

The Effect of Elderly Hadrah Gymnastics on Muscle Strength and Scope of Motion of Lower Extremity Joints in Elderly with Osteoarthritis (Martapura River Region, South Kalimantan)

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ABSTRACT

Increased life expectancy (UHH) in Indonesia from 71.7 years in 2016 (Novianty, Nodia, 2018). And it is estimated to increase to 72.2 years in 2035 (BPS, 2016). The implication of increasing the number of elderly people with high UHH is expected to be healthy and productive elderly people and free from diseases and health problems, however, the results of a preliminary study in East Banjarmasin, the number of elderly is 207 elderly (Posyandu, 2018). And almost 70% experience health problems such as osteoarthritis, so it is necessary to intervene in the form of Elderly Hadrah Gymnastics (SHL) which can increase muscle strength and scope of joint motion of the Elderly, so that the Elder can live healthy and free from osteoarthritis. The purpose of this study was to determine the effect of SHL on muscle strength and joint range of motion in elderly people with osteoarthritis in the Suburb area, Sungai Martapura Village, South Kalimantan Region.

Quasi Experiment research design with The Non-Randomized Control Group Pretest Posttest Design approach, the population of all elderly in the Martapura River area with a total of 110 elderly (Pemko Dinkes, 2016). The research sample was the elderly living in the Martapura watershed who had osteoarthritis, non-random sampling, purposive sampling technique, with a total sample of 68 elderly consisting of the control and treatment groups, each of which was 34 participants. Both groups measured muscle strength and joint range of motion before and after treatment. Data analysis used Paired T-test for paired samples and Independent T-Test for unpaired samples with normal distribution.

The results of research show There is an effect of SHL on the Strength of Pelvic and Knee Muscles of the Elderly as well as the effect of SHL on the Scope of Pelvic and Knee Joints in the Elderly. In the elderly who have osteoarthritis, they should do elderly Hadrah Gymnastics regularly at least 2 times a week.

Key words: Elderly Hadrah Gymnastics, Pelvic Muscles, Knee Muscles, Joint Scope, Osteoarthritis.

INTRODUCTION

The results of a preliminary study in East Banjarmasin, the number of elderly aged 60 years - 69 years is 132 elderly and aged 70 years is 75 elderly (Posyandu, 2018), almost 70% have health problems such as osteoarthritis, gout, hypertension. Osteoarthritis attacks weight-bearing joints, such as the knees, hips, back, neck, and joints in the fingers (Rizal FM, 2019). Disorders of the muscles of the extremities in the form of muscle disorders; Hamstrings, Quadriceps and Range of Motion. If this problem is not handled, it will have an impact on the decline in the quality of life of the elderly, both physically, mentally, socially and spiritually. This situation will of course lead to a low quality of life for the elderly. This is in accordance with the results of Syaefudin's research (2014), that the quality of life of the elderly in the majority of orphanages is in the sufficient category, this is also supported by the research of Nashir M (2014), that the quality of life of the elderly in the Bakumpai area of South Kalimantan is mostly low at 63%.

The activities of the Elderly Posyandu in the Sei Bilu sub-district, Banjarmasin, have so far only carried out treatment, Hb checks, and Supplementary Food Provision, as well as elderly exercise. And if the elderly who have gout or Osteoarthritis they usually experience muscle weakness in the lower

extremities, and impaired range of motion of the joints, so that it actually aggravates the condition of the disease. To overcome this, it is necessary to intervene in order to improve the quality of life of the elderly in the form of physical activity that can improve the condition of the muscles; Hamstring, Quadriceps and joint range of motion (Range of Motion = ROM) so that they can work freely.

The Elderly Posyandu in Sei Bilu Village is an elderly group where the intervention can be used for Elderly Hadrah Gymnastics (SHL) so that all elderly people can follow it. although the elderly can not stand because it can be done by sitting alone. Why use SHL, this is because the majority of the elderly living on the outskirts of the Martapura river are Muslims, so SHL which has an Islamic nuance and is based on local culture can be used as a tool or tool so that the elderly wants to join the program, so that the elderly become healthy.

