Health Gate
Volume 1 Number 3, July 2023 ISSN 2986-1098
Homepage: https://healthgate.ppnikotablitar.org/index.php/hg

DOI: http://dx.doi.org/10.33846/hg1305

Walking and Quadriceps Isometric Exercises on Pain and Range of Motion in Osteoarthritis Patients

Matrahman[1]

[1] Medical surgical nursing, Mardi Waluyo General Hospital, Blitar, matrahman77@gmail.com

ABSTRACT

Pain is known as the main symptom of Osteoarthritis (OA) which affect on the functional impairment and patient's quality of life. Alternatively, isometric quadriceps exercise and walking exercise could be employed to reduce the pain among knee OA patients. This study aimed to identify the comparison between walking exercise and isometric quadriceps exercise on pain and joint range of motion in knee osteoarthritis patients. This research was used quasi-experimental with non equivalent control group before–after design. The experimental and control group, involved 17respondents respectively with consecutive sampling technique. The results showed the walking exercise is significantly reduce pain and increase knee flexion range of motion (p 0.000). Similarly, the isometric quadriceps exercise is significantly decrease pain and increase knee flexion range of motion (p 0.000). Nevertheless, after being compared showed that walking exercise is no more effective reduce pain and increase knee flexion range of motion rather than isometric quadriceps exercise in knee osteoarthritis patients. A standard operational procedure for walking exercise and isometric quadriceps exercise is programmed.

Keywords*:* walking, isometric quadriceps, pain, range of motion, osteoarthritis

Background

Osteoarthritis (OA) is a degenerative disease that affects joints that is chronic and progressive, associated with joint cartilage damage (1). OA can also experience inflammation due to progressive erosion of the joint wrapper resulting in pressure on the nerve endings and causing pain(2). Osteoarthritis is a major cause of disability affecting approximately 10% of the western world population, and increases significantly with age. Approximately 50% of the population aged over 65 years who experience musculoskeletal complaints are mostly due to osteoarthritis(3). According to the results of the Basic Health Research (4), the prevalence of joint disease in Indonesia based on the diagnosis of health workers was 11.9% and based on diagnosis or symptoms was 24.7%. The prevalence of joint disease based on the diagnosis of health workers in East Java was 26.9%.

Knee osteoarthritis has typical clinical symptoms of pain, stiffness in the joint, especially after prolonged activity, limitation of joint range of motion and joint instability (5). Pain is the main symptom of patients with OA(6). The impact of knee OA can cause functional impairment, namely impaired ability to perform activities (7) . The inability to perform activities is due to pain and stiffness in the knee joint. Limitations in function involving movement of the knee joint also have an impact on reducing health status and decreasing quality of life. Knee pain in patients with OA has a lower quality of life compared to patients who experience knee pain but not OA (8).
Isometric exercise is a physical exercise programme for strengthening the quadriceps muscle. he

results of several studies on isometric exercise show that the exercise can reduce pain in knee osteoarthritis patients (9). The results of research show that isometric exercises can reduce pain and increase range of motion (ROM) in knee osteoarthritis patients (10). However, muscle strengthening exercises such as isometric exercises are complex exercise programmes that require a good understanding to implement the programme. Incomprehension due to the complexity of the exercise programme causes people to not comply (11).Walking is a simple activity exercise as well as a part of daily life activities. Walking can be an alternative exercise in OA patients because it is safe, easy to do and has a low risk of musculoskeletal injury, especially favoured by individuals who are not active in physical activity so as to increase adherence to the exercise (12). Regular walking is beneficial for knee joint health, improving bone growth, maintaining balance, preventing contractures, increasing mobility, feeling better, increasing self-esteem, improving cognitive function, and feeling a higher quality of life. Another benefit of walking is that it can reduce pain. Based on the results of research shows that walking exercises performed for less than 30 minutes can reduce pain and are safe for OA patients because they do not increase the burden on the knee joint (13).

Isometric exercises are complex, can induce pain and are not easy to perform, making patients lazy to do the exercise programme. Walking is a safe and easy exercise to do because it is part of daily activities and has a low risk of musculoskeletal injury. Walking provides benefits not only for physical health, reducing pain complaints, but also for mental health because it makes the mind calmer and more relaxed through stimulation of endorphin release. The synergy effect between stimulation of endorphin release and strengthening of the quadriceps muscle during walking could potentially provide a better effect than isometric exercise. This makes researchers want to compare the effectiveness of walking and isometric exercises on pain and joint range of motion in osteoarthritis patients. A comparison between walking and isometric exercise has not yet been reported.

