

# THE EFFECT OF RANGE OF MOTION EXERCISE AT LOWER LIMB TO ELDERLY POSTURAL BALANCE IN POSYANDU ALAMANDA 99 JEMBER LOR VILLAGE JEMBER DISTRICT

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## ABSTRACT

**Background:** Elderly with imbalance is one of the occurrence falls that lead to injury. Range of motion exercises is a cycle activity that improve the function of the limb and mobilization. This study aimed to the effect of range of motion exercise at lower limb to elderly postural balance in Posyandu Alamanda 99 Jember lor Village District Jember. **Methodology:** The design of this study was pre experimental, 16 elderly over 60 years as sample of this study by taking simple random sampling technique. Postural balance assessment done every sunday for three weeks. Analysis of the data using ANOVA test. **Result:** The results of data analysis showed p value of 0.002 means there was a significant increased in the value of body balance after active range of motion exercise at lower limb. The result of Post Hoc Test showed an increase in the average balance value of the most significant after 3 weeks of exercising. **Conclusion:** Advice of the results study are range of motion exercises at lower limb can be performed in the elderly among community and can be taught through elderly activities in integrated health service post.

**Keywords:** *Range of motion exercise, postural balance, elderly*

## INTRODUCTION

The main objective is to maintain the elderly health care elderly to be independent in a safe environment. One of the problems of nursing is to prevent accidents, injury, or other trauma and prevent the spread of infection and to maintain good body mechanics and prevent and repair the deformity (Potter, P.A. & Perry, A.G, 2005). Safety and security for the elderly is a necessity that is as important as the basic physiological needs, such as food and water (Stocklager, Jaime & Schaeffer, Liz, 2008). Elderly decreased muscle arrangement so that a decrease in strength and muscle contraction, elasticity and flexibility of muscles, as well as the speed and reaction time.

Decline in function and decreased muscle strength will lead to a decrease in the ability to maintain postural balance or the balance of the body of the elderly thus increasing the risk of falls in the elderly. Fall and its consequences is a major health problem in the elderly population (Sturnieks DL *et all*, 2008) . 31% - 48% of elderly falls due to impaired balance (Sigit, 2005). WHO study Bearo in Central Java to the 1203 population of elderly people over 60 years to get the incidence fell by 2.5% (Kusdiantomo S& Stefanie, 2006).

East Java Province in 2008 was the province with the second in Indonesia with the highest number of elderly people is 3.2 million after the Yogyakarta Province (Yayasan Gerontologi Abiyos, 2009). Jember is a regency in East Java which has the second highest number of elderly after Malang (Nalindra Prima,2010). The number of elderly in Jember is 128 485 elderly people with information to as many as 70 561 elderly elderly women and elderly men as much as 57 924 elderly (Dinas Kesehatan Kabupaten Jember, 2011).

*Puskesmas Patrang* a health center which has the highest number of elderly is 7,871. Results of preliminary studies on get that village Jember Lor Posyandu the elderly active IHC IHC 99. Alamanda Alamanda have data members each month. IHC Alamanda 99 is Posyandu are active and have a number of elderly as much as 208 (Dinas Kesehatan Kabupaten Jember, 2011). Based on the statement of midwives and cadres responsible member of IHC elderly get the most health problems are hypertension and complaints stiffness in the lower extremities, there are 5 people who've fallen elderly (Posyandu Alamanda 99, 2013.).

Risk of falling incidence can be reduced by improving the balance (Singh, M. A. F,

2000). Physiology of the most important in maintaining the balance is proprioception. Proprioception is the ability to sense the position of the joints or body parts in motion (Brown, S.P., Miller, W.C., & Eason, J.M, 2006). Part responsible for proprioception are generally located in the joints, tendons, ligaments and joint capsule while the pressure sensitive receptors located on the fascia and skin (Riemann, B.L. & Lephart, S.M, 2002). Range of motion exercises are exercises in the joints with the aim of increasing the range of motion, improve muscle tone and prevent joint stiffness. In addition to muscle strength, joint motion also improve balance (Kyung Bok, Soo. Heon Lee, Tae. Sook Lee, Sang, 2013). Based on their analysis, researchers interested in conducting research on the influence of lower extremity range of motion exercises to balance the body's elderly Posyandu Village Alamanda 99 Jember lor Jember.

