


## **Application of Knee Pain Exercise to Pain Intensity in Osteoarthritis Patients**

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Article Info	ABSTRACT
<p><b>Article history:</b> Received September 28, 2024 Revised November 06, 2024 Accepted November 07, 2024</p> <hr/> <p><b>Corresponding Author:</b> Agung Widiastuti, Nursing study program, Nursing Profesional Program, Faculty of Health Sciences, Universitas Duta Bangsa Surakarta, Indonesia Email: <a href="mailto:agung_widiastuti@udb.ac.id">agung_widiastuti@udb.ac.id</a></p>	<p>Knee osteoarthritis in the elderly can cause pain due to joint capsules and cartilage damage in the bone joints. Osteoarthritis cases increase the risk of mobility disorders and have an effect on disability. Improving the quality of life in patients with joint disease is very necessary, namely by providing pain management through knee pain exercise. Knee pain exercise can maintain muscle strength so that it can reduce pain, increase functional activity in patients with knee osteoarthritis. This study aims to determine the effect of knee pain exercise in reducing pain intensity in osteoarthritis patients. The research design used Quasy Experiment One Group Pretest - Posttest Control Group Design. The population in this study were all knee osteoarthritis patients who experienced joint pain. The sampling technique used the purposive sampling method. Knee pain exercise was given 3 times a week and was carried out for 2 weeks, pain scale measurements using the Numeric Rating Scale (NRS) were carried out before and after knee pain exercise was given. The average pre-test results showed that the level of pain intensity in the intervention group was 5.05 and the average post-test value was 1.09, while in the control group the average pre-test results were 5.05 and the post-test value was still within the average range of 5.00. The Wilcoxon test results in the intervention group showed a p value of 0.0001 while in the control group a p value of 0.36 was obtained. The conclusion of this study is that there is a change in the level of pain before and after knee pain exercise in the intervention group, so there is an effect of knee pain exercise in reducing pain intensity in osteoarthritis sufferers.</p> <p style="text-align: center;"><b>Keywords:</b> <i>Knee, Pain, Exercise, Osteoarthritis</i></p> <p style="text-align: center;">This article is licensed under a <a href="https://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution 4.0 International License</a>.</p> <div style="text-align: center;"></div>

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### **1. INTRODUCTION**

Knee pain exercises is a series of exercises designed to help reduce pain and improve joint function in patients with osteoarthritis, especially in the knee area. These exercises aim to strengthen the muscles around the knee, increase flexibility, and reduce pressure and friction on the knee joint that often causes pain. Some common types of exercises include hamstring stretches, step-ups, and strength exercises that focus on strengthening the quadriceps, hamstrings, and gluteus muscles.

These joint pain exercises work by increasing blood flow to the degenerative area and increasing the production of joint fluid, which helps lubricate and improve joint function. In addition, these exercises can improve joint stability and prevent further damage to the cartilage, ligaments, and bones around the knee joint. Based on research, these exercises can also reduce the risk of physical disability due to osteoarthritis by maintaining mobility and physical fitness of sufferers.

A study by Cuyul-Vásquez et al. (2020) showed that resistance exercises, such as hamstring stretches and strength training, can effectively reduce pain in patients with knee osteoarthritis. In addition, a study by Messier et al. (2022) confirmed that knee pain exercise can significantly reduce joint pain and improve the quality of life of people with osteoarthritis. This exercise also helps maintain overall body fitness, which is important in reducing the impact of obesity and reducing the

burden on the knee joint, which is often a factor in osteoarthritis. In other words, knee pain exercise is an effective non-pharmacological intervention in managing osteoarthritis pain and preventing physical disability, so it can be an important part of the treatment plan for patients with knee osteoarthritis.

Pain intensity refers to how severe or intense a person’s pain is, and is an important component of the clinical evaluation of a person’s health condition, including in patients with osteoarthritis. Pain can range from mild to severe, depending on factors such as tissue damage, pressure on the affected area, and the individual’s tolerance for pain. In osteoarthritis, pain is often caused by damage to the joint cartilage that causes friction between the bones, as well as inflammation of the tissue surrounding the joint.