Methods

The design in this study used a quasi-experimental design with a non-equivalent control group before-after design approach. This study consisted of two intervention groups, namely the walking exercise group, and the quadriceps isometric exercise group. The sample was knee OA patients at the Orthopedic Polyclinic of Mardi Waluyo Hospital, Blitar City who met the inclusion and exclusion criteria. Sampling using consecutive sampling. The walking exercise group was 17 respondents and quadriceps isometric exercise was 17 respondents. Inclusion criteria: outpatients diagnosed with knee OA based on medical diagnosis, unilateral OA, age ≥ 50 years, grade 2 or more OA patients who are not in the acute (inflammatory) phase such as swelling and redness of the knee joint, experiencing pain with a pain scale of 3-6, experiencing a decrease in joint range of motion, cooperative and communicative, willing to become research respondents. Exclusion criteria: OA patients knee post-surgery, knee OA patients who have just experienced knee injury, knee OA patients who have neurological disorders/motor disorders. The ethical principles applied were the principle of benefit, the principle of respect for dignity, and the principle of justice. This study began with the ethics submission process at FIK UI and continued with the process of submitting a research permit at Mardi Waluyo Hospital, Blitar. Respondents are free to withdraw at any time without any negative sanctions from the researcher. Researchers also guarantee the anonymity and confidentiality of respondents. Data Collection Tools: VAS scale (0-10 cm) to measure pain scores, and goniometer to measure joint range of motion. Procedure: Prior to the study, respondents were informed about the study and signed a consent form.Walking exercise intervention: Before the walking exercise, we started by doing deep breathing exercises for 10 times.Then perform walking exercises for 15 minutes

continuously (without stopping) on a flat road, done one (1) time in the morning regularly, five (5) times a week for two (2) weeks. Quadriceps isometric exercise intervention: Before quadriceps isometric exercise begins with doing deep breath exercises first 10 times. Then perform quadriceps isometric exercises by contracting the quadriceps muscle for 10 repetitions. 1 contraction for 10 seconds, each repetition rests 5 seconds, done one (1) time in the morning regularly, five (5) times a week for two (2) weeks. Data was processed and analysed using statistical software. Statistical tests used to analyse pain, joint range of motion of respondents before and after walking exercises using the Wilcoxon test. Analysis of pain before and after isometric exercise using the dependent t test, while the range of joint motion was analysed using the Wilcoxon test. The statistical test used to analyse respondents' pain between before and after walking training with quadriceps isometric exercise uses an independent t test. While analysing the range of joint motion between before and after walking training with quadriceps isometric exercises using the Mann-Whitney test.

Results

Univariate Analysis of Respondents' Characteristics

Characteristics of respondents in the walking exercise group and quadriceps isometric exercise group based on age, gender, body mass index, degree of OA, use of analgesic therapy, duration of knee OA can be seen in table 1 and table 2.

Table 1 Distribution of Respondents Based on Age, Duration of OA Knee in walking exercise groups and quadriceps isometric exercises

Variables	Intervention Group	Mean	Median	SD	Min-Max	95% CI
Age	- Walking exercise	64.24	63.00	7.02	51-78	60.62-67.85
	Quadriceps isometric exercise	64.76	66.00	6.52	52-74	61.41-68.14
Duration of knee OA	- Walking exercise	24.35	13.00	22.17	5-72	12.95-35.75
	Quadriceps isometric exercise	24.88	13.00	21.82	7-72	13.66-36.10

Based on table 5.1, it can be seen that the mean age of respondents in the walking exercise group and the quadriceps isometric exercise group is almost the same, the mean age of walking exercise respondents is 64.24 years, while the quadriceps isometric exercise is 44.76 years. The mean length of knee OA of respondents in the walking exercise group was 24.35 months. while the mean length of OA of respondents in the isomteric exercise group was found to be 24.88 months.