## METHOD

This study uses a pre experimental design by using the One Group Pre-test Post-test Design. The population in this study were elderly members of Posyandu Alamanda 99 lor Jember Regency Village over the age of 60-80 years amounted to 57 people. The sampling technique using simple random sampling technique.

Sampling is done on elderly people who meet the criteria for inclusion and exclusion criteria of 16 people. The inclusion criteria of this study are elderly aged 60-80 years, and willing to become respondents research by completing the informed consent sheet. The exclusion criteria of this study is a stress fracture, joint injury, and muscle injuries have vision and vestibular problems and had a history of heart problems and respiratory problems, as well as elderly people with contractures were not caused by complications of a stroke, for example burns, bursitis, tendinitis.

This research was conducted in the village of Jember lor Jember Regency, held in March 2014 through May 2014. Data collection tool used in this study is the assessment sheet Tinneti body balance test with the value range of 0 to 28 and a blood pressure cuff mercury sphygmomanometer in units mmHg. Processing and analysis of data by SPSS using ANOVA statistical test with a confidence level of 95% ( $\alpha = 0.05$ ).

## RESULT

### Characteristics Of The Elderly

The results of the analysis of the characteristics of the elderly describe the distribution of the elderly by age, sex, blood pressure, ethnicity and employment of the elderly. These characteristics relating to matters that affect range of motion, indications and contraindications of the lower extremity range of motion exercises.

Table 1. Average Elderly by Age And Blood Pressure In *Posyandu Alamanda 99 Jember Lor* village

Variabel	Mean	Standard Deviation	Minimum - Maximum	95% CI
Age	65,31	3,57	60 - 73	63,41 - 67,22
Systolic Blood Pressure (mmHg)	131,88	10,46	110 - 150	126,30 - 137,45
Diastolic Blood Pressure (mmHg)	82,50	7,74	70 - 90	78,37 - 86,62

Table 1 illustrates the distribution of the elderly by age, found the average age is 65.31 years old and the elderly are at the youngest age range is 60 years old and the oldest was 73 years old. Unknown interval estimate obtained 95% believed that the average age of the elderly was 63.41 years to 67.22 years, meaning that most of the elderly people who follow the practice is elderly aged between 63 years to 67 years.

Table 1 illustrates the results of a blood pressure measurement prior to the elderly lower extremity range of motion exercises. The measurement results discovered that the average blood pressure of elderly is 131.88 mmHg in systolic pressure and 82.50 mmHg, the average blood pressure within normal range. Minimum and maximum values of blood pressure is a systolic pressure of 110-150 mmHg and 70-90 mmHg in diastolic pressure, the minimum and maximum pressure range indicates the blood pressure is in the range of normal to high blood pressure degree 2 so that the elderly can be given lower extremity range

of motion exercises appropriate indications and contraindications lower extremity range of motion exercises.

Table 2. Frequency Distribution of the Elderly by Gender, Ethnicity, And Work In IHC Alamanda 99 Jember Lor village Jember

Variabel	Frequence (Peoples)	Percentage (%)
<b>a. Gender</b>		
1. Male	4	25,00
2. Female	12	75,00
<b>Total</b>	<b>16</b>	<b>100,00</b>
<b>b. Ethnicity</b>		
1. Java	5	31,20
2. Madura	11	68,80
<b>Total</b>	<b>16</b>	<b>100,00</b>
<b>c. Occupation</b>		
1. No Work	10	62,50
2. Entepreneur	4	25,00
3. Teacher	1	6,25
4. Janitor	1	6,25
<b>Total</b>	<b>16</b>	<b>100,00</b>

