ISSN 1978-6743
E-ISSN 2477-3948
Jurnal Ilmiah Kesehatan
(Journal of Health Science)
Fakultas Keperawatan dan Kebidanan | Universitas Nahdlatul Ulama Surabaya

The Effect of Ankle Strategy Exercises on Static Balance in The Elderly

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ARTICLE INFORMATION

Received: April, 8, 2020
Revised: October, 26, 2020
Available online: February, 2021

KEYWORDS

Static Balance, Ankle Strategy Exercise, Time Up Go To Test

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A B S T R A C T

Decreased muscle strength is a musculoskeletal disorder in the elderly, resulting in slow movements and impaired physical mobility. Physical changes that occur in the elderly cause the risk of falling. This study analyzes the ankle strategy exercise's effect on static balance in the elderly at Regional Technical Implementation Unit (UPTD) Griya Werdha Surabaya. This study was Pre-Experimental with One Group Pre-Post Test Design. From the population, there were thirty-five respondents by simple random sampling. This study's independent variable was ankle strategy exercises with frequency three times a week within a month. The dependent variable was a static balance with the instrument Time Up Go (TUG) test. The authors analyzed the data with the Wilcoxon test. The study results showed a significant effect of the ankle strategy exercise on static balance in the elderly (p=0,000). The result showed a decrease in the number of elderly who have the high-risk of falling before the ankle strategy exercise (60% of elderly have a high risk of falling) and after the intervention (34% of elderly have a decreased risk of falling). The elderly should do the ankle strategy exercise independently or with assistant three times a week to improve their static balance and decrease their high-risk of falls.

INTRODUCTION

The Elderly will experience a physical decline condition characterized by less clear hearing, worsening vision, decreased muscle strength, musculoskeletal disorders resulting in a slow movement, and excessive body movement (Kurnianingsi et al., 2012). Musculoskeletal impairment plays a significant role in the risk of falling in the elderly (Sunaryo & Christian, 2016).

The physical changes condition in elderly would limit the independence in meeting daily needs and cause the risk of falling (Kurnianingsi et al., 2012). The balance disorders affect incidents of falls (Supriyono, 2015). Low balance is the cause of falls' risk (Nejc, Loefler, Cvecka, Sedliak Milan, & Kern, 2013).

Static balance is the ability to maintain postural stability or individuals' ability to sustain the center of gravity and the support base (Inggrid, 2016). Static balance describes as a standing position without any activity. An inactive or silent state is the prefix before the move occurs. This position needs a healthy balance base for the coordination of better movement and more target. Static position improvement may lower the risk of falling on the elderly while sitting or standing (Pristianto, Adiputra, & Irfan, 2016).

A previous study showed that in Indonesia, the injury prevalence due to falls at the age of 65-74 years old was about 67.1%, and 75 years old was approximately 78.2% (Balitbangkes, 2013). The falls among seniors living in the community increased from 25% at 70 to 35% after 75 years old (Kurnianingsi et al.,

https://doi.org/10.33086/ JHS.V14.I1.1521

2012). An initial survey conducted on September 1, 2018, in 10 elders at the Regional Technical Implementation Unit of Griya Werdha **(**UPTD Griya Werdha) Surabaya found three of seven seniors were at risk of fall incidents. Those elderly used aids and had an acute disease, such as hypertension, arthritis, and diabetes mellitus. The activities that often caused the elderly to fall were waking up immediately, standing up, and into the bathroom—injuries sustained by the elderly, often with bruises on certain parts of the body. The elderly made some efforts like handled on wall handrail while going down *(*Stainless Steel*).* The activities performed in the orphanage are usually gymnastics every morning.

Older people who have a risk of falling have daily activities with a range of dependency levels or lack physical activity (Tamher & Noorkasiani, 2009). Conditions with decreased visual ability, vestibular, and somatosensory will undoubtedly worsen the balance in the elderly, and their focus also gets impaired (Base of Support) (Pristianto et al., 2016). Besides, the musculoskeletal decrease condition also affects muscles and postural, which lead to the change of gravity center toward the focus in the elderly. The strengths of both lower and upper extremities will decrease over time. It causes the elderly to experience balance disorders often while standing and prone to falls (Pristianto et al., 2016).

There are two factors cause falls in the elderly. Intrinsic factors include walking disorders, weakness of lower extremities, joint stiffness, syncope. Extrinsic factors include poorly lit room light, slippery floors, tripping objects, dangerous holding places, lying down beds, or low squat toilets (Ashar, 2016).