Table 2. Distribution of Respondents Based on Gender, BMI, OA Degree, Use of Analgesic Therapy in the walking exercise group and and quadriceps isometric exercise

Variables	Walking exercise		Quadriceps isometric exercise	
	N	%	n	%
Gender				

Health Gate
Volume 1 Number 3, July 2023 ISSN 2986-1098
Homepage: https://healthgate.ppnikotablitar.org/index.php/hg

Male	5		29.4	4		23.5
Women		12	70.6		13	76.5
IMT						
< 18.5= underweight	0	0		0	0	
18.5-24.9= normal	6		35.3	8		47.1
≥ 25.0= more		11	64.7	9		52.9
Degree of OA						
2nd degree	7		41.2	5		29.4
3rd degree		10	58.8		12	70.6
Use of analgesic therapy						
Take as directed by your doctor		13	76.5		11	64.7
Taken not as directed by a doctor	4		23.5	6		35.3

Based on table 2, the characteristics of respondents in the walking and quadriceps isometric exercise groups show that the gender of respondents is mostly female, BMI is mostly more, the degree of OA is mostly grade 3, the use of analgesic therapy is mostly according to doctor's instructions.

Bivariate Analysis

Analysis of Differences in Pain, Range of Motion of Joints Before and After walking exercise

Table 3 Analysis of differences in pain, joint range of motion before and after walking exercise

Variables		Mean	Median	SD	Min-max	*pvalue*
Pain	Before	4.38	4.30	0.66	3.3-5.4	
	After	2.05	1.80	0.76	1.1-3.2	0.000*
	Difference	2.33		0.58		
Flexion Joint	Before	104.29	109.00	11.12	81-117	
Range of Motion	after	111.24	114.00	10.60	90-124	0.000*
	Difference	6.95		1.92		

*Meaningful at α <0.05 by Wilcoxon test; SD=standard deviation

Based on table 5.3, the analysis results show that there is a significant difference between pain before and after walking training in knee OA patients (p 0.000 < α 0.05) in other words walking is effective in reducing pain in patients with knee OA. The results of the analysis of the range of motion of the flexion joint that there is a significant difference in the range of motion of the flexion joint before and after walking training in knee OA patients (p 0.000 < α 0.05) in other words walking is effective in reducing the range of motion of the flexion joint in patients with knee OA.

Analysis of differences in pain, joint range of motion before and after quadriceps isometric exercise

Health Gate
Volume 1 Number 3, July 2023 ISSN 2986-1098
Homepage: https://healthgate.ppnikotablitar.org/index.php/hg

Table 4. Analysis of Differences in Pain, Range of Motion of the Joints Before and After Quadriceps Isometric Exercise

Variables		Mean	SD	SE	*pvalue*
Pain	Before	4.62	0.68	0.16	
	After	2.01	0.63	0.15	0.000*
	Difference	2.61	0.53	0.13	
Flexion Joint Range of Motion	Before	104.47	10.96	2.66	
	after	112.12	10.14	2.46	0.000*
	Difference	7.65	3.22	0.78	

* Meaningful at α <0.05 by dependent t-test, Wilcoxon test; SD=standard deviation; SE=Standard error

Based on table 4, the analysis results show that there is a significant difference between pain before and after quadriceps isometric exercise in knee OA patients (*p* 0.000 <α0.05) in other words quadriceps isometric exercise is effective in reducing pain in patients with knee OA. The results of the analysis of joint motion range that there is a significant difference in flexion joint motion range before and after quadriceps isometric exercise in knee OA patients (*p* 0.000 < α0.05) in other words quadriceps isometric exercise is effective in reducing flexion joint motion range in patients with knee OA.

Analysis of Differences in Mean Pain, Range of Motion of Joints Before and After walking exercise with quadriceps isometric exercise

Table 5. Analysis of Differences in Mean Pain, Range of Motion of Joints between Before and After Walking Exercise with Quadriceps Isometric Exercise

Variables	Group	N	Mean	Mean difference	SD	SE	*pvalue*
Pain	- Walking exercise	17	3.24		0.65	0.16	
	Quadriceps isometric exercise	17	3.34	0.10	0.56	0.14	0.331
Range of Motion Flexion	Joints - Walking exercise	17	107.77	0.52	10.82	2.62	0.479
	Quadriceps isometric exercise	17	108.29		10.43	2.53	

*Significant at α<0.05 by Independent t-test, Mann-Whitney test; SD=standard deviation; SE=standard error

The results of the research analysis in table 5 show that there is no significant difference in the average pain between walking exercises and quadriceps isometric exercises in knee OA patients (*p* 0.331> α 0.05) in other words walking exercises are not more effective in reducing pain in patients with knee OA than quadriceps isometric exercises. There is no significant difference between the range of motion of the knee joint between walking exercises and quadriceps isometric exercises in patients with knee OA (*p* 0.479> α 0.05) in other words walking exercises are not more effective in increasing the range of motion of the knee joint in patients with knee OA than quadriceps isometric exercises. While the results of the analysis of the range of motion of the extension joint can be concluded that there is no significant

difference in the mean range of motion of the knee extension joint between walking exercises and quadriceps isometric exercises in knee OA patients (p 0.288>α 0.05).