In accordance with the results of research by Ilmi B, Rizani A, Parelange A, 2018,¹ that SHL has a significant influence in improving the quality of life of the elderly, which includes aspects/domains of physical health, psychology, social relations and the environment. To ensure that the quality of life of the elderly is determined by physical health, this study conducted an SHL intervention on muscle

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strength; Hamstring, Quadriceps and Range of Motion in the Elderly with Osteoarthritis.

So, it is necessary to research the Effect of SHL Intervention on Muscle Strength; Hamstring, Quadriceps and Range of Motion in the Elderly with Osteoarthritis in the Martapura Riverside area, Sei Bilu Village, Banjarmasin, South Kalimantan.

RESEARCH METHOD

Quasi Experiment research design with the approach of The Non-Randomized Control Group Pretest Posttest Design, the population of all elderly in the Martapura River region with a total of 110 elderly (Pemko Dinkes, 2016). The research sample of Elderly living in the Martapura River Region experiencing osteoarthritis, non-random sampling, purposive sampling technique, with a large sample of 68 elderly, consisting of a control group and treatment of 34 participants each. Both groups were measured for muscle strength and scope of joint motion before and after treatment. Data analysis uses Paired T-test untuk sampel berpasangan dan uji Independent T-Test untuk sampel tidak berpasangan dengan distribusi normal.

RESEARCH RESULT

The results of the study show a description of the strength of the right and left Hamstring muscles (Knee Flexion) in the elderly before and after the SHL intervention shown in table 1.

Based on table 1, it can be seen that the elderly Hamstring muscle strength before SHL treatment was mostly able to resist minimal resistance, namely 15 respondents or 44.1% in the right Hamstring muscle and as many as 14 respondents or 41.2% in the left Hamstring. While the Hamstring Muscle Strength of the elderly after SHL treatment was mostly able to resist maximum resistance, namely as many as 24 respondents or 70.6% in the right hamstring muscle and as many as 23 respondents or by 67.6% in the left hamstring muscle. Based on the description, there is a change in the strength of the right knee and left knee muscles in the elderly from before SHL treatment to after SHL treatment.

Based on table 2 above, it can be seen that the description of changes in the Hamstring of the Elderly before the SHL treatment has increased, for the right Hamstring as many as 18 respondents or 52.9%, and the left Hamstring as many as 20 respondents or by 58.8%.

Description of right and left quadriceps muscle strength (knee extension) in the elderly before and after hadrah exercise intervention in the elderly

The results of the study show a description of the strength of the right and left Quadriceps (Knee Extension) muscles in the elderly before and after the Hadrah Exercise intervention in the elderly as follows. (Table 3)

Based on table 3, that the quadriceps muscle strength of the elderly before SHL treatment was mostly able to resist minimal resistance; as many as 25 respondents or 73.5% in the Right Quadriceps muscle and as many as 26 respondents or by 76.5% in the Left Quadriceps muscle, while after SHL treatment most of them were able to resist maximal resistance; as many as 28 respondents or 82.4% in the right quadriceps muscle and as many as 27 respondents or by 79.4% in the left quadriceps muscle. Based on the explanation above, there was a change in the strength of the right quadriceps and left quadriceps in the elderly after the elderly hadrah exercise.

Based on table 4.6 above, it can be seen that the description of changes in the Elderly Quadriceps muscle after the Hadrah Elderly Gymnastics treatment which has increased for the right Quadriceps and Left Quadriceps each as many as 23 respondents or 67.6%.

DISCUSSION

Overview of hamstring and quadriceps muscle strength in the elderly with osteoarthritis before and after SHL intervention

The results showed that the condition of the Hamstring and Quadriceps muscles in the elderly with Osteoarthritis before and after the SHL intervention tended to change in the form of an increase in ability.