The efforts that can reduce the risk of falling on the elderly are exercises using ankle strategy exercise (Widiarti & Fatarudin, 2018). Ankle Strategy Exercise is the first adjustment strategy to optimize balance through joint contractions (Hyun Choi & Jun Kim, 2015; Widiarti & Fatarudin, 2018). The ankle strategy exercise movements are the head and body forward, accompanying the forward shift in the middle of the mass. The head backward, and the body accompanies the change (Widiarti & Triyono, 2018). This study analyzes the Ankle Strategy Exercise on static balance in the elderly in UPTD Griya Werdha Surabaya.

METHOD

The study design was pre-experimental with One Group Pre-Post Test Design. The authors did this study on February-March 2019 in UPTD Griya Werdha, Surabaya. The populations were 42 people, and the respondents were 35 people with inclusion criteria: willing to be a research respondent with informed consent, able to participate in activities from start to finish, while the exclusion criteria, namely, the elderly who have heart disease, stroke, mental disorders, and dementia.

This study used a simple random sampling technique. The dependent variable was the ankle strategy exercise, and the independent variable was a static balance. The instrument utilized the Time Up to Go (TUG) test. The TUG test itself is a tool for screening falls in the elderly. The researchers gave Ankle

https://doi.org/10.33086/JHS.V14.I1.1521

Strategy Exercise three times a week for one month. The statistic test applied Wilcoxon Signed-Rank with a significance value α <0.05.

There was human ethics in selecting respondents, such as providing information about the research implementation, signing informed consent without mentioning names, and keeping all respondents' data confidential.

RESULTS

The univariate data analysis consisted of age, gender, occupation, education, and elderly activities.

Table 1 Distribution of Elderly Characteristics at UPTD Griya Werdha Surabaya (n=35)

Characteristics	Frequency	%
Age		
60 - 74 Years Old	23	65,7
75 - 90 Years Old	12	34,3
>90 Years Old	0	0
Gender		
Male	17	48,6
Female	18	51,4
Job		
Civil servants	0	0
Private Employees	4	11,4
Self-Employed	16	45,7
Housewives	12	34,3
Unemployed	3	8,6
Education background		
Elementary School	3	8,6
Junior High School	13	37,1
Senior High School	18	51,4
Diploma/Bachelor degree	0	0
Uneducated	1	2,9
Physical activity		
Often	15	42,9
Rarely	18	51,5
Never	2	2,9

Most of the elderly were 60-74 years old (62.9%), women (51.4%), self-employed (45.7%), education levels of high schools (51.4%), and rarely did physical/sporting activity (51.5%) (Table 1).

The bivariate data analysis includes the effect of static balance before and after the ankle strategy exercise.

Table 2 Description of Static Balance in Elderly at UPTD Griya Werdha Surabaya

No.	Category	Before		After	
		Amount	%	Amount	%
1.	No risk of falls	14	40	23	66
2.	High risk of falls	21	60	12	34
	Amount	35	100	35	100
Wilcoxon signed-rank test (p-value = 0.000)					

Table 2 shows the decreased number of respondents with a high risk of falls, from 21 respondents (60%) before the intervention to 12 respondents (34%) after the ankle strategy exercise. The Wilcoxon

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signed-rank statistical test (p-value=0.000) shows a significant effect of Ankle Strategy Exercise on the static balance in the elderly.

DISCUSSION

Static Balance before Ankle Strategy Exercise

The results showed that 21 older people (60%) were mostly at high risk of falls by measuring static balance with the TUG test. The Time Up and Go (TUG) test is a valid tool for screening falling on older people (Virtuoso, Gregório, de Medeiros, & Mazo, 2014). Static movement on the Time Up Go to Test measuring instrument is from sitting to stand or prefix before moving. This test is faster, simpler, and uses minimal tools. The Elderly will experience a physical decline characterized by less clear hearing, worsening vision, decreased muscle strength, and musculoskeletal disorders, leading to slow movement and excessive body movement (Kurnianingsi et al., 2012). Elderly who have a high dependency level and lack physical activity at risk of falling (Tamher & Noorkasiani, 2009).

Lack of physical activity will further decrease the physical ability of the elderly. Low postural muscle ability will disrupt the static balance in the elderly and lead to fall incident. Musculoskeletal impairment plays a significant role in the risk of falling in the elderly (Sunaryo & Christian, 2016).