.

Discussion

Pain Differences Before and After Walking Exercise

The results of the analysis of this study found that there was a significant difference between pain before and after walking training in patients with knee OA (p value < α), in other words, walking is effective in reducing pain in patients with knee OA. The range of pain scores on the VAS scale in respondents before the intervention was 4.38, then after the intervention the pain score was 4.38. to 2.05. the difference in average pain scores before and after the intervention was 2.3. This shows that walking exercise can reduce pain in patients with knee OA. So it can be an alternative exercise for patients with knee OA. This is of course the use of analgesics can be reduced to avoid the side effects of analgesics so that patients are able to carry out their activities properly without dependence on analgesics to reduce pain. In line with research walking exercises can reduce pain, especially in OA patients (14). this is also supported the results of research shows that walking exercises performed for less than 30 minutes can reduce pain and do not increase the burden on the knee joint (13). Meanwhile, the results of research show that walking three times a week with a duration of 25 minutes can reduce joint pain in knee OA patients (P <0.01) (15). Reduced pain during walking in addition to a decrease in inflammatory chemical mediators such as cytokines, decreased MMP-3, also occurs due to stimulation of adaptations that can increase muscle mass, bone and increase quadriceps muscle strength or endurance and mood improvement through stimulation of endorphin release (16)This is reinforced which shows that endorphin is produced and released by the pituitary gland which is stimulated from continuous and regular walking.

Pain Differences Before and After Quadriceps Isometric Exercise

The results of the analysis of this study found that there was a significant difference between pain before and after quadriceps isometric exercise in knee OA patients (p value 0.000 < α 0.05) in other words quadriceps isometric exercise is effective in reducing pain in patients with knee OA. The range of pain scores on the VAS scale in respondents before the quadriceps isometric exercise intervention was 4.62, then after quadriceps isometric exercise the pain score was 2.01. The decrease in the average pain score before and after quadriceps isometric exercise was 2.61, this shows that quadriceps isometric exercise can reduce pain in patients with knee OA. So that it can be an alternative exercise in patients with knee OA. This is of course the use of analgesics can be reduced to avoid the side effects of analgesics so that patients are able to carry out their activities properly without dependence on analgesics to reduce pain.

Quadriceps isometric exercises performed continuously and regularly will increase muscle strength so that pain decreases. In line with the results of research that isometric exercise (quadriceps muscle strengthening) given for 2 weeks 3 times per day is effective in reducing pain in patients with significant knee osteoarthritis (p < 0.001)(17). Regular exercise (contraction of the quadriceps muscle regularly) can increase the strength of the quadriceps muscle, increase the diffusion of synovial fluid, and facilitate the pumping action mechanism causing the metabolic process and local circulation to take place properly as a result of vasodilation and relaxation after maximum contraction of the trained muscle. This will cause the transport of substance P and acetabolic produced through the inflammatory process can run well so that pain can be reduced (18).

The results of this study are also in accordance with research that isometric exercises / muscle strengthening exercises can reduce the mean pain score by 3.81 with a standard deviation of 0.45 in advanced osteoarthritis patients (p 0.000)(19). The results of several studies on isometric exercise show that the exercise can reduce pain in knee osteoarthritis patients (20)).

Isometric or static exercise is more intended for joint structural abnormalities, muscle weakness, especially the quadriceps muscle. Isometric exercises can reduce pain through the mechanism of strengthening the quadriceps muscle, so strengthening the quadriceps muscle is the focus of strengthening exercises for knee OA patients. Isometric contractions can help increase muscle strength and joint stability which are important for joint arthrokinematics. and can provide significant benefits in muscle strengthening programmes . With the increase in quadriceps muscle strength, mechanical stress on the knee is reduced so that there is a decrease in the release of collagenolytic metalloproteinases (MMPs) by cytokines as a result of which damage to the cartilage matrix decreases, thereby causing reduced knee pain. Cytokines are chondrocyte derivatives such as IL-1 and TNF which are known to play a direct role in the degradation of human cartilage by MMPs(3).

