

Effect of Quadriceps Set and Manual Traction on Pain in Osteoarthritis

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ABSTRACT

Background: Osteoarthritis (OA) is a joint disorder in which progressive loss of articular cartilage occurs and can lead to disability. The most common symptom of osteoarthritis is pain. Usually the pain is exacerbated by use of the joint and relieved by rest. treatment is only aimed at relieving pain, maintaining or increasing mobility, minimizing disability, and improving quality of life.

Objective: To determine the effect of quadriceps sets and manual traction on pain in knee osteoarthritis. **Methods:** This study used a pre-experimental method with a one group pretest and posttest design. Pain measurement was performed using a visual analogue scale (VAS). The data normality analysis test will use Shapiro Wilk while the bivariate analysis uses the paired sample t test, and the multivariate analysis uses a linear regression test.

Results: The results obtained from this study, there was a significant effect of manual traction and quadriceps sets on pain $p=0.000$ ($p < 0.05$) and there was no significant relationship between changes in pain with age ($p=0.266$) and BMI ($p=0.241$).

Conclusion: There is an effect of giving quadriceps sets and manual traction on the incidence of reducing pain in knee osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is a disorder of the joints where the cartilage joints disappear quickly and can cause disability. Osteoarthritis recognized as the most common form of arthritis in the world (Hsu & Siwec, 2022). Osteoarthritis can account for about 3.3% to 3.6% resulting in moderate to severe disability with a total of 43 million patients (Sen & Hurley, 2020). Number of sufferers of osteoarthritis globally increased by 48% from 1990 to 2019 (Hunter *et al.*, 2020).

There is no treatment for cure osteoarthritis. Most of the treatment is aimed at relieve pain, maintain or increase mobility, minimize disability, and improve quality of life (Sengul *et al.*, 2022). Physiotherapy as a health worker has an important role to play addressing and rehabilitating movement and mobility of patients with osteoarthritis. There are many modalities that can be used to overcome knee osteoarthritis problems such as quadriceps sets and traction knee joints.

Quadriceps set is an isometric exercise with static muscle contractions
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where there is no change in the range of motion of the joint but there is an increase muscle tone. This exercise can increase muscle strength quadriceps which can activate the endorphins system which suppresses pain. Increasing the strength of the quadriceps muscles can increase changes in pain joints and stiffness in patients with knee osteoarthritis (Sengul *et al.*, 2022).

Traction is defined as a passive motion in the form of a pulling force that can be done slowly (Karokaro *et al.*, 2020). A Studies show that traction on the knee joint is useful for improving pain and functional changes in patients with knee osteoarthritis increase joint space (Choi & Lee, 2019). A Studies show that traction on the knee joint is useful for improving pain and functional changes in patients with knee osteoarthritis increase joint space (Choi & Lee, 2019). The application of traction can widen the distance between joints and pain due to compression of nerve endings the sensory nerves around the joints are reduced (Choi & Lee, 2019). this modality each provides an overview of effectiveness in symptom management pain in osteoarthritis.

METHODS AND MATERIALS

The research method uses pre-experimental research design. This is a one
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group pre and post test design. The research was conducted at Posyandu Sentosa Healthy Elderly, Pepe, Gedongan with a population of 63 people. Sampling using purposive sampling where based on the specified criteria and found 12 people. Inclusion criteria: (a) Age > 45 years, (b) Diagnosed with knee osteoarthritis according to clinical diagnosis American College of Rheumatology, (c) Willing to participate in research program until the end, (d) grade 3. Exclusion criteria: (a) Have a history of knee injury, (b) Presence changes in the shape of the knee joint such as X, O, or others, (c) Post TKR surgery (Total Knee Replacement). It is known that the effect of the intervention can be seen after 4 weeks with a frequency of 3 times/week. Quadriceps intensity set of 3 sets of 10 reps holding contractions for 7-10 seconds. Manual traction is carried out for 30 seconds followed by 5 seconds of rest which is repeated 4 times.