The decrease in musculoskeletal function will also affect muscles and postural in the elderly. The change in posture affects the shift in the Center of Gravity in the elderly. The decrease of both lower and upper muscles causes the elderly to experience balance disorders often while standing and prone to falls (Pristianto et al., 2016).

The elder who is at high risk of falling is over the age of 74. Besides, physiological changes due to the increasing age will decrease alertness and limiting physical activity. Restrictions on physical activity will lead to atrophy or muscle weakness that disrupts balance (Achmanagara, 2012). Musculoskeletal disorders can weaken muscles, bones, and joints. It creates a low body balance, which is the cause of the risk of falling (Nejc et al., 2013). Lack of physical activity will further decrease the physical ability of the elderly. Low postural muscle ability in supporting the body will cause a static balance in the elderly to fall (Pristianto et al., 2016).

Factors that influence body balance are age, activity, musculoskeletal, and gender, affecting low static balance that causing a high-risk of falls. 60-70 years old seniors have decreased muscle strength in doing activities, so they experience muscle weakness. The female elderly have a lower level of balance and a higher risk of falls than males. It is associated with a decrease in the hormone estrogen in older women post-menopause. The higher the level of education also affects the balance of static, because the higher the level of education, the easier it is to perform the ankle strategy exercise well. Age, activity, musculoskeletal**,** and gender can cause static to unbalance.

https://doi.org/10.33086/JHS.V14.I1.1521

Static Balance after Ankle Strategy Exercise

This study result showed that 12 of 35 (34%) respondents had a decreased number of high-risk static balance. A previous study on 32 elderly showed that ankle strategy exercise reduced the number of seniors who had a high risk of falling, from 12 to 5 respondents (Widiarti & Triyono, 2018)

All physical activity requires body balance (Achmanagara, 2012). Physical activity restrictions can lead to atrophy or muscle weakness that interferes with body balance (Achmanagara, 2012). Physical activity can slow bone density loss and increase muscle size and strength. Physical activity can prevent the occurrence of falls in the elderly. It can carry out at leisure and leads to a person's ability to maintain flexibility, strength, and flexibility in the so-called physical exercise (Achmanagara, 2012). Improvement of the static position may lower the risk of falling on the elderly while sitting or standing (Pristianto et al., 2016).

This study results suggest that physical activity can improve static balance. Intense physical exercise can improve muscle strength in the elderly. Doing physical activity at least three times a week can help the elderly in improving balance. Physical exercise with sufficient intensity can affect muscles' size, strength, and capacity on the musculoskeletal system changes due to aging. Ankle Strategy Exercise will reduce the risk of falls in the elderly.

The Effect of Ankle Strategy Exercise on Static Balance in the Elderly

Based on the results, most respondents (60%) were at high risk of falls before the Ankle Strategy Exercise. While after the intervention, most of them (66%) were in the category of no risk of falls. The Wilcoxon test results get Z = -5,114 and p=0.000 and $\alpha = < 0.05$. When a p-value is lower than α, there is rejection in H_0 and acceptance in H_1. There was an effect before and after the intervention.

Prior research on 63 respondents showed no more improving static balance in undergraduate students in Physiotherapy Stikes' Aisyiyah, Yogyakarta. The analysis utilized a paired t-test before and after intervention with p=0.000 (intervention group) and p=0.025 (control group). Based on the complementary tests in both groups, hypothetical testing used data after treatment. Static balance variables in both groups using the independent hypothesis test of the t-test sample obtained p=0.625 (p>0.05) (Yuliana et al., 2014). It indicates an influenced ankle strategy exercise factor, such as age, activity, musculoskeletal, and gender. The ankle strategy exercise duration to improve the static balance in older people is three times a week for one month. This study's influenced factors were age, activity, how to do the right Ankle Strategy Exercise, and respondents' participation in ankle strategy exercise. Seniors who are active and adequately doing the ankle strategy exercise can improve static balance and reduce the high-risk of falls.

https://doi.org/10.33086/JHS.V14.I1.1521

CONCLUSIONS

There is a significant effect of ankle strategy exercise on the static balance in the elderly (p =0.000). The Frequency of ankle strategy exercise is three times a week to improve static balance and reduce the high-risk of falls in the elderly. Further research should consider adding a control group to evaluate the differences between intervention and control groups.

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