This pain often increases with physical activity or when there is pressure on the affected joint, such as when walking or standing. The intensity of the pain can also fluctuate, with patients feeling worse in the morning or after heavy activity, then lessening after rest. Pain intensity is usually assessed using a subjective scale, such as the Numeric Pain Rating Scale or Visual Analog Scale, which allows patients to identify how much pain they feel on a scale from 0 (no pain) to 10 (worst pain possible). Managing pain intensity is essential in osteoarthritis therapy, as uncontrolled chronic pain can lead to decreased quality of life and impaired physical function. Physical exercises, such as knee pain exercises, can help reduce pain intensity by strengthening muscles around the joint, increasing stability, and reducing pressure on the joint. Other approaches such as medications, physical therapy, and lifestyle changes can also be applied to control and reduce pain intensity, prevent physical disability, and improve patient well-being. (Rees, JD, 2020)

While Osteoarthritis is a joint disease characterized by degeneration of joint cartilage where the joint cartilage is damaged. This disease also involves changes in the joint capsule and damage to the joint cartilage at the articulation of the bones.(Center for Disease Control and Prevention, 2020). Damage to the cartilage of the joints causes someone to suffer from osteoarthritis, a condition that causes pain, stiffness in the joints, and functional disorders. One of the main problems in musculoskeletal disorders, especially in the elderly, is pain caused by damage to the cartilage tissue in the joint area.(Vina & Kwoh, 2018).

The following is a table containing data on osteoarthritis based on information available from various sources:

Table 1. The increasing trend in the prevalence of osteoarthritis globally, as well as data on the prevalence of osteoarthritis in Indonesia, especially in Central Java and Sukoharjo Regency.

Year	Prevalence/Cases	Location	Notes
2015	31.8 million (13.6%)	America (CDC, 2018)	Prevalence of osteoarthritis in the United States
2017	54.6 million (22.9%)	America (CDC, 2018)	Increasing prevalence of osteoarthritis in the US
2018	74.9%	Global (Rees, 2020)	Percentage of osteoarthritis patients globally
2018	6.78%	Central Java (RISKESDAS, 2018)	Prevalence of joint disease in Central Java
2020	6.7%	Central Java (RISKESDAS, 2020)	Prevalence of osteoarthritis in Central Java
2020	5.74% (1,822 cases)	Sukoharjo Regency (Health Service)	Prevalence of knee osteoarthritis
2023	78.6%	Global (Rees, 2020)	Increase in osteoarthritis patients

The prevalence of all joint diseases, osteoarthritis contributes to 50-60% of physical disability cases in Indonesia.(RISKESDAS, 2018). Combined data from the National Health Interview Survey (2018), states that the prevalence of osteoarthritis in America increased in 2015 to 31.8 million (13.6%) then increased in 2017 to 54.6 million (22.9%)(CDC/National Center for Health Statistics, 2018). This is in accordance with the 2018 Basic Health Research Data which states that the prevalence of joints in Central Java reached 6.78%.(RISKESDAS, 2018). According to the report(Rees, 2020), stated that osteoarthritis patients increased annually in 2018 by 74.9% increasing in 2023 to 78.6%. Comparable to data in Central Java reported by Riskesdas in 2020, the prevalence was 6.7%. Statistical data from the Sukoharjo Regency Health Office recorded 5.74% or 1,822 sufferers of knee osteoarthritis according to a summary of the last 3 years.

Patients with osteoarthritis of the knee experience thinning to peeling of the joint cartilage, which can irritate the nerve endings on the joint surface and cause pain when there is pressure or friction on the joint surface. Osteoarthritis is a joint disease that is included in degenerative diseases usually attacking people over 60 years of age with a percentage of 60.5% in men and 70.5% in women. Comparable to the increasing number of births and increasing obesity conditions will have a negative impact on health in the future (Aqshadila et.al., 2021).