In this study, the independent variables were the quadriceps set and manual traction and the dependent variable is pain. Researchers use visual analogue scale (VAS) in assessing the level of pain in knee osteoarthritis administered before and after therapy. Test data analysis using the SPSS version 21 application with bivariate analysis using paired sample t test

and multivariate analysis with linear regression test. This research declared ethically worthy by the TK.II Hospital Ethics Commission dr. Soedjono with ethical number 118/EC/XII/2022.

RESULTS AND DISCUSSION

As seen in table 1, it is known that the respondents who suffer from osteoarthritis knee are mostly female as much as 91.7%. Age of respondents who dominate 60-74 years with a percentage of 50%. BMI with a normal category of 41.7% followed by an obese category of 33.3% ranks second. Then followed by obesity 1 and obesity 2 with each percentage of 8.3%. namely the work in the results of this study more respondents in daily activities with the position of housewives which has a percentage of 58.3%. Shown in table 2, the average age of the respondents is 61.67 years where the youngest is 46 years old and the oldest is 75 years. The body mass index (BMI) found the lowest was 17.51 and the highest was 36.14. On pain level before treatment (pretest) had an average of 51.75, while the pain level after treatment (posttest) was 33.17. Based on figure 1, the average pain shows a greater change in the third and fourth weeks compared to the first week to the second week.

Based on table 3, the normality test using Shapiro Wilk shows that the results of changes in pain before and after treatment obtained a p value > 0.05 (pretest = 0.970, posttest = 0.547) which means that the data results are normally distributed. The normal distribution here shows that the quality of the data is very good before entering into the next data analysis technique, so that the next data processing can be done proceed according to the plan, namely the paired sample test, where the bivariate requires the initial data to be of good quality with the designation as a normal curve or normally distributed.

Statistical test results in table 4, found p value $< \alpha$ ($0.000 < 0.05$) which implies that the hypothesis can be believed to exist a convincing effect on changes in pain level before and after being given traction manual treatment and quadriceps set on knee osteoarthritis. Based on Figure 1, the average change in pain level for all respondents with quadriceps set intervention and manual traction experienced a decrease in pain and visible changes in the third week and the fourth is greater than the first week to second week.

Based on table 5, it can be interpreted that the multivariate results show a weak association between age and changes in pain ($r=0.349$) and body mass

index with changes in pain ($r=0.367$). Statistical results between age and BMI with changes in pain showed no significant association between pain and age and BMI (p value 0.266 for age and 0.241 for BMI).

The difference in decline between the first week to the second week is smaller than the difference in pain reduction from the second week to the third week and the third week to the fourth week. Response Adaptive behavior appears more complete after several training sessions. Adaptive processes indicate long-term adaptation due lasts for several weeks to 6 months (Hody *et al.*, 2019). Changes in pain after quadriceps sets due to expenditure intracortical inhibition and recruitment of the carrying motor neurons changes to the surrounding tissue. Percentage of motor unit activation during isometric contractions is higher than eccentric contractions and concentric where the difference is due to the different signal issued spinal cord. According to the research of Syahputra & Nurwijayanti (2021), which doing research for 4 weeks showed that the results before and after the intervention did not show the same range

of results higher which shows a high range on results before and after treatment. This could be due relatively short duration of research. Strength training can increase strength muscle and reduce pain at the same time, but nothing acceptable correlation between these changes. Changes in pain after traction caused temporary space between joint while the therapist holds traction for a few seconds and stimulation mechanoreceptors block pain transmission and inhibition muscle guarding reflex reduces discomfort in the muscles (Rathod *et al.*, 2019). Several studies regarding manual traction performed anywhere from 1 until 6 weeks, indicating presence results on changes in pain and increased functional ability in osteoarthritis, but the success is also due to additional physiotherapy modalities such as infrared, TENS, or Cold Packs. This study has limitations, namely the time lag between one intervention and the next. Another obstacle is the difficulty in holding meetings with several respondents. This is because the respondents did not come. so that the intervention schedule becomes closer or further apart.