Table 2 illustrates the frequency distribution of gender, ethnicity, and occupation. Characteristics of elderly people who follow the lower extremity range of motion exercises are the majority of the elderly is a woman 12 people (75%). The majority are

Tabel 3. Rerata Nilai Keseimbangan Lansia Di Posyandu Alamanda 99 Kelurahan Jember Lor Kabupaten Jember

Variabel	Me an	Standa rt Deviat ion	Minimu m- Maximu um	95% CI
Pretest	22, 18	2,13	19-25	21,04- 23,32
1 <sup>st</sup> Week	22, 50	1,96	19-25	21,45- 23,54
2 <sup>nd</sup> Week	22, 81	1,60	20-25	21,95- 23,66
3 <sup>rd</sup> Week	24, 62	1,58	22-27	23,77- 25,47

ethnic Madurese many as 11 people (68.8%), and distribution of predominantly elderly seniors who are not working as many as 10 people (62.5%).

In addition to the tribe of Madura, there are other parts of Java elderly. Most of the elderly is also still working with this type of work are teachers, janitors, and entepreneur.

### Elderly Body Balance Values Before and After Exercise Range of motion of lower extremity

Table 4 shows the distribution of the balance value of the elderly body before exercise had an average of 22.18, meaning that the risk of falls being categorized. The highest body balance value is 25. The balance of the body of the elderly mostly elderly have a balance value between 21 and 23, this range includes the category of moderate risk of falling.

Table 5 illustrates the distribution of respondents value balance of the body during exercise active range of motion of the lower limb, had an average balance of the body week 1 to week 3. Results after 1 week training obtained an average value of the balance of 22.50. Most are on the equilibrium value of 21 to 23, this value is included in the category of moderate falls.

Results of workout two weeks is obtained an average value of the balance of 22.81. Most are on the equilibrium value 22 to 24, this value is included in the category of moderate risk of falling.

Exercise for 3 weeks obtained an average value of the balance of 24.62. Most are on the equilibrium value of 24 to 25, the value is included in the category of low risk of falling.

### Comparison of Average Value Balance Body Before And After Exercise Lower Extremity Range of Motion

Table 4 illustrates the comparison of the average value of the balance of the body after exercise 1 week, 2 weeks, and 3 weeks. Based on the comparison p value, known p value of the equilibrium value of exercise 1 week and 2-week exercise does not have a sig. (F statistically) significant. Sig. (F statistically) significant resulting in training after three weeks, p value the 3rd week of the pretest 0,007, week 1 amounted to 0,030 and the 2nd week of 0.109.

Table 4. Test Results Bonferroni Post Hoc Test Value Balance From Pretest To 3 Weeks Exercise Range of Motion In IHC Alamanda 99 Jember Lor village Jember

Variabel	Durations	Diferrence Mean	P value
Pretest	1 Week	-.31250	1.000
	2 Weeks	-.62500	1.000
	3 Weeks	-2.18750*	.007
1 <sup>st</sup> Week	Pretest	.31250	1.000
	2 Weeks	-.31250	1.000
	3 Weeks	-1.87500*	.030
2 <sup>nd</sup> Week	Pretest	.62500	1.000
	1 Weeks	.31250	1.000
	3 Weeks	- 1.56250	.109
3 <sup>rd</sup> Week	Pretest	2.18750*	.007
	1 Week	1.87500*	.030
	2 Weeks	1.56250	.109

## Discussion

### Characteristics of the Elderly Members IHC Alamanda 99 Jember Lor village Jember

Factors affecting Range Of Motion are age, gender, culture and activity (Rubenstein, Laurence Z. & Josephson, Karen R, 2006). Based on the characteristics of the respondent discovered that the average age of respondents was 65.31 years of age, meaning that on average respondents in the elderly undergoing degeneration, one condition of the joints and muscles. Genesis falls identified as a problem that occurs in the elderly. Based on the findings in the United States, deaths due to falls occur in 13% of the population age 65 years, suggesting a syndrome geriatric primary, by 40% in this age group who live in the house will fall at least once each year, and 1 in 40 of them will enter hospitalisasi (Pudjiastuti, 2003).

