



Effectiveness of static exercise and friction massage in improving joint mobility and reducing pain.

Arif Setiawan^{1ABCD}, Zainul Aziz^{2BCDE}, Priyanto Priyanto^{3ACDE}

^{1,2,3}, Sports Coaching Education, Universitas Negeri Semarang, Indonesia

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Abstract: Joint disorders are common health issues affecting many individuals, resulting from injury, degenerative conditions, or excessive physical activity. These disorders often lead to reduced joint range of motion and increased pain, negatively impacting the quality of life. This study aimed to assess the effectiveness of static exercise and effriction massage therapy in improving joint mobility and reducing pain among individuals with joint disorders. A pre-experimental one-group pretest-posttest design was employed, involving 30 adults with lower back pain selected through purposive sampling. Participants underwent two interventions: effriction massage, targeting the lumbar region for 15 minutes, administered by a trained therapist, and static exercises. Pain levels and functional mobility were evaluated using the Visual Analogue Scale (VAS) and the Oswestry Disability Index (ODI) before and after the interventions. The analysis, conducted using paired t-tests, revealed significant improvements. Effriction massage and static exercise were effective in alleviating back pain, with a t-value of 15.07, an average difference of 6.58, and a 95% confidence interval ranging from 3.95 to 7.33. Additionally, static flexibility training significantly increased back flexibility, with a t-value of 5.68, an average improvement of 2.49, and a 95% confidence interval between 1.64 and 3.47. The study concludes that effriction massage and static exercise are effective in reducing pain perception and enhancing back flexibility in athletes, providing evidence for their use in managing joint disorders and improving functional outcomes.

Keywords: effectiveness; exercise therapy states; masase friction; joint motion; decreased pain

Corresponding author: Arif Setiawan, email: Arifsetiawan@mail.unnes.ac.id



INTRODUCTION

Joint disorders are one of the most common health problems experienced by the community, whether due to injury, degenerative disease or excessive physical activity (Hasrawati, 2022; Joy & Kotteeswaran, 2024; Najam & Jafri, 2022). This condition often results in decreased range of motion (ROM) and increased pain, which can ultimately reduce the quality of life of the sufferer (Gönenç & Terzioğlu, 2019; Masyitah et al., 2024). Several non-invasive therapies, such as static exercise therapy and efriction massage, have been widely used to treat this problem. However, more research is needed to understand the effectiveness of these two methods, both separately and together, in increasing joint range of motion and reducing pain.

Back pain is a common complaint among people. It is estimated that around 70-95% of adults will experience back pain at least once in their lifetime, with a point prevalence of around 25% and a 1-year prevalence of up to 50% (Delano et al., 2023; Huda et al., 2023). This back pain often occurs as a result of multidimensional injuries, especially in athletes, and is clinically described as a problem involving muscles, pain, and reduced joint range of motion (Nejati, 2019; Zhang et al., 2023). The location of the pain is usually in the area between the thoracic 12 and the gluteal fold, with or without pain radiating down the leg.

The main causes of these complaints come from various tissues such as the zygapophyseal joint, intervertebral discs, ligaments, nerve roots, dura mater, muscles and fascia (Ramaniam & Hemavathy, 2022; Rashid et al., 2020). In addition to anatomical factors, the condition is influenced by psychological, social and neurophysiological aspects. The complexity of back pain requires a comprehensive rehabilitation approach, such as a combination of static exercise therapy and massage, to improve joint mobility and effectively reduce pain.

Several previous studies have looked at rehabilitation interventions involving static exercise and efriction massage. Static exercises are known to improve muscle strength and joint flexibility, which in turn can increase joint range of motion (Ariani & Suryanti, 2021; Rambe, 2021; Triyarso & Setiawan, 2024). On the other hand, friction massage is used to improve blood circulation, repair injured soft tissues and reduce pain by stimulating certain nerves. Static exercises can help improve ROM in patients with knee injuries. Efriction massage is effective in reducing pain in patients with tendinitis.

This study presents a novelty by combining static exercise therapy and efriction massage as a multidimensional approach in the rehabilitation of low back pain, particularly in

athletes who have suffered complex injuries involving biological, psychological, social and neurophysiological elements. This approach provides a new perspective because previous studies have examined these two therapies more separately. The focus on the athlete population also offers a unique contribution compared to studies that generally involve non-athlete patients. However, there are gaps that need to be bridged, such as the lack of studies that explicitly evaluate the combination of both therapies, especially in neurophysiological aspects and long-term mechanisms of pain reduction. In addition, most studies still rely on subjective measurements such as the Visual Analogue Scale (VAS) without objective data such as biomechanical analysis. The optimal duration of the intervention and the variation in rehabilitation needs between athlete and non-athlete patients have also not been widely explored. Therefore, this study provides an important basis but requires further research to address the gap.

