



## Effectiveness Of Isometric And Range Of Motion (Rom) Exercise Toward Elderly Muscle Strenght In Pasuruan Integrated Service Unit, Elderly Social Services In Lamongan

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### ABSTRACT

**Objective:** Aging is a physiological process that will reduces the function of all organs, among other the musculoskeletal system that cause decreased muscle strenght. Under less of the muscle strenght will reduces activities and mobilization ability. Isometric and Range Of Motion (ROM) exercise is efficient alternative exercise for the elder who will begin the exercise program. This study was aimed to explain the difference of effectiveness between isometric and ROM exercise toward elderly muscle strenght

**Material and methods:** This study used to Pre Test and Post Test Design with time period approach involved 36 respondents, taken by purposive sampling. They were divided in to 2 groups; one group of 18 respondents underwent isometric exercise and the other group of 18 respondents did ROM exercise. Data were collected by checklist. Data were analyzed using Mann Whitney Test with level of significance  $\alpha \leq 0,05$ .

**Result:** Based on the result of research there were 8 (44,4%) respondents who had increased muscle strenght after did isometric exercise, and were 14 (77,8%) respondents who had ones with ROM exercise. The analysis result using Mann Whitney Test showed  $p = 0,044$  it means that  $H_0$  is rejected, so there are difference of effectiveness between isometric and Range Of Motion (ROM) exercise toward elderly muscle strenght. Range Of Motion (ROM) exercise was proven more effective to increase elderly muscle strenght who have normal movement, while isometric exercise was recommended to maintain muscle strenght for the elderly who get the injured extremity and contraindications to do movement.

**Conclusion:** It can be used as a program to create healthy elderly and using optimally their time to do better things, such as doing ROM and isometric exercise.

### INTRODUCTION

Increased life expectancy is one indicator of the success of health objectives nasional.<sup>8)</sup> Life expectancy is increasing resulting in the elderly population (elderly) higher, thus increasing the incidence of health problems in the elderly. The emergence of this problem is characterized by the high number of elderly dependency in Indonesia amounted to 13.72%. Health problems of the elderly who require increased maintenance efforts as well as increased health to reach old age healthy, happy, productive, independent and qualified.<sup>5)</sup>

Advanced age is the final stage of the human life cycle, which is part of the process of life that can not be avoided and will be experienced by each individual. At this stage, the individual undergoes many changes both physically and mentally.<sup>11)</sup>

One of the changes that occur in the elderly is viewed in terms of physical changes in the musculoskeletal system. Changes in the musculoskeletal system have resulted in a decrease in the number and size of muscle fibers that function decline and reduced strength.<sup>6)</sup> Decreased muscle strength lead to the ability to perform activities and mobilization declined. Elderly will experience limitations in moving and active,

increasing dependence on tools and others. Decreased muscle strength in elderly should no longer pose a problem because of the effects of the aging process can be handled when the body is kept healthy and active, so that the elderly who experience decreased muscle strength should perform active exercise to maintain the mobilization and independent activity is optimal.<sup>6)</sup>

Based on the initial survey in the Technical Implementation Unit (UPT) Elderly Social Services of Pasuruan in Lamongan in October 2013, finds that there are 55 seniors consisting of 13 elderly men and 42 elderly women. The results of observations and measurements of muscle strength were conducted in 20 elderly were selected at random, it was found that 13 elderly decreased muscle strength. Seniors who experience decreased muscle strength is experiencing barriers in the mobilization and activity so much depends on the external environment. Of the 13 elderly people who experience a decrease in muscle strength, known elderly aged 60-74 years 6 and 7 elderly aged 75-90 years. 8 of 13 elderly people who experience a decrease in muscle strength is elderly woman.

Based on information from the clerk at UPT of Elderly Social Services of Pasuruan in Lamongan, has carried out activities of elderly exercise 3 times a week to keep the elderly remain healthy and active. However, not all the elderly can follow elderly gymnastics. The results of the interview on 13 elderly people who experience a decrease in muscle strength, six elderly say rarely follow gymnastics for lazy and weak body. From the results it can be concluded that surveiديات decreased muscle strength among others, can be influenced by age, gender, and physical activity.