Characteristics of respondents who mostly do not work as many as 10 people (62.5%) can describe the condition describe the activities of the elderly less maximizes range of motion than the elderly who are still actively working. Muscles that are rarely trained will atrophy, especially in the elderly undergoing degeneration in the muscular system. Elderly decreased muscle arrangement so that a decrease in strength and muscle contraction,

elasticity and flexibility of muscles, as well as the speed and reaction time. The impact of changes in the composition of the muscles can reduce muscle strength (Petrella RJ, Chudyk A, 2008).

Most of the elderly are as many as 12 elderly women (75%). Gender affects the range of motion. Women have better elasticity joints than men. However, women after menopause bone demineralization because of a decrease in the hormone oxytocin. Bone demineralization results in women more difficult to maintain a good posture, making it more at risk for falls.

Active range of motion exercises that do the elderly can be done independently of the elderly who do not have heart disease, lung, and bone and muscular systems. Based on the research results can be noted that elderly blood pressure average is 131.88 mm Hg in systolic pressure and 82.50 mmHg, the average blood pressure within normal degree. The maximum value of the systolic blood pressure is 150 mmHg and 90 mmHg in diastolic pressure, the maximum blood pressure is in the range of type 2 high blood pressure, so it is still within the limits that can perform range of motion exercises.

### Body Balance Value Seniors Before Exercise Lower Extremity Range of Motion

Ability to maintain posture and the ability to mobilize a coordinated series of muscle function and bone, balance adjustment function, and the nervous system. With age, the elderly decreased function in maintaining posture and ability to mobilize. The resulting decline in the function of the elderly have a value of body balance and gait suboptimal so has the risk of falling.

The result showed the elderly body balance value 22.18, the lowest value of the balance owned by the elderly is 19 and the highest value that is owned elderly is 25. Based on the value category Tinneti test, the average value of 22.18 belonging to the risk of falling levels of being. Value 19 is the lowest body balance the body's equilibrium value in the elderly who are at the age of 70 years or more. Body balance value of Tinneti test obtained from elderly body balance when the body is still and assessment of gait.

The results of this study indicate that the elderly have a moderate risk of falling. The risk of falling is being able to relate to the characteristics of the elderly who have an

average age of 65.31 years. Age 65 years in the levels of age decreased ability to maintain body balance. Most of the elderly as many as 10 people (62.5%) is the elderly who are not working, meaning that most of the elderly have less activity levels in moving the limbs that can improve reduction in limb function such as muscle atrophy, decreased joint lubrication, joint stiffness, and penunan nerve function in the extremities elderly. The sex ratio showed that most of the elderly are women 12 people (75%). Women in elderly demineralized bone is greater than men, this is caused due to a decrease in estrogen and progesterone. Demineralization of bone in women causes women more likely to have decreased function of the body mechanics and posture thus maintain influence in maintaining the balance of the body.

### **Body Balance Value Seniors Exercise Range of Motion After the Lower Extremities**

The results of the study during a three-week active range of motion exercises of the extremities known elderly p value of 0.006. Results 0,006 p value <0.05 means  $H_0$  rejected, shows that there are differences in the average value of the body's balance of exercise week 1, week 2, and week 3. Active range of motion exercises of the lower limb elderly provide changes in the balance of the body during exercise elderly 3 weeks. There are differences in the average value of the body balance of elderly every week.

Physiology of the most important in maintaining the balance is proprioception. Proprioception is the ability to sense the position of the joints or body parts in motion (Brown, S.P., Miller, W.C., & Eason, J.M, 2006). Part responsible for proprioception are generally located in the joints, tendons, ligaments and joint capsule while the pressure sensitive receptors located on the fascia and skin (Riemann, B.L. & Lephart, S.M, 2002).