Differences in Joint Range of Motion Before and After Walking Exercise

The results of the analysis of the results of the analysis of joint motion range that there is a significant difference in flexion joint motion range before and after walking training in knee OA patients (p 0.000 < α 0.05) in other words walking is effective in reducing flexion joint motion range in patients with knee OA. Osteoarthritis (OA) of the knee can cause functional impairment, namely impaired ability to perform activities (7). The inability to perform activities is due to pain and stiffness in the knee joint. This will have an impact on reducing the range of motion of the knee joint. Walking is a dynamic rhythmic activity, mainly involving contraction of the lower extremity muscles, especially the thigh muscles (16).When walking, each extremity experiences one stance phase and one swing phase. The stance phase process mainly involves the musculus quadricep femoris, dorsiflexor muscles and the swing phase involves the dorsiflexor muscles, hamstring musculus, quadriceps musculus, iliopsoas musculus, musculus adductor longus and magnus . These muscles can maintain the flexibility of the knee joint and as a knee support muscle, especially the quadriceps muscle, so that the foot lalan exercise can train the muscles that can maintain the flexibility of the knee joint so that it can increase the range of motion of the joints and reduce joint stiffness (21).

The activity and coordination of the lower limb muscles is not only for movement and balance, but is also required for the maintenance of joint stability. Joint stabilisation is aided by the action of sensory receptors through the gamma muscle system to adjust to muscle activity around the joint(22). Increased quadriceps muscle strength and knee joint stability cause knee pain to decrease. Reduced pain in the knee results in better movement of the knee joint so that the range or range of motion of the joint can increase in patients with knee OA. Regular exercise involving the knee joint can significantly reduce TNF-α, hs-CRP and MMP-3 levels in synovial fluid in patients with knee OA. The mechanism is by inhibiting inflammation thereby preventing damage to chondrocytes and cartilage matrix, inhibiting degeneration of articular cartilage and improving the therapeutic effect and function of the knee (23).

Difference in Range of Motion of Joints Before and After Quadriceps Isometric Exercise

The results of the research analysis on joint range of motion showed that there was a

significant difference in flexion joint range of motion before and after quadriceps isometric exercise in knee OA patients (p 0.000 < α 0.05) in other words quadriceps isometric exercise in increasing flexion joint range of motion in patients with knee OA. The results of this study are in line with research that isometric exercises given 2 times a day evaluated for 4 weeks and 8 weeks can increase the mean range of motion (ROM) by 4.51 in patients with knee osteoarthritis with significance (p 0.001). Research by Thakur et al (10). Guadrisep muscle strengthening exercises given for 2 weeks 3 times per day effectively improve functional activity in patients with significant knee osteoarthritis (p < 0.001). The results of research showed that isometric exercises are effective in reducing stiffness and joint range of motion thereby improving physical function in patients with knee OA (3). Isometric exercise is a quadriceps muscle strengthening exercise by focusing on contractions of the vastus medialis oblique and rectus femoris muscles(24). As a result of regular and continuous contractions in these muscles, muscle strength will increase and joint stiffness will decrease, with reduced joint stiffness and increased quadriceps muscle strength so that pain in the knee can be reduced resulting in better knee joint movement so that the range or range of motion of the joints can increase in patients with knee OA.

Mean difference in pain between before and after walking exercise and quadriceps isometric exercise.

The results of research analysis indicate that there is no significant difference in the mean pain between walking exercise and quadriceps isometric exercise in knee OA patients (p 0.662> α 0.05) in other words, walking exercise is not more effective in reducing pain in patients with knee OA than quadriceps isometric exercise. The results showed that in both intervention groups there was a main complaint of pain. This is in accordance with the theory that knee osteoarthritis has a characteristic clinical symptom, namely pain(5). Pain is the main symptom of patients with OA (6). The occurrence of pain in OA is due to stimulation of nociceptors by inflamatory mediators such as serotonin, bradykinin, calcitonin gene-related peptide (CGRP) and substance P (SP), which are released during tissue damage. Pain that occurs in knee OA is associated with decreased quadriceps muscle strength. The results of research that quadriceps muscle strength is significantly associated with pain in patients with knee osteoarthritis. After the intervention in the form of walking exercises in intervention group I and quadriceps isometric exercises in intervention group II there was a significant decrease in the average pain in both intervention groups (25).