The picture of muscle strength before SHL intervention was the majority able to fight resistance at least 73.5% for the right quadriceps muscle, and 76.5% for the left quadriceps muscle. As for the right hamstring muscle by 44.1%, and for the left hamstring muscle by 41.2%, this situation indicates a decrease in muscle strength in the hamstring and quadriceps muscles because in the elderly the muscles experience atrophy of muscle fibers, muscle cramps, movement in the elderly. becomes slow and causes a decrease in joint flexibility so that it affects muscle work. The results of this study are in accordance with what Nograho (2000)² said in the elderly experiencing changes in bone, where the bones lose their density (density) and become more brittle, kyphosis, joints enlarge and become stiff, tendons contract and undergo sclerosis, muscle fiber atrophy so that a person's motion becomes sluggish, muscles cramp, becomes tremor and causes a decrease in joint flexibility. This is also in line with Oktavia, H (2016) who said that the elderly will experience many changes, one of which is flexibility, as said by Primina, (2006)³ that joint flexibility decreases in old age due to a degenerative process. reduced elasticity of muscle fibers, where in the connective tissue in the muscle fibers increases. In addition, joints in the elderly usually become inflamed and cause pain, synovial fluid thickens and hyaline cartilage degenerates, so that it can affect the range of motion and gait in the elderly (Ester, 2003).⁴

However, after the SHL intervention, there was an increase in the muscle strength of the elderly, namely being able to fight maximum resistance to 82.4% for the right quadriceps muscle, 79.4% for the

Table 1: Overview of hamstring muscle strength (knee flexion) in the elderly before and after shl intervention in Sungai Bilu Banjarmasin.

No	Kekuatan Otot Hamstring	Sebelum		Sesudah		Sebelum		Sesudah	
		Otot Hamstring Kanan		Otot Hamstring Kanan		Otot Hamstring Kiri		Otot Hamstring Kiri	
		F	%	F	%	F	%	F	%
1.	0 : Tidak ada kontraksi	0	0	0	0	0	0	0	0
2	1 ; Ada kontraksi	0	0	0	0	0	0	0	0
3	2:Ada gerakan, tidak melawan gravitasi	0	0	0	0	0	0	0	0
4	3: Mampu melawan gravitasi	8	23.5	0	0	10	29.4	0	0
5	4 : Mampu melawan tahanan minimal	15	44.1	10	29.4	14	41.2	11	32.4
6	5 : Mampu melawan tahanan maksimal	11	32.4	24	70.6	10	29.4	23	67.6
	Total	34	100	34	100	34	100	0	0

Table 2: Changes in elderly hamstring muscle strength before and after elderly hadrah gymnastics.

No	MMT	Kategori						Total	
		Meningkat		Tetap		Menurun		F	%
		F	%	F	%	F	%		
1	Hamstring Kanan	18	52.9	14	41.2	2	5.9	34	100
2	Hamstring Kiri	20	58.8	12	35.3	2	5.9	34	100

Table 3: Description of quadriceps muscle strength in the elderly before and after hadrah exercise intervention in the elderly at Sungai Bilu Banjarmasin.

No	Kekuatan Otot Quadrisep	Sebelum		Sesudah		Sebelum		Sesudah	
		Otot Quadrisep Kanan		Otot Quadrisep Kanan		Otot Quadrisep Kiri		Otot Quadrisep Kiri	
		F	%	F	%	F	%	F	%
1.	0 : Tidak ada kontraksi	0	0	0	0	0	0	0	0
2.	1 : Ada kontraksi	0	0	0	0	0	0	0	0
3.	2: Ada gerakan, tidak melawan gravitasi	0	0	0	0	0	0	0	0
4.	3: Mampu melawan gravitasi	2	5.9	0	0	2	5.9	0	0
5.	4: Mampu melawan tahanan minimal	25	73.5	6	17.6	26	76.5	7	20.6
6.	5: Mampu melawan tahanan maksimal	7	20.6	28	82.4	6	17.6	27	79.4
	Total	34	100	34	100	34	100	34	100

Tabel 4: Gambaran perubahan kekuatan otot quadrisep lansia setelah senam hadrah lansia di Sungai Bilu Banjarmasin.