Age and gender are factors that affect muscle strength. Reduced muscle mass between 0.5-1% annually after the age of 60 years and is estimated at 80 years of age about 50% of muscle strength has hilang.<sup>12)</sup> Elderly women are the most likely group to experience a decrease in muscle strength due to hormonal changes, lifestyle, metabolic rest, body fat and psychological.<sup>12)</sup>

Lack of physical activity is also a risk factor for decreased muscle strength. Seniors who do regular physical activity have better muscle strength. Low physical activity such as irregular exercise, at risk of decline faster. An estimated 3% reduced muscle strength in the elderly each day with immobile. Among the several factors that can affect muscle strength, physical activity is a factor that can be improved.<sup>12)</sup>

The aging process causes the collagen structure in the elderly are less able to absorb energy. This causes reduced muscle mass and recovery. Loss occurs due to the number of muscle fibers atrophy miofibril and changes, fibrous tissue, which began in the fourth decade of life. Muscle volume as a whole will shrink resulting in decreased function and kekuatannya.<sup>6)</sup> Things you can do is to prevent or minimize the impact of a decrease in muscle strength. Interventions that can be performed in the elderly is by physical exercise. There are some physical exercise for the elderly, namely, isotonic and isometric exercises, aerobic exercise, and exercise Range Of Motion (ROM).<sup>12)</sup>

Several studies have associated with efforts to improve muscle strength have been performed. Shanti Marietta research results in 2005 showed an increase in muscle strength in older osteoarthritis patients with isometric exercise. Another study of Sarah Ulliya in 2007, showed an increase in muscle

strength in elderly by administration ROM exercises.

ROM exercises isometric exercises and has demonstrated the ability to increase muscle strength. Each training method has advantages and disadvantages. Isometric exercises can be done at home with inexpensive cost, it can be done without tools, but quickly lead to fatigue due to lack of movement sendi.g) Exercise ROM for easy implementation can be done standing or lying down, can maintain the flexibility of the joints, but on passive motion, this exercise is less effective in increasing muscle strength because it helps maintain flexibility.<sup>12)</sup>

## RESEARCH METHODS

The design of this research study "Pre Experimental" type "Test Pre and Post Test Design" hypothesis "there are differences in the effectiveness of isometric exercises and training on muscle strength elderly ROM. An approach time in this study is longitudinal.

The independent variables in this study is an isometric exercise and workout Range Of Motion (ROM). The dependent variable in this study were elderly muscle strength.

The population in this study were all elderly UPT of Elderly Social Services of

Pasuruan in Lamongan, amounting to  $\pm$  55 people. The criteria for inclusion were: First, the elderly do not have hypertension and no history of hypertension. Second, physically and mentally healthy. Third, do not experience total paralysis and bed rest. Fourth, willing to become respondents. The sample for this study was 36 respondents taken by purposive sampling. Respondents were divided into 2 groups, isometric exercise group were 18 responders and ROM exercises amounted to 18 respondents.

Data collection is to take primary data by direct observation of the elderly muscular strength. In general observation sheet contains about the degree of muscle strength and explanation. Observation of muscle strength exercises performed before (pre-test) and 4 weeks after training (post-test). Each exercise is done 2 times a day and three days a week for 4 weeks. Isometric exercises, consisting of 6 movement with contraction held for 5 seconds and repeated eight times every movement. Meanwhile, ROM exercises consisted of 12 movements with repeated 8 times. This study statistically analyzed with Mann Whitney U test with a significant level of  $\alpha \leq 0.05$ .

## RESULT

Table 1. Frequency Distribution of Respondents by Gender in the Elderly at UPT of Elderly Social Services of Pasuruan in Lamongan in April 2014

Age	f	%
60-74 year	27	75
75-90 year	9	25
<b>Amount</b>	<b>36</b>	<b>100</b>

Table 2. Frequency Distribution of Respondents by Age in the Elderly at UPT of Elderly Social Services of Pasuruan in Lamongan in April 2014

Age	f	%
60-74 year	27	75
75-90 year	9	25
<b>Amount</b>	<b>36</b>	<b>100</b>

Based on Table 1 it can be seen that the majority (72.2%) of respondents were female. Based on table 2 above can be seen that the majority (75%) of respondents aged 60-74 years. The average value (Mean) age of

respondents was 71.94 years with the youngest (Min) is 61 years old and the oldest (Max) is 85 years old. Standard deviation age of respondents was 5.595.

### Muscle Strength in Isometric Exercise Group

Table 3. Data Distribution Muscle Strength in the Elderly Isometric Exercise Group at UPT of Elderly Social Services of Pasuruan in Lamongan in April 2014

muscle strength	f	%
increase	8	44,4
Permanent	7	38,9
decline	3	16,7
<b>Amount</b>	<b>36</b>	<b>100</b>

Based on table 3 it can be seen that almost half (44.4%) of respondents experienced an increase in muscle strength

after being given an isometric exercise. Increased muscle strength with an average increase of 0.2.