Further analysis showed that both walking and isometric exercises can reduce pain. Although statistically that walking exercise is not more effective in reducing pain in OA patients. However, walking has more benefits than isometric exercise. Isometric exercise is one form of exercise in the rehabilitation process in patients with knee OA which is considered quite effective in preventing disability in OA patients. Conceptually, isometric exercises reduce pain through the mechanism of increasing quadriceps muscle strength (26). Meanwhile, reduced pain during walking occurs due to improved mood through stimulation of endorphin release and through stimulation of adaptations that can increase muscle mass, bone and increase the strength or endurance of the quadriceps muscle(16). In addition, regular walking is beneficial for knee joint health, improving bone growth, maintaining balance, preventing contractures, increasing mobility, causing better feelings, increasing self-esteem, improving cognitive function, and life feels more quality (13).

Walking requires a good coordination of several different muscles. Coordination of activity of the lower limb muscles is required not only for movement and balance but for the maintenance of joint stability. Joint stabilisation is aided by the action of sensory receptors through the gamma muscle system to adjust to muscle activity around the joint (22). Walking

exercise is a simple activity exercise and as part of daily life activities that can maintain the patient's physical fitness, increase muscle elasticity. The more frequent use of the knee joint will physiologically increase muscle strength in the knee joint. If the quadriceps muscle is strong, it will be able to support body weight so that mechanical stress on the knee is reduced, and slow down the process of thinning the knee joint cartilage so that pain will decrease (18). Reduced pain during walking in addition to a decrease in inflammatory chemical mediators such as cytokines, decreased MMP-3, also occurs due to stimulation of adaptations that can increase muscle mass, bone and increase quadriceps muscle strength or endurance and mood improvement through stimulation of endorphin release (16). This is reinforced which shows that endorphin is produced and released by the pituitary gland which is stimulated from continuous and regular walking (27).

Difference in Mean Range of Motion between Before and After walking exercise with quadriceps isometric exercise.

The results of the analysis of this study indicate that the mean range of motion of the knee flexion joint before and after walking training is 107.77 with a standard deviation of 10.82. While the mean range of motion of the knee flexion joint before and after quadriceps isometric exercise is 108.29 with a standard deviation of 10.43. The results of the analysis can be concluded that there is no significant difference between the range of motion of the knee flexion joint between walking exercises and quadriceps isometric exercises in knee OA patients (p 0.595> α 0.05) in other words walking exercises are not more effective in increasing the range of motion of the knee flexion joint in patients with knee OA than quadriceps isometric exercises. Range of motion is the maximum amount of movement possible for a joint in one of three body cuts: sagittal, frontal and transverse. The range of motion (ROM) in the knee joint consists of flexion and extension with a range (degree) (28). A decrease in joint range of motion is usually caused by pain. Joint pain is often due to inflammation due to damage to the structure of the joint tissue which can be aggravated by movement. The results showed that in both intervention groups, apart from complaining of pain, there were also complaints of limited range of motion of the joints. In OA patients there are complaints of pain and limited range of motion of the joints(5). The limitation of joint range of motion is due to pain. The occurrence of pain in OA is due to stimulation of nociceptors by inflammatory mediators such as serotonin, bradykinin, calcitonin gene-related peptide (CGRP) and substance P (SP), which are released when tissue damage occurs (29). Pain that occurs in knee OA is also associated with decreased quadriceps muscle strength.

After the intervention in both groups the average range of motion of the flexion joint increased in both groups. The walking group increased by 6.95, while in the quadriceps isometric exercise group by 7.65. This is in line with research if walking exercises can reduce pain, especially in OA patients(14). The results of research shows that walking exercises performed for less than 30 minutes can reduce pain and are safe for OA patients because they do not increase the burden on the knee joint(13). While quadriceps isometric exercise based on the results of research that isometric exercises given 2 times a day evaluated for 4 weeks and 8 weeks can reduce the average pain by 4.63 (62.9%), in patients with knee osteoarthritis with significance (p 0.001)(10). Research result that isometric exercise (muscle strengthening exercises) can reduce the mean pain score by 3.81 with a standard deviation of 0.45 (P 0.000) (19).