No	MMT	Kategori						Total	
		Meningkat		Tetap		Menurun		F	%
		F	%	F	%	F	%		
1	Quadrisep Kanan	23	67.6	11	32.4	0	0	34	100
2	Quadrisep Kiri	23	67.6	11	32.4	0	0	34	100

left quadriceps muscle, and 70.6% for the right hamstring muscle, amounting to 67.6% for the left hamstring muscle, research results supported by Zhao and Wang said that physical exercise can improve motor function, the ability to balance, walk, and stability and posture of the elderly, so as to increase muscle strength and joint flexibility. A lot of evidence shows that aging can be inhibited either directly or indirectly by an active exercise program (Josaputra, 2005).⁵ The Elderly Hadrah Gymnastics is a sport movement that results in an increase in the strength of the Elderly Quadriceps Muscles, both right and left Quadriceps, which are in the Quadriceps muscle strength with a muscle strength value of 3, which is able to resist gravity, increasing to muscle strength with a value of 5, namely the strength of the Elderly Quadriceps muscle capable of resisting maximum resistance. This is of course because of the elderly gymnastics movements that can increase the strength of the Quadriceps muscles such as from sitting and then standing, the presence of body movements with flexion and extension movements on both legs with alternating hand pounding movements with the load on the knee, the Quadriceps muscle strength will increase. Likewise, the Hamstring muscles increased until they were able to fight maximum resistance with a value of 5 for both right and left Hamstring muscle strength. Based on this, there is an increase in the strength of the hamstring and quadriceps muscles in the elderly or what is called the strength of muscle power, this is as Irianto (2000)⁶ said that the main characteristic of exercise to increase muscle strength and endurance is exercise with movements against the load, both body weight and weight. own or external load, as well as the Elderly Hadrah Gymnastics according to Ilmi B, Rizani A, and Palarange, (2018)¹ in hadrah gymnastics there is a movement against the body's own burden during knee flexion and extension movements, causing muscle strength (power) Hamstring and Quadriceps, This is in line with what Harsono (1988)⁷ said "Power is the ability of the muscles to exert maximum strength in a very fast time" this is in line with what was said by Fox, Bowers (1988), that power produces a momentum,

and this momentum is power to produce strong and fast movements. So power is the performance of the maximum muscle work function divided by the unit of time (Riyadi S, 2008).

Based on the above discussion, with the Hadrah Elderly Gymnastics movement in the elderly who experience osteoarthritis, it will be able to improve fitness, strength and muscle endurance, especially the Hamstring muscles and Quadriceps muscles, both left and right.

Overview of the scope of motion (ROM) of knee flexion (femoral biceps), flexion and extension of the right and left hips in the elderly with osteoarthritis before and after the elderly hadrah gymnastics intervention

The results showed that the scope of joint motion in knee flexion (femoral biceps), flexion and extension of the right and left hips in the elderly with osteoarthritis decreased before hadrah exercise and after the SHL intervention, there was an increase in joint motion.

Of course, gymnastics has the direction of the elderly being able to maintain and improve joint movement so that the range of motion becomes flexible. Increased joint range of motion in knee flexion due to the absence of Range of Motion (ROM) exercises to maintain or improve the level of perfection of the ability to move joints normally and completely to increase muscle mass and tone (Potter & Perry, 2005).⁸ This is also supported by the opinion (Nurhidayah, et al. 2014). ROM exercises are carried out to maintain or improve the ability to move joints normally and completely to increase mass and muscles so that they can prevent deformities, stiffness and contractures and furthermore, it can be said that a person's maximum ROM exercise in carrying out movements. Here are the range of motion or the limits of movement of muscle contractions in carrying out the movement, whether the muscles are fully shortened or not, or fully elongated or not (Lukman and Ningsih, 2009).⁹ Suratun, et al (2006) with ROM

exercises will move the joints as optimally and as widely as possible according to one's ability which does not cause pain in the joints being moved and causes an increase in blood flow into the joint capsule (Astrand, *et al.* 2003).

Muscle work on the movement of SHL during exercise is carried out by the biceps femoris muscle group. The ligamentous structure will assist in extension of the knee when the tibia is strengthened in a weight-bearing position. As the knee moves from flexion to extension, movement of the lateral condyles is stopped at 160 degrees of motion by the anterior cruciate and collateral ligaments. contraction m. The quadriceps cause the medial condyle to increase the range of motion of the joint by 20 degrees, increasing full flexion to 180 degrees. (Putri, 2017)¹⁰ the results of other studies also say that with ROM exercise there is an increase in the range of motion of the hip joint (flexion 3,920, extension 1,680, abduction 4,370, adduction 3,670) while the knee joint (left flexion 3,880 and right flexion 4,580) and movement ability increases of 12.68 seconds. Philantip, A (2015). So that ROM exercises are able to move all the joints in the extremities so that the motion of the hip joints is more perfect.