### Group Exercise Muscle Strength in ROM

Table 4. Distribution of Elderly Data on Muscle Strength Exercise Group ROM in UPT of Elderly Social Services of Pasuruan in Lamongan in April 2014

muscle strength	f	%
increase	14	77,8
Permanent	3	16,6
decline	1	5,6
<b>Amount</b>	<b>36</b>	<b>100</b>

Based on table 4 it can be seen that almost all (77.8%) of respondents experienced an increase in muscle strength

after being given ROM exercises. Increased muscle strength with an average increase of 0.3.

## Effectiveness of Isometric Exercise and Training Range Of Motion (ROM) on Muscle Strength Elderly

Table 5. Table Silang effectiveness of Isometric Exercise and Training Range Of Motion (ROM) on Muscle Strength in the Elderly UPT of Elderly Social Services of Pasuruan in Lamongan in April 2014

Exercise	muscle strength			Amount
	increase	Permanent	decline	
Isometric group	8 (44,4%)	7 (38,9%)	3 (16,7%)	18 (100%)
ROM group	14 (77,8%)	3(16,6%)	1 (5,6%)	18 (100%)
Amount	22 (61,1%)	10 (27,8%)	4 (11,1%)	36 (100%)
$Z = -2,010$		$p = 0,044$		$\alpha = 0,05$

Based on Table 5 above can be seen that the respondents increased their muscle strength at a given respondent isometric exercises at 8 (44.4%), while respondents who experienced an increase in muscle strength in a given workout respondents ROM by 14 (77.8%).

At a given respondent isometric exercise, muscle strength increased by an average of 0.2, lower than respondents in ROM exercises with an average increase of 0.3.

Based on the results of Mann Whitney test using SPSS version 16.0 of the significance level  $\alpha = 0.05$  was obtained  $p = 0.044$  where  $0.044 < 0.05$ , then  $H_0$  is rejected as such there are differences in the effectiveness of isometric exercises and drills Range Of Motion (ROM) of the muscle strength of elderly.

## DISCUSSION

### Muscle Strength in Isometric Exercise Group

The results of this study explains that there is a significant increase in muscle strength in the elderly after the treatment is given in the form of an isometric exercise. In isometric exercise group, nearly half (44.4%) of respondents there is an increase in muscle strength between pre-test and post-test, and nearly half (38.9%) of respondents there is no impairment between pre-test and post-test or said to remain, while a minority (16.7%) of respondents there is a decrease between pre-test and post test. The average

increase in muscle strength is 0.2 with an average before being given isometric exercises was 3.6 and the average after a given practice is 3.8.

Increased muscle strength obtained in this study according to the results of research Widjanantie (2006) that after four weeks of isometric exercises in the age group 50-65 years, muscle strength increased by approximately 21.95%. Large increase in muscle strength is affected by the type of exercise, intensity of exercise, the tools used, and age.

In this study, the average age of respondents was 72.2 years. Isometric exercises done three times a week and two times a day without using tools. The percentage increase muscle strength obtained in this study is slightly smaller than the results obtained Widjanantie, which is 20% after 4 weeks of training. Different outcomes is because due to the different measurement techniques, the type of exercise and muscle that has not been trained at the beginning of the exercise. According to the concept of muscle strength limit (limiting strength) by Muller and Rohmert cited by Reyes (1979) in Ward (2011) that the untrained muscles at the beginning of the exercise will be even greater increase in strength are obtained. UPT of Elderly Social Services of Pasuruan in Lamongan, activities for physical fitness training, including muscle strength have been performed through the activities of elderly gymnastics held three times a week, so this is

no longer the isometric exercise early exercise program for the elderly there.

Increased muscle strength which means that in the elderly is caused by administration of an isometric exercise. Isometric exercises, continuously improve the muscle tension, resulting in increase in size of the muscle fibers are active. Increasing the size of muscle fibers causes the amount of muscle protein and increase muscle size (hypertrophy), thereby increasing the power generated great. Isometric exercises are also helpful to maintain muscle strength in the period of immobilization for an isometric exercise does not cause muscle pain and can be done in a standing position, sitting or sleeping. Isometric exercises are conducted regularly on the right foot, it will help develop muscle strength of elderly.

Stanley and Beare (2006) found that one form of exercise that can be done to minimize the decline in muscle strength is with an isometric exercise. This exercise increases strength and muscle mass and prevent loss of bone density and mineral content of the total body. Isometric muscle contraction increases muscle tension without changing the length of muscles that move the joints. Isometric contraction is done by alternately tightening and relaxing the muscle groups.