Although conceptually walking involves more of the knee joint in the activity process and involves several muscles that are important in the arthrokinematics process of the knee joint, statistically it shows that there is no significant difference in the range of motion of the knee joint between walking exercises and quadriceps isometric exercises in knee OA patients (p> α) in

other words walking exercises are not more effective in increasing the range of motion of the knee joint in patients with knee OA than quadriceps isometric exercises. The absence of differences or that walking exercises are not more effective in increasing the range of motion of the joints can be influenced by several characteristics, including the two exercises, both walking exercises and quadriceps isometric exercises, have equality in terms of BMI, duration of knee OA and range of motion of the joints before intervention through an equality test. In addition, although the two exercises are equally effective in increasing joint range of motion, the exercises do not focus on ROM movements so that once the pain decreases it will have an effect on increasing joint range of motion. This could contribute to there being no significant difference between walking and isometric quadriceps exercises in increasing knee joint range of motion.Conclusions and Recommendations.

The results of this study prove that supportive group therapy has an effect on resilience to drug abuse after rehabilitation, namely $p = 0.005$ at a significance of $\alpha = 0.05$. Because of the influence resulting from supportive group therapy, it is recommended that institutions to improve service quality by adding supportive group therapy to their post-rehabilitation program.

Conclusions and Recommendations

It is necessary to create a programmed exercise implementation protocol for both walking and quadriceps isometric exercises, Patients with obesity and moderate degrees of OA can be directed with quadriceps isometric exercise options. While patients with normal weight or less body mass index and mild degrees of OA, can be directed to walking exercises, as well as providing lifestyle education for a better quality of life

Acknowledgment

The author would like to thank the respondents and PPSDM KEMENKES RI as the research funder and RSUD Mardi Waluyo Kota Blitar as the research site.

References

1. S S, A A, A.W S, S.K M, B S, A.F S. Handbook of Internal Medicine. 6th ed. Jakarta: Internal Publishing; 2014.
2. Goncharov N, Priorov NN. Osteoarthritis Etiology: Pain as a Basis of Local Therapy,. 3rd ed. Harvard: Harvard university; 2011.
3. P S, L S, T T, A E. The Musculoskeletal System. Basic Science and Clinical Condotions. Second Edition. Churchill Livingstone. Elsevier.: Churchill Livingstone; 2015.
4. Riskesdas Jatim. Laporan Provinsi Jawa Timur RISKESDAS 2018. Kementerian Kesehatan RI. 2018. 191 p.
5. Firestein G.S, R.C B, S.E G, I.B M, J.R O. Kelley's Textbook of Rheumatology. 9th ed. philadelphia: Elsevier Inc.; 2013.
6. Perrot S. Best Practice & Research Clinical Rheumatology Osteoarthritis pain. Best Pract Res Clin Rheumatol. 2015;
7. Davison MJ, Ioannidis G, Maly MR, Adachi JD, Beattie KA. Intermittent and constant pain and physical function or performance in men and women with knee osteoarthritis. Osteoarthr Initiat.
8. Kiadaliri A osteoarthritis with health-related quality of life: A population-based cohort study in southern SH and Q of LOA, Lamm CJ, de Verdier MG, Engström G, Turkiewicz A,

