

THE EFFECTS OF ANKLE STRATEGIES EXERCISE AND TANDEM WALKING EXERCISE IN ELDERLY PEOPLE WITH DYNAMIC BALANCE DISORDER

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ABSTRACT

Introduction: The normal aging process affects all physiological processes in the elderly or that's called geriatric giants causing several problems, one of the loss of the ability is to maintain balance when walking.

Purpose : This study aims to determine The effects of ankle strategies exercise and tandem walking exercise in elderly people with dynamic balance disorder.

Methodology : Sixty elderly people participated in this study. They were separated into two groups with 30 participants in each group. First group were given ankle strategy and the second group were given tandem walking exercise. The balance test was used Time Up and Go Test (TUGT) and One Leg Standing (OLS) Test. The best TUG score and OLS (in seconds) of 3 trials in each condition was obtained for analysis.

Results : After six times a weeks during 4 weeks, there was increase dynamic balance ability value in elderly people. The result test using Paired Samples t-test in 1st group showed $p = 0.000$ ($p > 0.05$) and in the 2nd group showed $p = 0.000$ ($p > 0.05$) meaning that both treatments given to 1st and 2nd group had an effect on the balance improvement in elderly people. Therefore, no significant difference between the two groups.

Originality : There were significant increase in the dynamic balance ability of elderly people after routinely getting ankle strategy exercise and tandem walking exercise after six times in a weeks during 4 weeks.

Keywords : Aging Process, Dynamic Balance, Time Up and Go Test, One Leg Standing Test, Ankle Strategy Exercise, Tandem Walking.

INTRODUCTION

According to the World Health Organization (WHO), the elderly is the closing period in a person's life span starting from the age of 60 years until death, marked by physical and psychological changes that are decreasing. Based on the results of

the annual Susenas in 2016, the number of elderly people in Indonesia reached 22.4 million people or 8.69% of the total population. Meanwhile, in 2018 the number of elderly is estimated to reach 9.3% or 24.7 million people and it is estimated that in 2025 the number will reach 36 million people (Depkes, 2018).

Normal aging affects all physiological processes in the elderly which causes several degenerative problems including hearing loss (Presbycusis), decreased visual acuity (presbyopia), decreased muscle mass and muscle strength, changes in the body's immune system, urinary system that is not sterile and uncontrolled, disease cardiovascular disease, hypertension, cancer, osteoarthritis, diabetes mellitus, osteoporosis, cognitive impairment (short term memory loss), alzheimer's disease (dementia), depression, mobility disability, decreased walking speed and falls.

It is known that 30% of people aged 65 years and over experience one or more falls each year, and this percentage increases to 40% after the age of 75 years (Schwenk et al, 2013). In Indonesia, a third of the total elderly are in the risk group for falls which can result in severe injuries and even death (Kemenkes RI, 2013). 31% - 48% of the elderly fall due to balance disorders (Kusnanto, 2007).

The risk of falling increases with age. The aging process affects the postural control system. Causes of poor postural control in the elderly have been known such as degeneration of the sensory system (vestibular, visual and proprioceptive), musculoskeletal (decreased muscle strength and changes in activation patterns) to be the biggest factors affecting balance in the elderly.

Balance is the ability to gather information through the sensory and proprioceptive systems related to the position of a person at rest or in motion to produce appropriate motor responses to control body movements. When this ability decreases, due to disease and the normal aging

process, the risk of falling increases. Postural stability or also called balance, is the ability to control the center of mass in relation to the Base of support (BoS) (Baris et al, 2019; Shumway-Cook and Woollacott, 2012).

Exercises that can be done to improve balance skills in the elderly are Ankle Strategy exercise and Tandem Walking. Ankle joint strategy is important for the body's balance strategy. During walking, the Ankle joint absorbs the impact of Ground Reaction Force (GRF), supports body weight, and propels the lower leg. The main function of the ankle joint is to provide balance control against postural disturbances, shock absorption during gait, and lower extremity movements. Ankle Strategy and Muscle Synergy are related to the first pattern to control the postural sway. Ankle Strategy returns the CoM to a stable position through body movements centered mainly around the ankle joint (Shumway-Cook and Woollacott, 2012).

Ankle Strategy Exercise is carried out in several movements, namely anterior, posterior, lateral right and lateral left. In the Posterior Sway response, the normal muscle synergistic response to this strategy activates the tibialis anterior muscle, the quadriceps muscle followed by the abdominal muscles. The Anterior Sway activates the gastrocnemius, hamstring and trunk extensor muscles. In the lateral sway response, the head moves to the right and left, and the body accompanies a sideways shift in the middle of the body mass. In this position activates the vastus medialis muscle of the right upper leg, sinistra and the vastus medialis muscle of the left upper leg.

