Elderly Community Dwellers in Shahroud", *Iran Red Crescent Med Journal*, 18(5): e26340.
- Faidah, N, Kuswardhani, & Artawan, G 2020, "Pengaruh Latihan Keseimbangan

- Terhadap Keseimbangan Tubuh Dan Resiko Jatuh Lansia”, *Jurnal Kesehatan*, Vol. 11, No. 02
- Fitri, A & Berawi, N 2019, “Hubungan obesitas dengan keseimbangan postural”. *Jurnal ilmiah mahasiswa kedokteran Indonesia*, vol 7 No 2.
- Gupta S, Yadav R, & Malhotra A 2016, “Assessment of physical disability using Barthel index among elderly of rural areas of district Jhansi”, *India J Family Med Prim Care*, 2016;5(4):853-7
- Giriwijoyo, S 2017, *Fisiologi Kerja dan Olahraga Fungsi Tubuh Manusia pada Kerja dan Olahraga*, Jakarta: RajaGrafindo Persada.
- Hager, A, Mathieu, N, Hoskovec , L, Swanenburg, J , Biel, R & Hilfiker, R 2019, “Effects of three home-based exercise programmes regarding falls, quality of life and exercise-adherence in older adults at risk of falling: protocol for a randomized controlled trial”. *BMC Geriatrics*.
- Ibrahim, H, Nurhasanah, & Juanita 2018, “Relationship between Balance and Daily Activities among Elderly In Aceh Besar Health Center”, *Idea Nursing Journal*, Vol. IX No. 2.
- Jin, L, Yoo, H, Lee, B 2017, “Effects Of Augmented Reality-Based Otago Exercise On Balance, Gait, And Physical Factors In Elderly Women To Prevent Falls: A Randomized Controlled Trial”. *The Journal of Physical Therapy Science*.
- Johnson, T, Anens,E, Johansson, T & Karin, H 2020, “The Otago Exercise Program With or Without Motivational Interviewing for Community-Dwelling Older Adults: A 12-Month Follow-Up of a Randomized, Controlled Trial”, *Journal of Applied Gerontology*.
- Kiik, M, Vanchapo, R, Elfrida, F, Nuwa, S, & Sakinah, S 2020, “Effectiveness Of Otago Exercise On Health Status And Risk Of Fall Among Elderly With Chronic Illness”. *Jurnal Keperawatan Indonesia*.
- Kisner, C, & Lynn, A 2017, *Terapi Latihan Dasar Dan Teknik*, Jakarta: Buku Kedokteran EGC, vol. 1 edisi 6.
- Kurnianingsih, E 2017, “Pengaruh Otago Exercise Programme Terhadap Rentang Gerak Sendi Pada Lanjut Usia”, *Jurnal Keterampilan Fisik*, Vol. 2, No 2
- Mahendra, W, Andayani, N, Dinata, K 2016, “The Otago Home Exercise Programme

- Better For Reducing The Risk Of Fall Than Balance Strategy Exercise In Elderly At Tabanan”, *Majalah Ilmiah Fisioterapi Indonesia*, Volume 4, Number 3
- Manohare, A & Hande, D 2020, “Effect Of 6 Weeks Otago Exercise Program On Balance In Older Adults”, *International Journal of Current Advanced Research*, ISSN: O: 2319-6475, ISSN: P: 2319-6505.
- Martins, C, Guia, D, Saraiva, M, & Pereira, T 2020, “Effects of A Modified Otago Exercise Program on the Functional Abilities and Social Participation of Older Adults Living in the Community”, *J. Environ. Res. Public Health*, doi:10.3390/ijerph17041258.
- Munawarah, S, & Triariani, Y 2019, “Pengaruh Pemberian Senam Yoga Terhadap Keseimbangan Statis Pada Lansia”, *Jurnal Human Care*, E-Issn:2528-66510;Volume 4;No.2
- Negara, P, Kuswardhani, T, Irfan, M, Adiputra, N, Purnawati, S, & Jawi, M 2020, “Twelve Balance Exercise Lebih Efektif Dalam Menurunkan Risiko Jatuh Dibanding Otago Home Exercise Pada Lanjut Usia Di Banjar Tainsiat, Desa Dangin Puri Kaja, Denpasar, Bali”, *Sport And Fitness Journal*, E-Issn: 2654-9182 Volume 8, No.3.
- Nurmalasari, M, Widajanti, N, & Dharmanta, S 2018, “Correlation between History of Fall and Timed Up and Go Test in Geriatric”, *Jurnal Penyakit Dalam Indonesia*, Vol. 5, No. 4.
- Rudy, A & Setyanto, R 2019, “Analysis of Factors Affecting Risk Falls on Elderly”, *Jurnal Ilmiah Ilmu Kesehatan: Wawasan Kesehatan*, p-ISSN 2087-4995, e-ISSN 2598-4004.
- Susilo, W, Limyati, Y, Decky, G 2017, “The Risk of Falling in Elderly Increased with Age Growth and Unaffected by Gender”. *Journal of Medicine and Health* Vol.1 No.6.
- Ashar, P, Khasanah, U, & Maftuhah 2016, “Gambaran persepsi risiko jatuh pada lansia di Panti Werdha Budi Mulia”, Universitas Islam Negeri Syarifah Hidayatullah.