

## Effect Of Balance Exercise and Tandem Stance Interventions to Improve Balance in the Elderly

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### ABSTRACT

Elderly people are identified with various declining health conditions, especially physical health conditions. The health conditions of the elderly decline along with increasing age, which will affect the quality of life of the elderly. The worsening health condition of the elderly is contrary to the elderly's desire to remain healthy, independent, and able to carry out activities. Balance disorders are something that often occurs in the elderly. Balance is the basis of functional human movement for both children and the elderly. Weakened lower extremity muscle strength in the elderly can cause slow movement, short steps, feet not being able to move firmly enough and being more easily swayed so that balance becomes disturbed. **Methods:** This research is a pre-experimental research with a one-group pre-test & post-test design. The sample population is elderly people with balance disorders in Pekanbaru nursing homes. Collecting patient data using the Berg Balance Scale (BBS) pre-test and post-test. During the research period, the total sample was 22 respondents the sampling technique used was the cluster sampling technique, namely the selection of samples referring to groups with certain predetermined characteristics, namely those who met the inclusion criteria. **Result:** The results of the study showed an increase in balance before & after the intervention showing a significant change from the p value = 0.000 with a confidence level of 95%. Based on the Paired Sample T Test with a value of  $p = 0.000 < (0.05)$ , it shows that there is an increase in balance in the elderly. Conclusion: It was concluded that the increase in balance before & after giving balance exercise and tandem stance showed an increase in balance in the elderly after being given with a frequency of 3 times a week for 1 month.

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### AUTHORS' CONTRIBUTION

- Conception and design of the study;
- Acquisition of data;
- Analysis and interpretation of data;
- Manuscript preparation;
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## INTRODUCTION

An elderly person is someone who has reached the age of 60 years. The process of aging in human life is a natural thing, and all people who live long will experience this process, how fast or slow the process is depends on each individual. Human development starts from infancy, childhood, adolescence, adulthood, and old age and finally reaches the old age phase at the age of more than 60 years. The aging process is

irreversible and multifactorial, including genetic factors, and is associated with physiological and morphological changes in the musculoskeletal system, especially in the elderly. All these changes contribute to increasing the risk of falls in elderly people, postural imbalances are a major determining factor in the occurrence of these events and cause new needs for public health attention (branch *et al*, 2022). The elderly undergo a life process that has more time to adapt to various environmental stresses, which can weaken the body's abilities and become a process of degeneration, which will cause deterioration and changes in all systems. Especially changes in the neuromuscular system will affect functional changes in muscles, namely a decrease in elasticity, speed, and reaction time. According to WHO, the age limits for the elderly include middle age between 45-59 years old, elderly between 60-74 years old, old age between 75-90 years old, very old age (Very Old) aged 90 years and over (Prabowo *et al*, 2020).

Balance is the ability to maintain body balance in various positions. Balance can also be interpreted as the relative ability to control the body's center of mass or center of gravity, base of support (Setiawan, 2018). Balance involves various movements in each body segment, assisted by the musculoskeletal system and fulcrum. The ability to balance body mass with the fulcrum will enable humans to carry out activities effectively and efficiently. Balance disorders in the elderly are caused by degenerative processes and weakening of sensory and musculoskeletal functions (muscle strength, joints, soft tissue) causing loss of balance in the elderly, which will affect the body's center of gravity in the support plane. Balance problems will have an impact on decreasing daily activities, the risk of falls in the elderly, lack of activity so that it directly affects social or work activities and results in reduced levels of confidence in the elderly (Frederic *et al*, 2022).

Components of balance; Sensory information system (Visual system) Visuals play an important role in the sensory system. Cratty & Martin (1969) in Irfan 2010, stated that balance develops with age, the eyes will help to focus on important things to maintain balance, as well as being a monitor of the body during static or dynamic movements. Vision is also the main source of information about the environment and the place we are in, vision plays an important role in identifying and adapting movements to the environment where we are. Visible vision When the eye receives rays coming from objects along the line of sight. Visual information allows the body to adapt or react to changes in the field of activity, thus providing synergistic muscle work to maintain body balance (Avelar *et al*, 2016). The vestibular component is a sensory system that plays an important role in balance. The vestibular receives input (input) from the receptors of the labyrinth, resticular formation and cerebellum. The output from the vestibular nucleus goes to motor neurons through the spinal cord, especially to motor neurons that innervate proximal muscles, muscle groups in the neck and back (postural) muscles. The vestibular system reacts very quickly so it helps maintain body balance by controlling postural muscles (Watson *et al*, 2008). The somatosensory system conveys information about the position and movement of

body parts, and the body relative to each other and to supporting surfaces. dominant input to maintain balance when the support surface is firm, flat, and fixed. The effect of aging on proprioception is that a decrease in muscle mass and strength is one of the prominent characteristics of natural aging. Loss of strength can limit daily living activities and movement, increase the likelihood of falls, and may even result in loss of mechanoreceptors which can further reduce proprioception and balance (Umah, 2018).

Factors That Influence Balance; 1) The center of gravity is the center of gravity, which is at the center of an object. The function of the center of gravity in humans is this point which always supports body weight so that the body is in a state of balance. 2) Line of Gravity (LOG), According to Yan *et al*, (2019) states that the line of gravity (LOG) is an imaginary line that is vertical through the center of gravity and the center of the earth. 3) The base of support (BOS) is the part that is connected to the support surface. When the line of gravity is exactly at the fulcrum, the body is in balance.

