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Submission date: 24-Aug-2025 07:06PM (UTC+0700)
Submission ID: 2734123921
File name: 4_Agustus_2025_JSA_Ulfatul_Azizah_Awaliyyah_197_204.pdf (800.44K)
Word count: 4803
Character count: 26074

Journal Sport Area
http://journal.uir.ac.id/index.php/JSP
Vol. 10. No. 2. August, (2025)

Effectiveness of petrissage massage manipulation in reducing delayed onset muscle soreness (DOMS)

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Received 18 November 2024; Accepted 25 May 2025; Published 30 July 2025
Ed 2025; *10*(2): 197-204

ABSTRACT

Background: Delayed onset muscle soreness (DOMS) often occurs after intense physical activity and can limit subsequent performance. While common recovery methods such as ice therapy, stretching, and anti-inflammatory medications are widely used, they may not always be effective or free of side effects. Massage therapy—particularly the petrissage technique—offers a promising alternative by improving blood circulation, reducing muscle tension, and accelerating tissue recovery. **Research Objectives**: This study aims to evaluate the effectiveness of petrissage massage manipulation in reducing DOMS-related pain, offering a practical and non-invasive recovery method. **Methods**: A pre-experimental one-group pretest-posttest design was used. Participants experiencing DOMS were recruited from Klinik Satu Sehat. Pain levels were assessed using the Visual Analog Scale (VAS) before and after the intervention. Data were analyzed using the Shapiro-Wilk test for normality and a paired sample t-test to examine the effect of the massage treatment. **Finding/Results**: The study found a 38.7% reduction in pain levels after applying petrissage massage, indicating a significant improvement in muscle recovery. This reduction reflects the positive impact of increased blood flow and muscle relaxation facilitated by the massage technique. **Conclusion**: Petrissage massage manipulation is an effective technique for alleviating DOMS pain. It enhances blood flow, reduces muscle stiffness, and supports faster tissue healing. Future studies are encouraged to test this method across different populations, such as trained athletes and sedentary individuals, to explore potential variations in its effectiveness.

Keywords: DOMS; massage therapy; petrissage technique; pain recovery; physical rehabilitation

https://doi.org/10.25299/sportarea.2025.vol10(2).19747

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How to Cite: Awaliyyah, U. A., Raharjo, H. P., Saputro, R. E., Irawan, F. A., & Kresnajati, S. (2025). Effectiveness of petrissage massage manipulation in reducing delayed onset muscle soreness (DOMS). *Journal Sport Area*, *10*(2), 197-204. https://doi.org/10.25299/sportarea.2025.vol10(2).19747

Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Human life cannot be separated from the need for physical activity. One form of physical activity that can be done every day and provides many benefits if done regularly is exercise. Exercise if done without good planning or not programmed properly, can have negative impacts. One of these negative impacts is sports injuries (Saputro et al., 2022). Sports injuries often occur in the musculoskeletal system, which includes

muscles, skeletons, or bones, especially when doing sports. Sports injuries can have a bad impact and become an obstacle for athletes, because these injuries can force someone to stop sports activities temporarily (Basiran et al., 2020). Injury can be interpreted as damage to body function caused by sports activities and can harm physical performance and interfere with daily life activities.

Exercise can also cause delayed onset muscle soreness or DOMS (Delayed Onset Muscle Soreness). DOMS is a type of muscle soreness that usually appears within 24-72 hours after a person does physical activity (Zondi et al., 2015). DOMS occurs due to damage to muscle tissue, which triggers the body to repair the damage and stimulates sensory nerve endings, causing pain. The process of DOMS involves several factors, such as the formation of lactic acid, muscle stiffness, connective tissue damage, muscle damage, and inflammation. DOMS is often experienced by individuals who do high-intensity sports or exercises, especially movements that involve eccentric contractions, which are when the muscles hold weight and contract in a lengthened state, which can cause microscopic tears in the muscles (Veqar & Imtiyaz, 2014).

Efforts to prevent and overcome DOMS are needed to reduce the occurrence of DOMS. According to Sari (2016), one of the effective techniques to prevent and reduce DOMS pain due to intensive training is sports massage. Massage is a technique that uses hand touch to speed up the recovery process and reduce symptoms felt by the body (Zebua et al., 2021; Karadavut & Acar, 2024). Sports massage has many physiological benefits, such as increasing blood pressure, lowering heart rate, increasing range of motion, reducing muscle tension, reducing muscle pain, and relaxing muscles (Nurmaya et al., 2023). Sports massage has a significant positive impact on athletes and sportsmen, supporting physical performance, preventing injury or DOMS, and functioning as rehabilitation therapy (Efda & Ambardini, 2024).