Tandem walking exercise is one of the exercises to improve proprioception that plays a role in informing motion precision and balance which is influenced by several components of balance, namely information systems (including visual, vestibular and somatosensory), synergistic postural muscle responses, muscle strength, adaptive systems, and joint range of motion. The purpose of proprioceptive training in tandem walking alone is to retrain afferent pathways to develop the sensation of joint movement and activate motor activity in the central nervous system and to inform the precision of muscular reflexes that contribute to the formation of dynamic joint stability.

Balance research can be measured using the Timed Up and Go Test (TUGT) and One Leg Standing (OLS) Test score. The timed up and go test is a sensitive (87%) and specific (87%) measure to identify elderly people who are prone to falls. This test correlates well with other, more detailed scales, but is faster and easier to perform (Salzman, 2010). While the One Leg Standing (OLS) test is one of the tests used to identify

balance disorders and the risk of falling by assessing postural stability in a static position.

Based on the explanation above regarding the risk of falling in the elderly caused by balance disorders, therefore the author wants to carry out ankle strategy exercise and tandem walking exercise management in the elderly with dynamic balance disorders.

LITERATURE REVIEW

The management of ankle strategy exercise and tandem walking exercise in this case study is strengthened by several relevant previous research results conducted by Wardhani et al, (2020) with 30 participants who were divided into 2 treatment groups, namely ankle strategy exercise and balance exercise for 4 weeks, tested with paired sample T-test for group 1 p value = 0.000 ($p < 0.05$) with a TUGT value with a mean of pre-14.89 \pm 0.75 and post-11.89 \pm 0.59 which means there is a significant effect on group with the provision of ankle strategy exercise to increase dynamic balance in the elderly.

Meanwhile, in Widarti's research (2018) with 32 participants before the ankle strategy exercise was carried out, the results showed that as many as 20 elderly people did not have a risk of falling and 12 elderly people did not have a high risk of falling, after the ankle strategy exercise was carried out, it was found that as many as 27 elderly people did not risk of falling and 5 elderly people have a high risk of falling.

Riyanto et al, (2019) conducted a study with a sample of 20 people, ankle strategy exercise and tandem walking were administered 3/7 days for 4 weeks, the results of the test of the effect of two groups, namely ankle strategy exercise $p < 0.05$ ($p = 0.000$), tandem walking $p < 0.05$ ($p = 0.000$) and the results of the different effects between the two groups $p < 0.05$ ($p = 0.000$) with an average of 2.726 indicate that the application of ankle strategy exercise and tandem walking in the elderly is more effective in improving balance dynamic elderly.

Another study conducted by Valentin et al, (2016) conducted a study with 20 participants with the application of tandem walking exercise and one legged stance, after examination before and after exercise using TUGT obtained significant test results with p value = 0.000 in group 1 and $p = 0.001$ in group 2 with the difference in the test results increasing balance $p = 0.009$, it can be concluded that the provision of tandem walking exercises is better in one legged stance exercise to improve dynamic balance in the elderly.

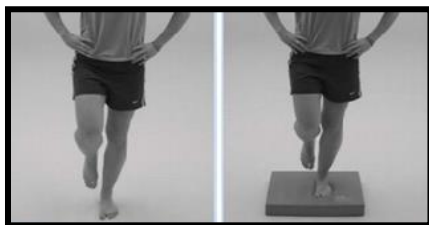
METHODOLOGY

This research has been carried out in this research was conducted at the Harapan Kita Elderly Social Institution, Sukarame District, Palembang City. This study was conducted 6 times a week for

4 weeks. This research is pre-experimental using a comparative approach pretest and posttest design which aims to determine the effect of strategy ankle exercises and tandem walking exercises in the elderly with dynamic balance disorders.

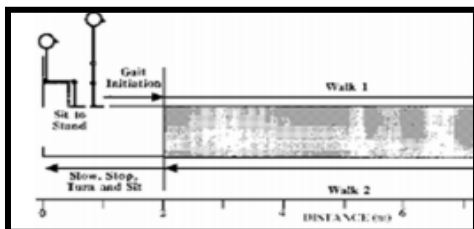
The participants in this study were the elderly, both women and men, who resided in our hope social institutions, provided that they had met the research criteria, namely at least 60 years of age, had balance disorders and no musculoskeletal disorders and were willing to be participants in this study.

Then measure the balance using the One Leg Standing (OLS) Test and the Time Up And Go Test (TUGT). In the OLS test measurement, participants were asked to stand on one leg, the time was calculated by the researcher using a stopwatch and recorded.



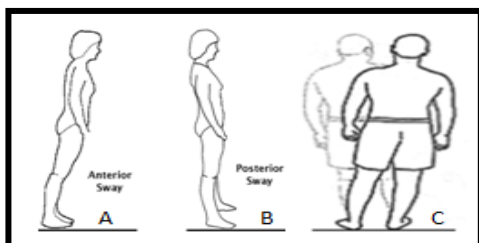
One Leg Standing Test
(Bell, 2014)

While in the TUGT measurement, participants will be asked to walk on a 3 meter long track with the participant's initial position sitting then walking and turning back to its original position while the researcher calculates the length of time it takes participants.