## METHODS

This research is a pre-experimental research with a one-group pre-test & post-test design. The sample population is elderly people with balance disorders in Pekanbaru nursing homes. Collecting patient data using the Berg Balance Scale (BBS) pre-test and post-test. During the research period, the total sample was 20 respondents the sampling technique used was the cluster sampling technique, namely the selection of samples referring to groups with certain predetermined characteristics, namely those who met the inclusion criteria. Inclusion criteria 1) Elderly aged 45-65 years. 2) Willing to be a research subject from the beginning to the end of the research and agree by signing an informed consent. Exclusion criteria 1) Elderly people who refuse to participate in this research, 3) Elderly people who have participated in other exercise interventions, 4) The sample is not willing to be a research subject.

### Hypothesis Study

There is an influence of providing balance exercises and tandem stances on improving the balance of the elderly.

### Data Analysis

1. Test Statistics descriptive
2. Test data normality, using test Shapiro Wilk to know if the data is normally distributed ( $p > 0.005$ ) or not normally distributed ( $p < 0.05$ ).

Test analysis comparative ( test hypothesis ), result test the normality of the data shows that the data is normally distributed then used parametric statistical test that is test paired t samples and test independent t sample. If the results test the normality of the data indicates this data is not normally distributed then use the non-parametric statistical test that is test, Wilcoxon.

## RESULTS AND DISCUSSION

**Table 1.**

Frequency and percentage Age Based on Category Age Respondents

No	Age Group (years)	F	%
1.	45-50	4	20.0 %
2.	51-55	2	10.0 %
3.	56-60	5	25.0 %
4	61-65	9	45.0 %
<b>Total</b>		<b>20</b>	<b>100 %</b>

The data above explain that the frequency of patients on group treatment aged 45-50 years amounted to 4 people (20.0%), aged 51-55 years there were 2 people (10.0%), aged 56-60 years as many as 5 people (25.7%), and patient age 61-65 years a number of 9 people (45.0%). With these results, analysis shows that ages 61-65 are the group age with a total sample the most namely 9 people (45.0%).

**Table 2.**

Analysis Pre and Post-test Each Group

Groups	Mean	Std Deviation	Paired Sample T-Tes		
			Paired Sample Correlation	Sign	P-Value
Group 1 Pre – Post	1.60	0.693	0.437	0.162	0,001
Group 2 Pre –Post	2.50	0.602	0,268	0,398	0,001

**Table 2**, the Paired Sample Correlation showed on Group 1 and Group 2 is significant  $< 0,05$  which means there were differences in Berg Balance Scale (BBS) scores before and after in each group. To determine the effect of intervention in both groups on BBS scores, a difference test analysis was carried out on scores after treatment between the two groups as shown in **Table 3**.

**Table 3.**

Analysis of difference tests after treatment in the two groups

Groups	Mean	Std Deviation	Paired Sample T-Tes	
			Paired Sample Correlation	P-Value
Group 1 Post	2.40	0.894	0.05	0.028
Group 2 Post	1.40	0.483		

Table 3, the result showed that P-value  $< 0.05$  means there were significant effects in both groups after the intervention.

Balance exercise was provided nine times over three weeks regularly to the respondents with a risk of falling. The results showed that after providing balance exercise, the muscle strength score was significantly increased, although still in the category of less muscle strength. According to the theory put forward by PN (2014), the balance exercise in an elderly person could improve the balance of the body via speed reaction to correct body posture during movement or muscle contraction.

The results of this research were supported by the theory of Hall & Guyton (2014) who explains when the muscle is being contracted, the contractile muscle protein synthesis takes place much faster than the devastation speed, resulting in filaments

actin and myosin that growing progressively in the myofibrils. Then myofibril itself will break down in each muscle fiber to form the new myofibrils. Increasing the number of additional myofibrils causes muscle fibers to become hypertrophic. In muscle fiber, hypertrophy is experiencing an increase in fosfagen metabolism system components, including ATP and phosphocreatine. This increased the ability of aerobic and anaerobic metabolic systems that can boost energy and muscle strength. Increased muscle strength is what makes the elderly more vigorous in supporting the body and movement. The theory of Sherwood (2015) stated that during low to moderate exercise, muscle cells were able to form enough ATP through oxidative phosphorylation to balance the energy needs in a moderate level of contractile device for a long period.

The results of research conducted by Frederic, et al which was conducted on the elderly concluded that elderly people who do regular balance exercises will reduce the risk of falling. (Frederic & Al Haris, 2022). The results of other studies also revealed that there is a good postural balance as a result of routine balance exercises that will reduce the risk of falling in older people (Muladi, 2022).

In research conducted by LKS Pelita Hati Sigi Regency, one of the changes that were measured And analyzed before and after training balance exercise strategy combination tandem walking exercise is the change in the balance against the receipt risk of falling with the use Berg Balance Scale (BBS). Balance exercise strategy which is combined with tandem walking exercise is a capable exercise improving the level of balance, the balance begins when all the receptors in the body like eyes, hearing, skin, muscles, and joints receive external stimulation in the form of sensory input and then transmit it to the body columna vertebral column leads to the vestibular nucleus which is in the brain stem so that action will be carried out the process of receiving information that will produce a motor output so that it becomes a movement in response to received sensory stimuli who will be oriented towards adjustment body movements will produce an optimal balance that will be produced if the mechanism is running with optimal (Nuraini et al, 2017).

## CONCLUSION

The application of Balance exercise and tandem stance is a conservative intervention in the treatment of balance disorders in the elderly at the level of Severe Berg balance scale (BBS). The addition of balance exercise and tandem stance to Effectively improves static and dynamic balance abilities in conditions of balance disorders in the elderly.

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