Sports massage has several manipulations used to help improve blood circulation and reduce DOMS tension or pain. Giving massage manipulation after sports activities can reduce pain and muscle tension. Petrissage manipulation is often used because it is considered effective in reducing muscle tension, swelling, and pain, as well as increasing blood flow. Petrissage massage is considered to provide benefits in increasing plantar flexor flexibility and increasing muscle strength. In line with the research of McKechnie et al. (2007) that the results of petrissage massage manipulation can increase plantar flexor flexibility which can be an alternative to static stretching in athletic sports. Previous studies by Kaur and Sinha (2020) and Ogai et al. (2008) stated that petrissage massage is considered capable of reducing tissue stiffness, increasing muscle flexibility, reducing lower leg muscle fatigue which can be used as a therapeutic method to support post-exercise pain recovery and prevent injury.

However, there has been no previous research that has tried to use the petrissage massage manipulation technique to reduce DOMS pain and there is no literature available. Therefore, efforts need to be made using the petrissage massage manipulation technique to help recover DOMS pain in the lower extremities. This effort is expected to provide recommendations regarding effective methods to reduce DOMS pain after doing high-intensity sports or activities. The purpose of this study was to determine the effectiveness of petrissage manipulation in reducing the intensity of DOMS pain in the lower extremities of patients at Klinik Satu Sehat, Kota Semarang after doing sports or exercise activities.

METHOD

Research Design

This study uses the quasi-experimental method with a one-group pretest-posttest design. Quasi-experiment is an experimental method that has treatment, impact measurement, experimental unit but does not use random experiments to see comparisons in order to see the results of changes given by treatment (Abraham & Supriyati, 2022). One group pretest-posttest design is a study that provides treatment to a group without a control group, then the results of the treatment are observed both before and after the treatment is given (Hastjarjo, 2019). the research subjects are divided into one group and then data collection and measurements are carried out before and after being given petrissage massage manipulation treatment with the intention of knowing whether there the subjects experience change and reductions in pain before and after being given treatment. The research design used can be described as follows:

$$O_1 \rightarrow X \rightarrow O_2$$

Description:
O_1 = Pretest value (before petrissage massage manipulation)
X = Treatment (petrissage massage manipulation)
O_2 = Posttest value (after petrissage massage manipulation)

Research Subject

The population of this study was patients of the Klinik Satu Sehat in Kota Semarang who experienced DOMS pain. Determining the calculation of the population of patients experiencing DOMS pain using data on the number of patients who came to the Klinik Satu Sehat in Kota Semarang for 1 month (May 1-31) and obtained a population with 35 patients with complaints of DOMS pain. Samples were taken using the purposive sampling method with the criteria (1) male or female, (2) Age 18-40 years (3) active aerobic exercise (4) experiencing DOMS pain in the lower extremities approximately 24 hours after exercise, (4) no history of acute injury. So that the subjects used in this study were 10 men and women with complaints of DOMS pain. Sample exclusion criteria in this study: (1) patients who are unwilling to be respondents, (2) unwilling to undergo the treatment given, (3) have a history of bone fractures, (4) are not active in sports.

Research Procedures

The sample was given VAS pretest to determine the intensity of pain felt. After that, procedure for massage treatment refers to Jönhagen et al. (2004) that which is modified and adapted to the research needs the patient was given 1 massage therapy treatment, each manipulation was 4 minutes (effleurage, tappotement, friction) and massage using petrissage massage manipulation for a period of 8 minutes once for a total time of 20-30 minutes. During the treatment, the sample was asked to estimate the intensity of the massage to avoid pain and discomfort during the treatment. The next step was for the sample to take a final test (posttest) to determine whether there was a change in the DOMS pain felt by the sample after being given treatment.

Measurement

Pain examination in this study subjects used a pain scale, namely the Visual Analog Scale (VAS) with a range of numbers from 0-10. Data collection on the pain scale was carried out by the subjects themselves by sliding or moving the marks on the Visual Analog Scale as a sign of the intensity of pain felt by the study subjects. VAS is used to measure pain intensity with the initial pain scale test occurring after 24 hours of physical activity or exercise (Crellin et al., 2021). The second test was carried out after the sample was given treatment for approximately 20-30 minutes. The results of the validity and reliability tests based on the research of Abend et al. (2014) which compared the visual analog scale (VAS) with the state anxiety score of the Spielberger state-trait anxiety inventory (STAI) in patients who were going to undergo surgery, showed a relationship between VAS and STAI ($r = 0.66$; $p < 0.01$).