Based on this, with ROM exercises in SHL, the elderly experience an increase in joint movement and overcome pain, be productive and healthy in facing their old age.

Elderly hadrah exercise causes muscle stretching so that pain is reduced and blood flow is smooth. This is in line with research exercises involving stretching muscles and joints. The intensity of the exercise is carried out by paying attention to discomfort or pain training (Renold C., Ibrahim and Polii H, Wungouw H (2015)¹¹ in addition, based on research by Sarah U, Bambang S, BM Wara K (2007)¹² states that there is an influence of Range Of Motion (ROM) Against Knee Joint Flexibility in the Elderly These results indicate that SHL performed for 3 weeks has been able to increase knee joint flexion ROM in the elderly who have limited movement.

The effect of elderly hadrah gymnastics on the treatment and control of the strength of the right and left hamstring (knee flexion) and quadriceps (knee extension) muscles in the elderly with osteoarthritis before and after SHL intervention

The results showed that there was an effect of SHL on the strength of the Hamstring and Quadriceps muscles in the elderly, this means that the Hadrah Elderly exercise performed for 6 weeks 2 times per week can increase muscle strength (greater power). According to experts caused by factors of the nervous system; that is, from an untrained state to being trained, the nervous system will be able to control the number of motor unit recruitment and the frequency of motor unit stimulation so as to produce greater muscle contraction strength (Pate RR, Mc Clenaghan B, Rotella R, 1993).¹³ In addition, the Effects of Exercise on Muscles Continuously causes muscle hypertrophy: (Increased muscle mass due to exercise, especially weight training; a real long-term effect of muscle exercise) and strengthens these muscle groups (Anonymous, 2016).¹⁴ This means that the elderly who previously did not always do SHL exercises and now do SHL regularly, will cause the nervous system of the elderly to be able to control the number of motor unit recruitment and the frequency of motor unit stimulation so as to produce greater muscle contraction strength.

It is known that SHL is a movement that is carried out regularly, which is divided into 3 stages, namely; warming up, implementation and relaxation, where each stage there is movement of flexion, extension in the lower extremities, especially the legs and also in the upper extremities of the arms besides that SHL movements are carried out with knee and hip joint movements with muscle strength focused on

the hamstring and quadriceps muscles (lower extremities). Lower extremity muscle strength is the ability of the muscles in the lower extremities to perform their functions, including moving places, supporting heavy loads, and being a stable pedestal when standing (Ilmi, B, Rizani A, and Plarange A, 2017).¹ muscle strength and joint motion in the joints, so that the elderly who experience osteoarthritis by doing Hadrah Elderly Gymnastics will experience an increase in the work of the hamstring muscles and quadriceps muscles.

The effect of elderly hadrah gymnastics on the treatment and control of the scope of motion (ROM) knee flexion, right and left hip flexion and extension in the elderly with osteoarthritis before and after the elderly hadrah gymnastics intervention

The results showed that there was an effect of SHL on the scope of motion of the right hip and left hip, extension of the right and left hips and that there was an effect of the Elderly Hadrah Gymnastics on the scope of motion of the left knee flexion joint, but there was no effect on the scope of motion of the right knee flexion joint. Elderly with Osteoarthritis, this means that the Elderly Hadrah exercise performed for 6 weeks with 2 times per week can increase improvement, namely widening the Scope of Motion of the right and left hip joints and left knee joints. This means that the elderly who do SHL exercises can experience an increase in the range of motion of the joints, both right and left hips, and left knee joints, this is what we know in Osteoarthritis sufferers experience limitations in the range of motion of the joints due to the age factor (Gregory Minnis, 2019).¹⁵ This causes immobilization. This is in line with what S. Morini, *et al.* (2004)¹⁶ said that impaired mobility in the joints can be efficiently compared with an active lifestyle and that subsequent periods of training can increase the mobility of the lower limbs. This opinion makes it clear that the elderly who always do exercise will repair the damage to mobility in the joints efficiently. The same thing is also said by Nograho (2000).² Although osteoarthritis can damage various joints which often attacks the joints in the knees, hands, hips, and spine and often worsens over time, but if you stay active, maintain your weight, and keep your body healthy and healthy. Following a healthy lifestyle, the progression of this disease can be inhibited and will improve joint function (Effendi & Makhfudli, 2009)¹⁷ so that the hip and knee joints have good flexibility. This is in line with the results of research that hip and knee flexibility in the elderly shows that chronic and acute complaints in the elderly can act effectively in avoiding the inevitable damage to physical abilities. In particular, it is possible to increase articular mobility, and thereby limit articular disability, a quality considered the most important (Morini, *et al.* 2004) Others argue that with activity and exercise good ROM induces some changes in joint components and metabolism. network. As connective tissue proliferation was found in knees immobilized for fifteen days, and was established at thirty days, this suggests that ROM maintains range of motion and reduces changes in joint components (Matsuzaki T, *et al.* 2014).¹⁸