Range of motion exercises are exercises in the joints with the aim of increasing the range of motion, improve muscle tone and prevent joint stiffness. Through active range of motion exercises for the elderly is expected to stimulate proprioception optimally. Through active range of motion exercises in the elderly is expected to improve function in the extremities elderly, both on the system and the system joints integument. Maximize joint function is

expected to improve the conduction of nerve impulses through mechanoreceptor.

### **Body Balance Difference Analysis Values Elderly Before and After Exercise Range of Motion Active Lower Extremities**

Aging causes changes in the muscle cells actually reduce muscle mass. Loss of muscle mass is referred to as sarcopenia. Adverse effects of aging on muscle has been shown to be controlled or even reversed with regular exercise. Importantly, exercise also improves the connective tissue surrounding muscle tissue utilizing, thus becoming the most beneficial for injury prevention and physical rehabilitation therapy.

Exercise is recommended for the balance of the body is exercise that increases muscle strength. Sizes for structural adaptation in the elderly are the same as in young people [18]. Adaptation of the structure of muscle in the elderly after exercise there is an increase in both protein synthesis and contractile elements.

Exercise can increase muscle strength, which in turn will improve postural balance of the elderly can be done 3-4 weeks of training with a frequency of three times a week [19]. After the active range of motion exercises of the lower limb down, the average value of the balance of the body's first week after the workout is 22.50. This value increases from the body before exercise keseimbangan value of 22.18, but this increase is not significant and is still in the category of moderate risk of falling.

Results of the second week of the exercise shows the value 22.81, the value showed an increase that was not significant. Changes in the average value of the most significant body keseimbangan obtained after the third week of training with body balance value 24.62. Changes in the average value of the balance of the body after practicing for three weeks showed the value of the balance of the body including the low risk category falls. Low falling categories showed an average improvement of body balance value of prior active range of motion exercises.

Range of motion exercises to develop motor coordination skills and aktifitas functionally and give feedback on the sensory nerves of contraction. So with range of motion exercises are routinely trained sensory receptors in the response of the entire surface of the muscle, skin, joint capsule and ligaments to stimulate the formation of proprioception. Through increased training of the muscles,

joints, and ligaments it will increase sensorimotor that will improve proprioception, with increased proprioception it will affect the increase in the balance of the body.

The results also showed an increase in the average number of elderly body balance after week 1 to week-3 drills. Comparison of the standard deviation week 1 1.96, week 2 of 1.60, and the 3rd week of 1.58 indicates an increase in the average weekly basis, but decreased from a mean increase range. These results may indicate that there are certain exercises that long average increase will be at a smallest value until it reaches a turning point where there is no increase in the average value of the balance of the body.

Lower extremity range of motion exercises can be done in the long-term training program. Although there is no increase in the value of balance, lower extremity range of motion exercises can be done to prevent deformity. Elderly require regular exercise to slow down the body deformity due to degeneration of the body cells.

### Conclusions

Characteristic of respondents in this study consists of: the average age of respondents was 65.31 years, women made up 12 people (75%), most of the Madurese as many as 11 people (68.8%), with an average blood pressure 131.88 mmHg in systolic pressure and 82.50 mmHg in diastolic pressure, as well as more than half of the respondents do not work as many as 10 people (62.5%). The average assessment body balance of elderly before the lower extremity range of motion exercises is 22.18, meaning elderly group is still in the category of moderate risk of falling. The average assessment body balance after exercise three weeks was 24.62, which means that older people are included in the category of low risk of falling. The results of the analysis of data obtained p value = 0.002, meaning that there is a difference in the value of the balance of the body before and after exercise. Increasing the value of the most significant body balance obtained after training for 3 weeks so there is the effect of the active range of motion exercises to balance the body's lower extremities elderly after 3 weeks of training.

### Suggestion

Lower extremity range of motion exercises can be used as a routine exercise injury prevention by the elderly, can be taught

by health professionals, especially cadres Posyandu, and extremity range of motion exercises can be taught in the family, especially families who have family members who are elderly.

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