According to(American Academy of Orthopedic Surgeons, 2020), states that the incidence of osteoarthritis is second only to cardiovascular disease in causing physical or activity limitations. Damage to cartilage, ligaments, bones, and muscles, as well as changes or narrowing of the joint space, are all part of osteoarthritis. X-rays and joint space narrowing will show osteophytes, or newly formed bone. The most common signs and symptoms include pain, stiff joints, and muscle weakness, which can cause physical disability that interferes with daily activities.(Center for Disease Control and Prevention, 2020).

In avoiding physical disability, treatment is needed, one of which is joint exercise (National Center of Biotechnology Information, 2021). Exercises performed on the knee joint are one of the interventions that can be given to patients with knee osteoarthritis. Joint pain exercises such as hamstrings, steps ups, strength can be useful for relieving pain, improving physical function, increasing joint strength, protecting joints from damage by reducing joint pressure, preventing disability, and improving physical fitness (National Center of Biotechnology Information, 2021). This is also supported by research results (Messier, et.al., 2022), knee pain exercise can reduce pain in osteoarthritis joints. In the research results of Cuyul-Vásquez et al. (2020), resistance exercises such as hamstrings, steps ups, strength can reduce pain(Cuyul-Vásquez et al., 2020). Based on this background, the author is interested in conducting research on the effect of knee pain exercise in reducing pain intensity in osteoarthritis patients.

## **2. METHODS**

This type of research is a quasi-experimental one group pretest - posttest control group design which aims to determine the effect of knee pain exercise in reducing pain intensity in osteoarthritis patients. The population in this study were elderly people suffering from osteoarthritis in the Grogol Sukoharjo Health Center work area. Sampling used a purposive sampling technique with 20 respondents from each intervention and control group. The research instrument used the NRS (Numeric Rating Scale) and SOP knee pain exercise. The inclusion criteria in this study were elderly people with pain intensity in the moderate range (4-6) which was calculated using a numeric rating scale. Exclusion criteria included researchers not including osteoarthritis patients after knee replacement surgery, stroke patients, patients with wounds on the knee or lower extremities. Data analysis used the Willcoxon test. This study has undergone an ethical test feasibility from the KEPK team of the Dr. Moewardi Regional General Hospital, Surakarta City with the number 2.138 / VIII / HREC / 2024. The standard operating procedures for knee pain exercise used in this study are as follows:

## STANDART OPERASIONAL PROSEDUR KNEE PAIN EXERCISE

Tahap 1  
Straight Leg



Tahap 2  
Quads exercise with roll



Tahap 3  
Leg cross



Tahap 4  
Sit/Stand



Tahap 5  
Knee squats



Tahap 6  
Steps Ups



Keterangan : Masing-masing gerakan knee pain exercise dilakukan sebanyak 10 kali dengan masing-masing kaki.

### 3. RESULT AND DISCUSSION

#### Respondent Characteristics

**Table 2. Frequency Distribution of Demographic Characteristics of Respondents Based on Age, Gender, Education, Occupation, Duration of Suffering in Osteoarthritis Patients in the Intervention and Control Groups (n=40)**

Characteristics	Group		Control	
	Intervention	Percentage (%)	Number (n)	Percentage (%)
<b>Age</b>				
46-55 years	9	45	4	20
56-65 years	10	50	13	65
66-77 years	1	5	3	15
<b>Total</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>
<b>Gender</b>				
Man	6	30	8	40
Woman	14	70	12	60
<b>Total</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>
<b>Education</b>				
No school	2	10	3	15
SD	7	35	7	30
JUNIOR HIGH SCHOOL	5	25	4	20
SENIOR HIGH SCHOOL	6	30	6	35
<b>Total</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>
<b>Long Suffering</b>				
≤ 1 year	4	20	4	20