Isometric exercises ideal for use in situations where muscle strength should be maintained but the movement is contraindicated. This exercise is suitable for the elderly with immobility condition that does not allow to do range of motion exercises, such as edema limb or extremity injuries.

### **Group Exercise Muscle Strength in ROM**

The results of this study explains that there is a significant increase in muscle strength in the elderly after the treatment is given in the form of ROM exercises. ROM in the exercise group, almost all (77.8%) of respondents there is an increase in muscle strength between pre-test and post-test,

whereas a minority (16.6%) of respondents there is no impairment between pre-test and post-test or said fixed, and a small percentage (5.6%) of respondents there is a decrease between pre-test and post test. The average increase in muscle strength is 0.3 with an average before being given ROM exercises was 3.8 and the average after a given practice is 4.1.

Increased muscle strength caused by the elderly receive treatment in the form of ROM exercises. ROM exercises done by moving the joints to the fullest but do not cause pain. With the facilitation of joint movement will slowly decrease stiffness and stimulate a shift of muscle fibers. The more often driven muscle can increase muscle strength and prevent deterioration of the muscles faster.

The results of this research in line with several related studies, although the time and duration of visit is different. Febrina research results (2011) conducted for 7 days and treated 2 times a day with the samples taken as many as 20 respondents and using pre-post test showed that there was an increase in muscle strength between pre and post after a workout ROM for 7 days.

Jenkins (2005) suggested that normality can be restored joints and muscles by moving the joints and muscles regularly. Stanley & Beare (2006) also added that the ROM exercises can improve and maintain muscle strength and joint flexibility.

### **Effectiveness of Isometric Exercise and Training Range Of Motion (ROM) on Muscle Strength Elderly**

After analyzing the data using Mann Whitney test using SPSS version 16.0 of the significance level  $\alpha = 0.05$  was obtained  $p = 0.044$  where  $0.044 < 0.05$ , then  $H_0$  is rejected so that it can be concluded that there are differences in the effectiveness of isometric exercises and exercise Range of Motion (ROM) on elderly muscular strength. ROM in the exercise group showed an increase in muscle strength is more significant than in the group of isometric exercises. The average

increase in muscle strength in the exercise group ROM is 0.3, higher than the isometric exercise group at 0.2.

When the movement of a person decreases, the joints become more stiff, sore and will reduce the muscle strength to reduce the ability of the move. Seniors who do not do exercises to improve mobility can exacerbate physical condition. So that in the elderly, it would be better if the free time is filled with activity or isometric exercises ROM exercises, as appropriate.

As noted Foss (1998) in Pujiatun (2001) isometric exercises cause an increase in the size of muscle fibers without changing the length of the muscle. In isometric exercise, the muscles in a state of static, so that although the number of muscle fibers increases, no shift or movement of the muscle fibers. Increases the number of muscle fibers in this exercise due to increased muscle tension when receiving prisoners. While the ROM exercises, joint or muscle is moved to the maximum. A shift in muscle fibers that in addition to increasing the number of muscle fibers, also restores muscle normality. In this exercise, the muscles contract retracts and extends alternately enabling the increase range of motion and muscle strength are more significant. ROM exercises with a combination of longer and shorter contraction of the muscle causes the muscle to move dynamically. Space in ROM exercises wider in order to ensure flexibility and co-development untrained muscle endurance in conjunction with the development of strength. It is becoming a fundamental difference that dynamic contraction in ROM exercises can improve muscle strength better than the static contraction in isometric exercises. Isometric exercises can be used as a training program for the elderly, but this exercise is more ideal in maintaining muscle strength compared with its function in improving muscle strength.

Isometric exercise is recommended for the elderly with the condition of immobility

and contraindications to movement, such as the elderly with injuries and lower extremity edema, could also be on the elderly in postoperative rehabilitation phase. While the elderly with normal range of motion would be better to conduct regular exercises with the ROM because it has been proven that with regular ROM exercise can improve muscle strength. With the state of the elderly who are increasingly weakened due to decreased organ function, it would be better if the elderly free time is filled with activities ROM exercises. More frequent ROM exercises, the more cells that weaken muscles began to actively return to contract so that it can increase muscle strength and reduce and prevent paralysis as a result of the shrinking of muscle fibers (atrophy) in the elderly. It can be used as a program to realize the healthy elderly and elderly optimally utilize the time with things that are useful.