Data Analysis Techniques

Data analysis techniques in this study used SPSS version 26. Data analysis steps with descriptive analysis, statistical tests, namely normality tests as prerequisite analysis tests needed to determine whether research data is normally distributed or not normally distributed and homogeneity tests, namely the requirement test in independent sample t-test and anova analysis to determine whether several population variants in a study are the same or not, hypothesis testing using paired sample t-test to determine whether or not there is a significant difference from the results of two average data (Park et al., 2017). Calculation of the percentage of effectiveness of reducing pain after being given petrissage nassage manipulation treatment is calculated based on the average value of the pretest and posttest.

RESULTS AND DISCUSSION

In this study there are descriptive data consisting of data on the number of respondents (n), body weight (kg), height (cm), and pretest and posttest pain scale measurements. The data has been presented in the form of Table 1.

Table 1. Descriptive Data Sample

N=10	Mean	Min	Max	SD
Weight (kg)	73.44	57	107	± 14.844204
Height (m)	1.676	1.6	1.77	± 0.0475815
BMI (kg/m)	26.086	20.4	37.02	± 4.9686219
Pretest	6.2	4	6	± 1.2489996
Posttest	3.8	2	8	± 1.4

Descriptive data of the research subjects produced an average weight of 73.44 kg, minimum weight of 57 kg, maximum weight of 107 kg. Height data showed an average result of 1.67 m, minimum 1.6 meters, maximum height of 1.77 meters. The pain scale in this study was measured using VAS (Visual Analog Scale) with a range of 0-10. A value of 0 on the VAS indicates that the subject does not feel pain and a value of 10 indicates the highest pain/pain. The pretest average was 6.2 with a standard deviation of ± 1.2489996. The posttest average result was 3.8 and a standard deviation of ± 1.4.

Table 2. Shapiro Wilk Test

Test	Statistic	df	Sig.
Pretest	0.942	10	0.575
Posttest	0.887	10	0.158

The results of the Shapiro-Wilk normality test in the table show a significance value in the pretest of 0.575 and a posttest of 0.158. The results of the pretest significance value of 0.575 > 0.05 and the results of the posttest significance of 0.158 > 0.05 can be concluded that the data in this study are normally distributed.

Table 3. Paired Sample T-Test

Test	Mean	Std. Deviation	t	df	Sig.
Pretest-Posttest	2.4	± 0.84327	9.0	9	0.000

Based on the results of the paired sample t-test in the table above, the test results show that there is an effect of providing petrissage massage manipulation treatment on research subjects with a significance value of 0.000 < 0.05. The percentage of effectiveness of reducing pain after being given petrissage massage manipulation treatment was calculated based on the average value of the pretest and posttest using the following formula:

$$Efectiveness = \frac{Posttest - Pretest}{Pretest} x\ 100\%$$

To determine the effectiveness of petrissage massage manipulation treatment on Delayed Onset Muscle Soreness (DOMS) pain, we calculated the percentage change in pain levels. This was done by finding the difference between the average posttest and pretest values, dividing that difference by the pretest value, and then multiplying by 100%. The resulting effectiveness in reducing pain was found to be 38.7%.

This study aims to determine the effectiveness of petrissage massage manipulation on the recovery of DOMS pain in the lower extremities in athletes after exercise or sports. The results of the study from data processing that has been carried out using the paired sample t-test showed that the provision of petrissage massage manipulation affects reducing pain levels in DOMS pain sufferers of Klinik Satu Sehat patients in Kota Semarang by obtaining a p-value of 0.000 < 0.05. The results of the study stated that the provision of petrissage massage manipulation in DOMS pain sufferers is effective in recovering and reducing pain. The data states that the percentage of effectiveness in reducing pain is 38.7%.

Sports massage is one of the therapy methods used by athletes or sportsmen to improve performance, and prevent and overcome injuries, and other physical disorders caused by excessive exercise or sports intensity (Ramdhan et al., 2024). Sports massage manipulations that are often used include effleurage, petrissage, shaking, friction, and tapotement (Davis et al., 2020). This manipulation can be useful for relaxing muscles, relieving muscle tension, reducing DOMS pain, improving blood circulation, and increasing joint flexibility (Nunes et al., 2016). Research by Ilmi et al. (2018) stated that giving sports massage manipulation after doing eccentric activities has a positive impact on reducing muscle pain. This indicates that the decrease in pain intensity is influenced by effleurage, petrissage, shaking, and tapotement manipulation (Ilmi et al., 2018). Petrissage massage is one of the methods used to reduce DOMS pain.