The main concept in physical rehabilitation therapy is to improve joint function and reduce pain. Neuromuscular adaptation theory and inflammation reduction theory are often the basis of various rehabilitation-related studies. Static exercise, according to the neuromuscular adaptation theory, allows for increased joint stability and muscle flexibility, which significantly contributes to improved ROM (Frey et al., 2024; Radaš et al., 2022; Ramdhan et al., 2024). Meanwhile, friction massage is consistent with the theory of inflammation reduction, which reduces soft tissue inflammation and facilitates the healing process. Therefore, the combination of these two methods is expected to make a significant contribution to the rehabilitation of joint disorders.

Previous studies have looked at the effectiveness of static exercises and massage individually, but there is still little research that compares or combines the two methods in a comprehensive way. Most previous studies have tended to focus on just one method, and not many have explored how the two methods can work synergistically. This study therefore aims to fill this gap by evaluating the effectiveness of a combination of static exercise therapy and friction massage in improving joint range of motion and reducing pain. The novelty of this study lies in the combination approach of the two therapies, which has not been extensively studied in the context of joint rehabilitation.

This study aims to evaluate the effectiveness of static exercise therapy and friction massage in increasing joint range of motion and reducing pain in patients with joint disease.

The results of this study are expected to make a significant contribution to the development of rehabilitation methods that are more effective in treating joint disorders.

MATERIAL AND METHODS

This study is a pre-experimental study using a one-group pretest-posttest design model. In this design, pre-treatment and post-treatment measurements are taken without a control group, allowing researchers to compare baseline and post-intervention conditions evaluate the effectiveness of massage therapy and static exercises in reducing back pain and improving movement function.

The study sample consisted of 30 adults who experienced lower back (lumbar) pain. The selection of samples was carried out by purposive sampling technique, where participants were selected based on certain criteria, namely those who experienced back pain corresponding to lumbar pain symptoms. Participants in the study were drawn from a larger population, and a sample of 30 people was considered representative enough to assess changes in pain and movement function. In this study, participants underwent two types of interventions, namely massage efriction focused on the lumbar back area and static exercise therapy. This study used a pre-experimental design with one-group pretest-posttest model. The experimental process began with an intervention in the form of massage efriction, which was performed by the therapist for 15 minutes on the back area, focusing on the lumbar part. This therapy aims to relieve muscle tension and increase blood flow to the area. After the massage session, participants were asked to perform static exercises independently at home for one week. This exercise includes stretching and strengthening the lower back muscles, which aims to increase the flexibility and strength of the muscles associated with back pain.

Before and after the intervention, participants were measured for pain level and movement function using measurement instruments including the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI). VAS was used to measure pain intensity, in which participants rated their pain on a scale of 0 to 10. Meanwhile, the ODI measured the impact of back pain on participants' functional ability to perform daily activities, such as walking, sitting, and standing. In addition, a flexibility test was also carried out to measure the range of motion of the lumbar joint in order to evaluate changes in movement ability after the intervention. After the one-week intervention, participants again filled out VAS and ODI questionnaires to measure changes in their pain and movement function. Pretest and posttest Data were then

analyzed using a t-test for paired samples. This t-test was used to compare changes before and after the intervention, both in terms of pain level (VAS) and movement function (ODI), to evaluate the effectiveness of the intervention given.

This study involved 30 participants who experienced low back pain, selected through purposive sampling method. Prior to the intervention, participants underwent an initial measurement (pretest) to assess pain intensity using the Visual Analog Scale (VAS), movement function through the Oswestry Disability Index (ODI), and spasticity by measuring the range of motion of the lumbar joints. VAS is used to rate pain on a scale of 0 to 10, while ODI measures the impact of pain on daily activities, such as walking, sitting, and standing. Afterwards, participants received an intervention consisting of a 15-minute effriction massage of the lumbar region by a trained therapist and static exercises to improve flexibility and muscle strength. After one week of intervention, a re-measurement (posttest) was performed using a VAS, ODI, and spasticity test to evaluate changes in pain intensity, movement function, and joint range of motion. The pretest and posttest data were then analyzed using a T-test for paired samples to compare changes before and after the intervention, so that the effectiveness of the therapy could be evaluated.

RESULTS

In this study, the age of the respondents was divided into 3 groups: late adolescence, early adulthood and late adulthood. Most respondents (33.3%) were in the 46-55 age group. The lowest age group was late adolescence (26.67%). Characteristics by gender are dominated by women (60%), data can be seen in Table 1. Athletes with acute back pain were the most common, with 13 people (43.3%) compared to chronic back pain (57.7%). Most patients with back pain complained of tingling (76.6%) and had no history of falls (63.4%). 17 patients (57.7%), there were seven patients with radiographic spondyloarthrosis (23.3%), followed by normal image (13.3%), spondylolisthesis and spondylosis were the same number of patients (6.6%), HNP and lumbar scoliosis each experienced back pain (3.3%) can be seen in Table 2.