However, in this study there was no influence of the elderly Hadrah Gymnastics on the Scope of Motion of the Right Knee Flexion Joint, this was possible because when measuring the Scope of Motion of the Right Knee Joint, the participants stood on their left foot and experienced an imbalance in the left knee. This happened because the participants were unable to maintain their body position. This is as explained by Delitto, (2003) that static balance is the ability to maintain a body position where the Center of Gravity (COG) does not change or maintain equilibrium in a fixed position (Delitto, 2003). Furthermore, another opinion says that body balance is the ability to maintain the neuromuscular system in an efficient position or attitude while we are moving (Harsono, 1988),⁷ so that because of this imbalance it affects the scope of motion of the joints on the right side. This is as stated

by Bowolaksono, (2013)¹⁹ that balance is one of the factors needed by individuals in carrying out effective and efficient movements in addition to flexibility, coordination, strength and endurance. Good will allow a person to perform activities or movements that are effective and efficient with minimal risk of falling. Where the body is able to maintain its position against gravity and other external factors, to maintain the body's center of mass in balance with the fulcrum and to stabilize body parts when other body parts move.

Based on this, it can be proven that with "Elderly Hadrah Gymnastics can improve the condition of the strength of the hip muscles, both right hip muscles and left hip muscles, as well as improve the condition of the knee muscles, both right and left muscles. In addition to that, the Elderly Hadrah Gymnastics can improve the Scope of Motion of the Joints. Especially the scope of motion of the hip joint both left and right. For Joint Range of Motion: Increase the strength of the hip muscles, both right and left hip muscles. left hip muscles, as well as improving the condition of the knee muscles, both right and left muscles. Besides, Hadrah Elderly Gymnastics can improve the scope of joint motion, especially the left and right hip joint range of motion. Especially the scope of motion of the hip joint both left and right. For the scope of joint motion: there is an effect of the elderly hadrah exercise on the left knee flexion joint range of motion, and there is no effect of the elderly hadrah exercise on the range of motion of the knee flexion joint

CONCLUSIONS AND SUGGESTIONS

Conclusion

The conclusions of this study are:

The condition of the ability of the Hamstring (Pelvic) and Quadriceps (Knee) muscles after SHL intervention tends to increase the power of the Hamstring (Pelvic) and Quadriceps (Knee) muscles in the elderly.

Circumstances of Joint Motion (ROM), Knee Flexion (Femoral Biceps), and Flexion and Extension of Right and Left Hips in Elderly with Osteoarthritis after SHL intervention tended to improve or be more extensive.

There is an Effect of SHL on the Treatment and Control of the Strength of the Right and Left Hamstring Muscles (Knee Flexion) and Quadriceps (Knee Extension) in the Elderly with Osteoarthritis Before and After the SHL Intervention

The Effect of SHL on Treatment and Control of Scope of Motion (ROM) Knee Flexion, Right and Left Hip Flexion and Extension in Elderly with Osteoarthritis Before and After SHL Intervention.

Suggestion

Based on the findings SHL can be used in the elderly with Osteoarthritis disorders to increase muscle strength and widen the scope of joint motion.

SHL socialization to the community, especially the elderly, for regular SHL implementation.

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