The decrease in DOMS pain in patients at the Kota Semarang Satu Sehat Clinic after being given petrissage massage manipulation treatment, is because petrissage massage manipulation is manipulation using squeezing and pressure. Petrissage or massaging is a movement by pressing and then squeezing the tissue using one or both hands (Kurniawan & Kurniawan, 2021). The purpose of petrissage manipulation is to encourage blood flow back to the heart and encourage the combustion of residues resulting from physical activity or sports (Handayani et al., 2024). Petrissage is useful for increasing blood flow by mobilizing deep muscle tissue and increasing oxygen circulation so that this can reduce DOMS pain and can reduce inflammation in the muscles (Gasibat & Suwehli, 2017; Guo et al., 2017). Increased blood flow to the muscles will help remove lactic acid and energy metabolism left in the body after exercise and increase the recovery of energy and other nutrients needed for the recovery process of DOMS pain. Petrissage massage is useful for increasing blood flow in the massaged area, stimulating blood vessels, and delivering oxygen and nutrients to tired muscle tissue (Ilmi et al., 2018). The physiological mechanism behind this increase in blood flow is related to the body's response to the mechanical stimulus produced by petrissage massage manipulation. When treating muscles, this causes changes in blood vessels that increase blood flow. Research shows that sports massage manipulation, which includes techniques such as petrissage, can cause a decrease in heart rate and increase blood pressure, which simultaneously increases blood and lymphatic circulation (Priyonoadi et al., 2018). Therefore, petrissage massage manipulation is important as an effort for post-workout recovery, where the body needs increased blood flow and reduced metabolic waste contributes to reducing inflammatory reactions due to muscle damage, thereby helping to reduce the symptoms of pain felt (Mardiana et al., 2022). This manipulation is very useful when the body or muscle fatigue occurs. The effects of petrissage massage can affect motor nerves. This manipulation is very useful when the body or muscle fatigue occurs.

The results of the study stated that the petrissage massage manipulation technique was effective with a value of 38.7% in reducing DOMS pain after doing high-intensity sports activities. This can be seen based on the decrease in the pain scale after being given petrissage massage treatment, obtaining an average pre and post test value of 2.4. In line with research conducted by Mahardika et al. (2024) petrissage manipulation sports massage treatment affects reducing muscle fatigue after basketball training. Giving sports massage using effleurage and petrissage techniques is considered effective in reducing DOMS pain and providing post-match relaxation. This technique is safe to use because it provides pressure to relax and helps smooth blood circulation. Another study conducted by Lubis et al. (2023) stated that sports massage manipulation of effleurage and petrissage had an effect on reducing muscle fatigue after pencak silat training and had a high percentage compared to other massage manipulations. The provision of petrissage technique sport massage treatment to the decrease in post-exercise fatigue obtained an rtable value of 0.361 and a contribution of 89.93% which means that the provision of petrissage technique sport massage treatment to the decrease in post-exercise fatigue of Al Azhar Bengkulu Athletes Pencak Silat is significant and large.

The results of this study are the following Muanjai and Werasirirat (2014) study which stated that petrissage massage manipulation reduces DOMS pain compared to other pain recovery methods such as stretching and static rest. Petrissage massage can increase blood flow and oxygen circulation which can help to reduce DOMS pain by reducing muscle stiffness and fatigue felt after doing sports or high intensity exercise. Holub and Smith (2017) study results showed that petrissage massage manipulation sports massage together with other massage manipulations can effectively reduce DOMS pain after exercise or sports with high intensity and duration. Providing petrissage massage manipulation treatment for lower extremity DOMS pain as a recovery

method is considered to accelerate pain reduction and body recovery in reducing pain due to heavy exercise or sports with high intensity and duration. Following research conducted by Sa'roni and Graha (2019) which states that sports massage is effective for reducing pain caused by post-exercise with duration and intensity.

CONCLUSION

The conclusion is that the provision of sports massage treatment with petrissage massage manipulation has an effect and is effective with a percentage of 37.8% on reducing and recovering DOMS (Delayed Onset Muscle Soreness) pain in the lower extremities. The expected implications can provide new insights into the use of petrissage massage manipulation techniques as an alternative method for DOMS pain recovery. This study provides recommendations related to effective massage manipulation to practitioners such as trainers and therapists on how petrissage massage can be applied effectively in DOMS pain recovery programs. The limitations of this study are the limited number of samples so that the results cannot be generalized widely. Further research suggestions can increase the number of population variation samples to obtain more valid effectiveness results.

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