Table 1. Characteristics of the research sample

| Characteristics | Frequency | Percentage (%) |
|-----------------|-----------|----------------|
| Total samples | 30 | 100 |
| Age | | |
| Late Teens | 8 | 26,67 |
| Early Adulthood | 12 | 40 |
| Late Adulthood | 10 | 33,33 |
| Gender | | |
| Female | 18 | 60 |
| Men | 12 | 40 |

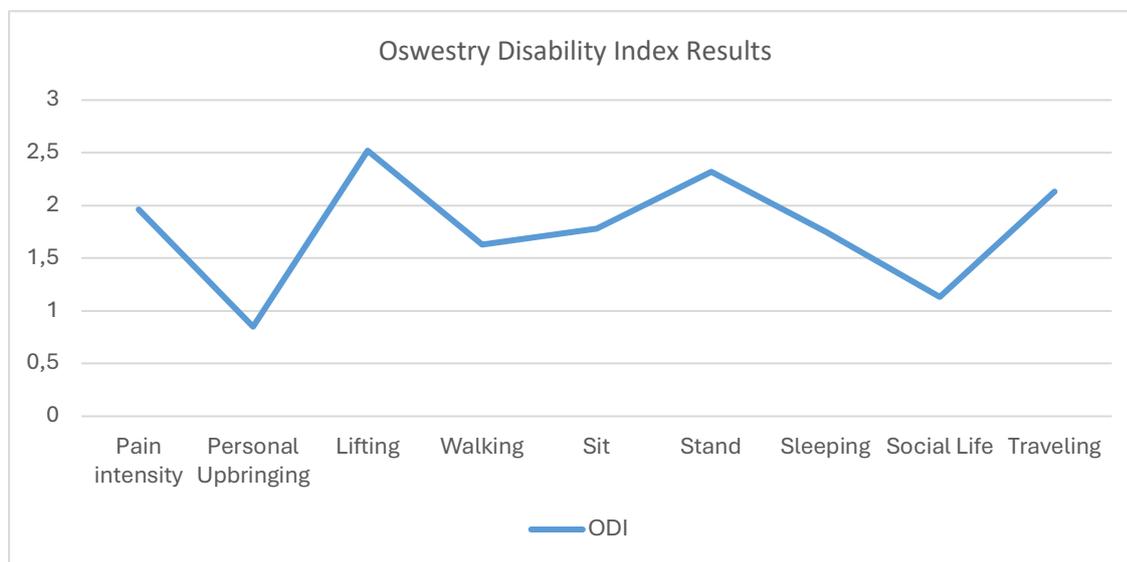
Table 2. characteristics of back pain experienced

| Characteristics | Frequency | Percentage (%) |
|-------------------------------|-----------|----------------|
| Duration of pain | | |
| Acute | 13 | 43,3% |
| Chronic | 17 | 57,77% |
| Tingling | | |
| There is tingling | 23 | 76.6% |
| No tingling | 7 | 23,4% |
| History of disease | | |
| There is a history of falling | 14 | 46,6% |
| No history | 16 | 63.4% |
| Expertise X-Ray | | |
| Normal | 4 | 13.3% |
| Spondylolisthesis | 2 | 6,6% |
| HNP | 1 | 3,3% |
| Spondylosis | 2 | 6,6% |
| Spondyloarthrosis | 7 | 23,3% |
| Lumbar Scoliosis | 1 | 3,3% |
| No X-rays | 13 | 43,3 |

In the ODI questionnaire, the questions on lifting, walking and travelling, among others, have a higher mean. The question about personal education has the lowest mean. The normality table shows that all data have p-values (Sig.) greater than 0.05 (> 0.05), indicating that the overall variable has a normal distribution. In other words, since the significance value is greater than 0.05, it can be concluded that the data are normally distributed. In the homogeneity table 5, you can see the GIS value. $p > 0.05$ and $F_{\text{levene}} < F_{\text{table}} (3,37)$, so the data can be said to be homogeneous. T test results in Table 6, it was found that the value of post-test flexion (125.07) $>$ the value of pre-test flexion (108.93). The results of the analysis showed that all the data have a value of p (sig.) more $> (0.000)$ and the value of p (0.000) is < 0.05 . This indicates an increased range of motion in the lumbar joint in patients with complaints of back injury.