According to Martini (2004) in Ulliya (2007), both ROM exercises as preparation for the elderly infirm in beginning an exercise program. ROM with exercises, can improve muscle strength and flexibility of joints in the elderly who experience muscle weakness and limitation of motion, so that the elderly can carry out activities of daily life with more independent.

## CONCLUSIONS

- 1) Average muscle strength of elderly before being given isometric exercises is 3.6.
- 2) Average elderly muscle strength after being given isometric exercises is 3.8. Nearly half of elderly increased muscle strength in isometric exercise group.
- 3) Average muscle strength of elderly before being given a workout ROM is 3.8.
- 4) Average muscle strength after a given exercise elderly ROM is 4.1. Almost all elderly increased muscle strength in the exercise group ROM.
- 5) There are differences in the effectiveness of isometric exercises and drills Range Of Motion (ROM) on muscle strength in the

elderly UPT of Elderly Social Services of Pasuruan in Lamongan.

## References

- 1) Achmanagara, Ayu Andriyani. 2012. *Hubungan Faktor Internal dan Eksternal dengan Keseimbangan Lansia di Desa Pamijen Sokaraja Banyumas*. Tesis tidak diterbitkan. Jakarta: FIK UI
- 2) Asmadi. 2008. *Teknik Prosedural Keperawatan: Konsep dan Aplikasi Kebutuhan Dasar Klien*. Jakarta: Salemba Medika
- 3) Febrina, Sukmaningrum. 2011. (<http://ejournal.stikestelogorejo.ac.id>), diakses 17 Mei 2014
- 4) Jenkins, L., 2005, Maximizing Range of Motion In Older Adult. *The Journal on Active Aging*, January February, Vol 4 third ed, 50-55
- 5) Komisi Nasional Lanjut Usia (Komnas Lansia). 2010. *Aksesibilitas dan Kemudahan dalam Penggunaan Sarana dan Prasarana*. Jakarta: Komnas Lansia
- 6) Maryam, Raden Siti. 2008. *Mengenal Usia Lanjut dan Perawatannya*. Jakarta : Salemba Medika
- 7) Mubarak, Wahit Iqbal. 2008. *Buku Ajar Kebutuhan Dasar Manusia: Teori dan Aplikasi dalam Praktek*. Jakarta: EGC
- 8) Parsiyo dan Madya, Widyaiswara. 2013. *Indikator Keberhasilan Pembangunan*. (online), (<http://ppmkip.bppsdp.deptan.go.id>), diakses 15 November 2013
- 9) Pujiatun. 2001. *Perbandingan Latihan Isotonik dan Latihan Isometrik terhadap Kekuatan Otot Kuadriseps Femoris*. Tesis tidak diterbitkan. Semarang: Fakultas Kedokteran Undip
- 10) Shanti, Marietta. 2005. *Perbandingan efek latihan isokinetik dan isometrik terhadap nyeri, kekuatan otot dan kemampuan fungsional pada pasien osteoarthritis lutut*. Tesis tidak diterbitkan. Jakarta: Universitas Indonesia
- 11) Soejono, dkk. 2010. *Pedoman Pengelolaan Kesehatan Pasien Geriatri untuk Dokter dan Perawat*. Jakarta: Pusat Info dan Penerbitan Bagian Ilmu Penyakit Dalam FKUI
- 12) Stanley, Mickey & Beare, Patricia Gauntlet. 2006. *Buku Ajar Keperawatan Gerontik*. Jakarta: EGC
- 13) Ulliya, Sarah. 2007. Pengaruh latihan berbentuk *Range Of Motion* (ROM) terhadap fleksibilitas sendi dan kekuatan otot pada lansia di Panti Wreda Wening Wardoyo Ungaran. *Media Nurse*, (online), 1 (2):49-56, (<http://www.ejournal.undip.ac.id>), diakses 15 November 2013
- 14) Wardhani, Indah Retno. 2011. Kekuatan Otot dan Mobilitas Usia Lanjut Setelah Latihan Penguatan Isotonik *Quadriceps Femoris* di Rumah. *Majalah Kedokteran Indonesia*, vol 61 (1):3-8
- 15) Widjanantie. 2006. *Pengukuran Fungsi Lutut dengan Timed Up and Go Test dan Stair Climbing Test pada Latihan Isometrik Kuadriseps Femoris Pasien Osteoarthritis Lutut*. Tesis tidak diterbitkan. Jakarta: Program Studi Ilmu Kedokteran Fisik dan Rehabilitasi Medik Universitas Indonesia