Lohmander, et al. Association of knee pain and different definitions of knee osteoarthritis with health-related quality of life: A population-based cohort study in southern Sweden. Health Qual Life Outcomes. 2016;14(1):1–8.
9. Bokaeian HR, Bakhtiary AH, Mirmohammadkhani M, Moghimi J. Quadriceps strengthening exercises may not change pain and function in knee osteoarthritis. J Bodyw Mov Ther.
10. Akodu AK, Fapojuwo OA, Quadri A. Comparative effects of pilates and isometric exercises on pain, functional disability and range of motion in patients with knee osteoarthritis. J Heal Sci. 2017;5(1).
11. Zen Ahmad. Covid 19: Reals and Challenges Against Doctors. Conf Med Sci Dies Natalis Fac Med Univ Sriwij. 2020;2(1):65–87.
12. Connor SRO, Tully MA, Ryan B, Bleakley M, Baxter GD, Bradley JM, et al. Failure of a numerical quality assessment scale to identify potential risk of bias in a systematic review: a comparison study. BMC Res Notes. 2014;8(224).
13. Farrokhi S, Jayabalan P, Gustafson JA, Klatt BA, Sowa GA, Piva SR. Gait & Posture The influence of continuous versus interval walking exercise on knee joint loading and pain in patients with knee osteoarthritis. Gait Posture. 2016;56(5).
14. Hiyama Y, Yamada M, Kitagawa A, Tei N, Okada S. A four-week walking exercise programme in patients with knee osteoarthritis improves the ability of dual-task performance: a randomised controlled trial. SAGE Journals [Internet]. 2012;26(5). Available from: https://journals.sagepub.com/doi/abs/10.1177/0269215511421028
15. Loew L, Brosseau L, Kenny GP, Durand-bush N, Poitras S, Angelis G De, et al. An evidence-based walking programme among older people with knee osteoarthritis: the PEP (participant exercise preference) pilot randomised controlled tria. Clin Rheumatol [Internet]. 2017;36. Available from: https://link.springer.com/article/10.1007/s10067-017-3606-9
16. Kelly P, Murphy M, Mutrie N. The health benefits of walking [Internet]. Emerald Publishing Limited; 2017. Available from: https://www.emerald.com/insight/content/doi/10.1108/S2044-994120170000009004/full/html
17. Thakur R, Mande M, Mitra M. Effectiveness of Quadriceps Strengthening Exercises in Reducing Extensor Lag, Pain and Improving Functional Activity in Patients of Knee Osteoarthritis. Researchgate [Internet]. 2017;11(2). Available from: https://www.researchgate.net/profile/Tais-Marcolino/publication/316054085_Associations_between_the_Frequency_of_Smartphone_Use_Psychosocial_Aspects_and_Occupations_among_Undergraduate_Occupational_Therapy_Students/links/5936a50aa6fdccb09963bbdb/Associatio
18. Marlina T. Effectiveness of Knee Exercise on Reducing Pain Intensity of Knee Osteoarthritis Patients in Yogyakarta. Sriwij Nurs J [Internet]. 2015;21. Available from: https://ejournal.unsri.ac.id/index.php/jk_sriwijaya/article/view/2331
19. Elbadawy MA. Effectiveness of Periosteal Stimulation Therapy and Home Exercise Programme in the Rehabilitation of Patients With Advanced Knee Osteoarthritis,. Clin J Pain [Internet]. 2017;33(3). Available from: https://www.ingentaconnect.com/content/wk/cjpn/2017/00000033/00000003/art00009
20. Bokaeian HR, Bakhtiary, A. H., Mirmohammadkhani M, Moghimi J. Quadriceps strengthening exercises may not change pain and function in knee osteoarthritis. J Bodyw Mov Ther [Internet]. 2018;22(2). Available from: https://www.sciencedirect.com/science/article/abs/pii/S1360859217301377
21. Ambrose KR, Golightly YM. Physical exercise as non-pharmacological treatment of chronic pain: Why and when. Best Pract Res Clin Rheumatol [Internet]. 2015;25(1). Available from: https://www.sciencedirect.com/science/article/abs/pii/S1521694215000297

22. Khademi-kalantari K, Rahimi F, Jaberzadeh S. Lower limb muscular activity during walking at different speeds: Over-ground versus treadmill walking: A voluntary response evaluation. J Bodyw Mov Ther [Internet]. 2017;21(3). Available from: https://www.sciencedirect.com/science/article/abs/pii/S1360859216301991
23. Zhang S-L. Effects of exercise therapy on knee joint function and synovial fluid cytokine levels in patients with knee osteoarthritis. Mol Med Rep [Internet]. 2013;7(1). Available from: https://www.spandidos-publications.com/10.3892/mmr.2012.1168
24. Nugraha IBA, Kambayana G. Principles of Exercise for Patients with Osteoarthritis. Cermin Dunia Kedokt [Internet]. 2017; Available from: https://adoc.pub/prinsip-latihan-penderita-osteoartritis.html
25. Putri DMP. Keperawatan Transkultural Pengetahuan praktik berdasarkan budaya [Internet]. Keperawatan Transkultural. 2017. p. 285–7. Available from: http://repository.akperykyjogja.ac.id/102/1/Buku Keperawatan Transkultural Lengkap.pdf
26. Maher AB, Salmond S., Pellino T. Orthopaedic Nursing. 3rdth Edition. philadelphia: W.B Saunders Company; 2002.
27. Rokade PB. ReleaseofEndomorphinHormoneandIts. 2011;431127(215):436–8.
28. Potter AP, Perry A. Fundamentals of nursing. Mosby: St.Louis Missouri: Mosby-Year Book, Inc.; 2009.
29. Enohumah KO, Imarengiaye C. Pain in Osteoarthritis. African J Biomed Res [Internet]. 2008;11(2). Available from: https://www.ajol.info/index.php/ajbr/article/view/50713