2-3 year	11	55	10	50
>3 years	5	25	6	30
	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>
<b>Work</b>				
Laborer	3	15	5	25
housewife	9	45	6	30
Self-employed	2	10	4	20
civil servant	3	15	3	15
Private	3	15	2	10
<b>Total</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>

Based on table 2, it can be seen that the characteristics of the respondents show that most of the respondents are aged 56-65 years in the intervention group as many as 10 respondents (50%) and the control group as many as 13 respondents (65%). The characteristics of gender are mostly women, both the intervention group as many as 14 people (70%) while the control group as many as 12 respondents (60%). The characteristics of respondents based on the length of suffering, the most is 2 to 3 years in the intervention group as many as 11 people (55%) while the control group as many as 10 respondents (50%). The characteristics of respondents based on the most recent education is elementary school, both the intervention and control groups as many as 7 respondents (35%). The percentage of respondents' jobs varies greatly from 40 respondents, the data obtained is that the most are housewives, both the intervention group as many as 9 (45%) while the control group as many as 6 (30%).

Based on the research results, data was obtained that most respondents were aged 56-65 years, which is included in the age group with the most cases of knee osteoarthritis, this is due to problems with the joints caused by physiological changes. Aging is considered to be the cause of increased weakness around the joints, decreased joint flexibility, calcification of cartilage, and decreased chondrocyte function, all of which are factors that contribute to the development of *osteoarthritis* (Myszka et al., 2020). This is supported by the results of the study (Atukorala, 2023), it was found that the aging process in the elderly causes the musculoskeletal system to experience decreased function, causing problems such as joint stiffness, muscle weakness which can affect the quality of life of an elderly person. In addition to age, gender characteristics can also affect the occurrence of osteoarthritis. This is supported by the results of the study, which stated that an elderly person suffering from osteoarthritis was female as many as 34 respondents (72.3%). This is because a woman is susceptible to osteoarthritis which causes the hormone estrogen during menopause. This hormone plays an active role in the loss of bone mass which causes a sensation of pain in the knees in the elderly. This is supported by (Sturesdotter Åkesson et al., 2022) A woman who has osteoarthritis can be affected by hormones, obesity, previous joint injuries.

The educational characteristics of the majority of elderly people with the last education are elementary school (35%), this is supported by the results of Godean's research (2018), the average elderly person has an elementary school education. The higher the level of education, the easier it is for respondents to receive information and vice versa if they have a low education it will hinder the development of knowledge. This is supported by research (Lee et al., 2021), low education has a close relationship with the occurrence of knee pain or osteoarthritis, this is due to a person's lifestyle that lacks knowledge to overcome knee pain in the joints. The characteristics of respondents who have suffered from osteoarthritis for a long time are mostly 2 to 3 years.

This is supported by research by Ester, Rosa & Gil (2017) which stated that most respondents suffered from osteoarthritis for around 1 to 5 years (50.7%). Work is one of the factors that can cause osteoarthritis, where the work in question is work that often involves heavy lifting. From the results of the study, it was found that most respondents worked as housewives (IRT) as many as 4 respondents (36.4%). Being a housewife is one of the causes that can worsen osteoarthritis, this is because the position that is often used in completing housework is using the knee joints as a support and for too long so that this can trigger osteoarthritis. This is in line with research by Ezzat & Linda (2014), most women have a higher cumulative peak force index score than men, especially in the field of housework so that this can trigger osteoarthritis.

**Table 3. Pain Intensity Before and After Knee Pain Exercise in Intervention and Control Groups (n=40)**

Characteristics	Intervention		Control	
	Pre	Post	Pre	Post
Min	4.00	4.00	4.00	4.00
Max	6.00	6.00	6.00	6.00
Mean	5.05	1.09	5.05	5.00
Standard Deviation	0.759	0.852	0.759	0.852

Based on table 3, the intensity of pain before and after in the intervention group and the control group, the minimum value was 4.00 while the maximum value was 6.00. In the intervention group, the pain intensity value before the intervention in the intervention group and the control group obtained an average value of 5.05. Based on the results of Rahmiati's research (2018), it was found that joint pain is a condition that is often experienced by the elderly which is caused by degenerative diseases that cause joint synovial fluid to decrease and result in joint stiffness and pain. This is also supported by the results of the study(Ika Wardojo et al., 2021), the results showed that osteoarthritis in the elderly causes limited movement in the painful area. If the elderly's joint activity is passive, it will result in stiffness and continuous joint problems and if it continues for a long time, it will result in physical limitations.