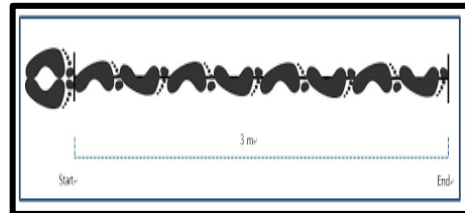
Time up and go test
(Jacobs and Fox, 2008)

Ankle strategy exercise is done by focusing body mass on the ankle in 4 movements, namely anterior sway, posterior sway and lateral dextra sinistra sway. With 8-10x reps each movement.



A) Anterior Sway, B) Posterior Sway,
C) Lateral Sway dextra sinistra.
(Hyunkim, 2015; Blum, 2006)

Tandem walking is done with the participant's initial position sitting at the beginning of the track as far as 3 meters or 10 steps that the cone has prepared as a final sign at the end of the track, then walking in a tandem pattern (heel-toe-heel) until it turns back to the starting position.



Tandem walking
(Choi, 2015)

Analysis of the data used is univariate analysis conducted to analyze the variables of age, and gender of the participants. While the bivariate analysis of the paired t test was carried out to determine the effect of strategy ankle exercises and tandem walking exercises in the elderly with dynamic balance disorders.

RESULTS AND DISCUSSION

The elderly who participated in this research were 60 elderly who were divided into 2 groups, each group of 30 elderly. Group 1 was given ankle strategy exercise, while group 2 was given treatment in the form of walking tandem exercise.

Characteristics of Participants Gender and Age

The variables of sex and age of participants were analyzed by univariate. It can be seen in table 1 below.

Table 1.

Characteristics of Respondents Based on Gender of Participants

No	Variable	Frequency	
		Klp 1	klp 2
1	Man	14	12
2	Woman	16	18
Total		30	30

Table 2.

Characteristics of Respondents Age of Participants

No	Variable	Frequency	
		Klp 1	klp 2
1	60 – 65	18	21
2	66 – 70	5	3
3	71 – 75	4	6
4	76 - 80	3	-
Total		30	30

Most of the participants who participated in this study were female elderly. While the elderly who

participated the most in this study were the elderly in the age range of 60-65 years. While the least elderly are in the age range of 76-80.

Hypothesis testing

Table 3

One Leg Standing Test Evaluation			
Evaluation	Pre	Post	Difference
1	01.75	02.43	0.68
2	01.95	02.58	0.63
3	01.11	01.87	0.76
4	01.54	02.58	1.04
5	01.63	02.39	0.76
6	02.25	02.64	0.39

Table 4

Evaluation Time up and go test			
Evaluation	Pre	Post	Difference
1	26.36	21,12	5.24
2	33.97	29.38	4.59
3	30.41	26.47	3.94
4	23.40	21.93	1.47
5	24.30	19.63	4.67
6	22.51	18,50	4.01

Table 5

Hypothesis testing			
	Group	α	
Pre and Post One Leg Standing Test	1	0.004	
Pre and Post Time up and go test	2	0.004	

The results of the analysis using the Wilcoxon test found a significance value of 0.004 < value: 0.04 so that there was a difference in the effect of giving pre and post ankle strategies and also pre and post giving interventions in the form of one leg standing to the elderly with balance disorders.

Table 6

Different Intervention Effect			
Variable	Group	mean	α
Balance Value	1	6.10	0.000
	2	14.90	

The results of the analysis using the test Paired Samples t-test found the significance value 0.000 ($p > 0.05$) it means that there is no significant difference between giving ankle strategy and walking tandem exercise in the elderly with dynamic balance disorders.

CONCLUSION AND RECOMMENDATION

The results of this study are in accordance with Yuliana's research (2014), which states that the ankle strategy exercise is able to maintain body

posture so that it is better suited to the anatomical position of the body. This happens because the ankle strategy exercise is an exercise with controlled and centered movements in the ankle so that the postural muscles of the body from distal to proximal will be activated optimally.

Nugrahani, (2014) concluded that giving tandem walking exercise has an effect on improving balance in the elderly. Giving tandem gait can improve balance, besides tandem gait is one of the exercises that aims to train posture or body position, control balance, coordination, and body movements.

Ankle strategy exercise and Tandem walking can be applied to participants with balance disorders. Regularly performing ankle strategy and tandem walking exercises for individuals with dynamic balance disorders can significantly reduce the risk of falling, which can be seen from the value of the Time up and go test (TUGT) and One Leg Standing (OLS) Test.

The results of this study are expected to be a reference in developing the science of Physiotherapy in developing knowledge, especially in the scope of Geriatric Physiotherapy.

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