Table 1. Characteristics of Respondents

	Frequency	Percentage (%)
Gender		
Famale	11	91.7
Male	1	8.3

Age		
45 – 59	5	41.7
60 – 74	6	50.0
≥75	1	8.3
IMT		
<18.5 (not enough)	1	8.3
18.5-24.9 (normal)	5	41.7
25.0-29.9 (obesity)	4	33.3
30.0-34.9 (obesity 1)	1	8.3
35.0-39.9 (obesity 2)	1	8.3
Work		
Housewife	7	58.3
trader	3	25.0
Household servant	1	8.3
Farmer	1	8.3

Table 2. Univariate analysis

	<i>Mean</i>	Standar Deviation	Min-Max	95% CI
Age	61.67	9.129	46-75	55.87-67.47
BMI	24.6242	5.11315	17.51-36.14	21.3754-27.8729
VAS				
<i>Pre test</i>	51.75	15.915	21-80	41.64-61.86
<i>Post test</i>	33.17	15.379	6-66	23.40-42.94

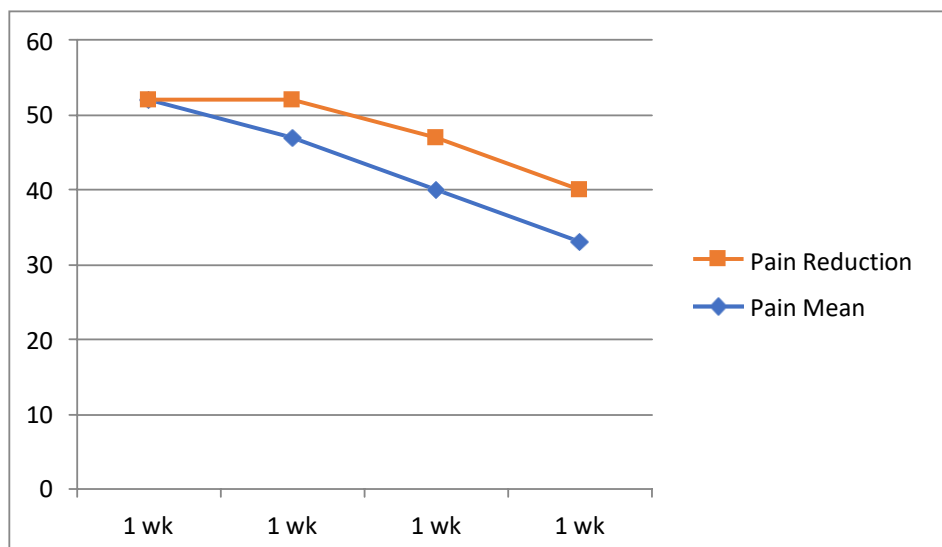


Figure 1. Pain Level Chart

Table 3. Normality Test

	<i>Kolmogorov-Smirnov</i>			<i>Shapiro-Wilk</i>		
	Statistics	Df	Sig.	Statistics	Df	Sig.
<i>Pre test</i>	.135	12	.200	.977	12	.970

<i>post test</i>	.216	12	.187	.920	12	.547
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Table 4. Bivariate Analysis

	<i>Mean</i>	<i>Standard Deviation</i>	<i>Std. Error Mean</i>	<i>P value</i>
<i>Pre test and post test</i>	18.583	4.680	1.351	0.000

Table 5. Multivariate Analysis

	<i>r</i>	<i>R2</i>	<i>SE</i>	<i>Line Equations</i>	<i>P value</i>
Age	0.349	0.122	15.113	Pain = -3.138 +0.589*usia	0.266
BMI	0.367	0.134	15.007	Pain = 6.017+1.103*IMT	0.241

CONCLUSIONS AND SUGGESTIONS

In this study regarding "The Effect of Quadriceps Set and Manual Traction on Pain in Knee Osteoarthritis" concluded that there is an effect of giving quadriceps sets and manual traction on changes in knee osteoarthritis pain level. The findings of this study answer the initial research problem, that the two modalities can change pain level and the reduction itself. Besides that, the factors that affect pain reduction with quadriceps sets and traction like age and BMI did not significantly affect the two modality in changing the level of pain.

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