Meanwhile, data on pain intensity after intervention in the intervention group obtained an average value of 1.9 based on the research results.(Rhmadina & Setiyono, 2020), the level of pain was obtained after the knee joint exercise movement was carried out, the results showed a decrease in the level of pain. Joint movement exercises are carried out gradually, so they will have an impact on reducing the joints because the production of synovial joint fluid can reproduce to lubricate the joint area so that it is useful for reducing joint pain. This is also supported by the results of research by Messier et. al., (2022), which states that after:

**Table 4. Data Normality Test**

Group	P Value
Control Pre	0.01
Control Post	0.02
Intervention Pre	0.001
Intervention Post	0.026

From the data in table 4, the results of the data normality test using the Shapiro Wilk test were obtained for both the intervention group and the control group, with a p value <0.05, so it was concluded that the data was not normally distributed, so it would be tested using the Wilcoxon test statistical analysis.

**Table 5. Data Analysis Before and After Knee Pain Exercise in Control and Intervention Groups**

Group	Z	P value
Intervention	-3.964	0.0001
Control	-0.905	0.366

Based on table 5 explaining the results of the effect of pain intensity before and after knee pain exercise using the Wilcoxon Signed Ranks Test, a P-Value of 0.000 or a P-Value <0.05 was obtained, so it can be concluded that Ho is rejected and Ha is accepted, meaning that there is a significant difference between pain intensity before and after knee pain exercise intervention. So it can be concluded that there is an effect of knee pain exercise on pain intensity in osteoarthritis patients in the intervention group. The average level of pain intensity in the intervention group before the intervention was 5.05 while the average after the intervention decreased in pain intensity to 1.09. While in the control group, a P-Value of 0.366 was obtained or a P-Value > 0.05 meaning that there

was no significant difference between pain intensity before and after knee pain exercise intervention in the control group. So it can be concluded that there is no effect of knee pain exercise on pain intensity in osteoarthritis patients in the control group. The average pretest result of pain intensity in the control group was 5.05, while the posttest result did not experience a significant decrease and was still within the range of 5.00.

From the results of the study, it can be concluded that in the intervention group there was an effect of reducing pain intensity after knee pain exercise. This is supported by the results of the study by Messier et. al., (2022), an elderly person when doing joint exercises will experience changes that joint pain can be reduced and can improve blood circulation and respondents can return to their activities properly. Knee pain exercise can reduce joint pain from damage by reducing stress on the joints, preventing disability, and increasing physical fitness Messier et. al., (2022). Knee pain exercise can maintain muscle strength so that it can reduce pain, increase functional activity in patients with knee osteoarthritis and knee pain exercise intervention can maintain and improve strength, endurance and cardiovascular ability and can increase muscle strength so that it can maintain joint stability and increase the scope of joint space and reduce joint damage so that pain is reduced and also becomes a useful therapy for carrying out activities and for reducing joint pain (Putri et al., 2021).

## CONCLUSION

The conclusion of this study shows that the average pain level in the control group pre-test was 5.05 and post-test 5.00 while in the intervention group the average pre-test was 5.05 and post-test 1.09. The results of the Wilcoxon test in the control group obtained a p-value of 0.366 so that there was no change in the level of pain in the control group p-value 0.36 while in the intervention group showed a p-value of 0.0001 so that there was a change in the level of pain before and after knee pain exercise so that it can be concluded that there is an effect of knee pain exercise on pain intensity in osteoarthritis sufferers in the intervention group.

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