Table. 3 Distribusi Hasil Kuesioner Oswestry Disability Index

| ODI | Mean | Std. Deviasi |
|---------------------|------|--------------|
| Sub-skor (poin) | | |
| Pain intensity | 1.96 | 0.85 |
| Personal Upbringing | 0.85 | 0.66 |
| Lifting | 2.52 | 1.76 |
| Walking | 1.63 | 1.25 |
| Sit | 1.78 | 1.33 |
| Stand | 2.32 | 1.37 |
| Sleeping | 1.75 | 1.59 |
| Social Life | 1.13 | 0.93 |
| Traveling | 2.13 | 1.94 |



Figur 1. Oswestry Disability Index Results

Table. 4 uji normalitas

| Test results | P | Sig. | Description |
|-------------------------|-------|------|-------------|
| Pretest fleksi | 0,985 | 0.05 | Normal |
| Posttest fleksi | 0,867 | 0.05 | Normal |
| Pretest ekstensi | 0,396 | 0.05 | Normal |
| Posttest ekstensi | 0,718 | 0.05 | Normal |
| Pretest fleksi lateral | 0,985 | 0.05 | Normal |
| Posttest fleksi lateral | 0,867 | 0.05 | Normal |

Table. 5 uji Homogenitas

| Groups | F tabel | F levene | P | Description |
|-------------------|---------|----------|-------|-------------|
| Pretest fleksi | 3.37 | 0,509 | 0,679 | Homogen |
| Posttest fleksi | 3.37 | 0,550 | 0,584 | Homogen |
| Pretest ekstensi | 3.37 | 1,380 | 0,271 | Homogen |
| Posttest ekstensi | 3.37 | 0,840 | 0,484 | Homogen |

| | | | | |
|--------------------------------|------|-------|-------|---------|
| <i>Pretest</i> fleksi lateral | 3.37 | 1,630 | 0,207 | Homogen |
| <i>Posttest</i> fleksi lateral | 3.37 | 1,426 | 0,258 | Homogen |
| <i>Pretest</i> fleksi | 3.37 | 1,140 | 0,351 | Homogen |

Table 6. T test results

| Data | Average | Sig (2-tailed) |
|--------------------------------|----------------|-----------------------|
| <i>Pretest</i> fleksi | 108,93 | 0,000 |
| <i>Posttest</i> fleksi | 125,07 | 0,000 |
| <i>Pretest</i> ekstensi | 37,13 | 0,000 |
| <i>Posttest</i> ekstensi | 40,50 | 0,000 |
| <i>Pretest</i> fleksi lateral | 35,37 | 0,000 |
| <i>Posttest</i> fleksi lateral | 39,33 | 0,000 |

Based on the results of this study, in the experimental group that received effriction treatment once at the first opportunity, there was a significant difference between the value before and after treatment, with a p-value (0.000) < of 0.05. Therefore, it can be concluded that Effriction has a significant effect on increasing the range of motion of the back joints in patients with back sports injuries at MCO Arif Clinic. Based on the normality table, all the data show the value of p (Sig.) greater than 0.05 (> 0.05), indicating that all the variables have a normal distribution. In other words, since the significance value is greater than 0.05, it can be concluded that the data are normally distributed. Since the data is normally distributed, the analysis can continue.

A comparison of the mean changes from pre-test to post-test in the experimental group showed a significant increase in the range of motion (ROM) of the back joints in patients with a back sports injury. The data showed that the mean pretest flexion was 108,930 and the mean posttest flexion was 125,070. The analysis confirmed that Effriction treatment was effective in increasing the range of motion of the dorsal joints in patients with dorsal sports injuries, characterised by a significant increase in ROM. Based on the p-value (0.000) < 0.05, it can be concluded that there was a significant increase in the range of motion of the back joints of patients with back sports injuries at the MCO Arif Clinic (Sports Injury Massage).

DISCUSSION

The purpose of this study was to determine whether there is an increase in the range of motion of the back joints in patients with back sports injuries. This study was conducted from March 10 to July 22, 2024 with one-time treatment. The results of statistical analysis showed an increase in the range of motion of the back joints in patients who had a sports back injury.

Effriciton is a therapeutic technique that combines massage movements (effleurage) and rubbing movements (friction) simultaneously with light pressure and fast (Daniati et al., 2024; Lubis et al., 2023; Puspitasari et al., 2024). Effleurage can be applied to various parts of the body using the palm or fingers. While the friction technique has been shown to improve blood circulation, increase body temperature, accelerate lymphatic flow, relieve muscle fatigue and speed up tissue healing. (Öndes & Ersin, 2023; Öndes & Ersin, 2023). Massage therapy for back injuries using the massage-effriciton technique combines effleurage and friction movements using the thumb and palm of the hand. The aim is to relax stiff muscles and reduce strain on the back joints.

The incorporation of effleurage and friction techniques in the form of effriciton adds a new dimension to manual therapy, particularly for back injuries. The results of this latest study provide strong evidence that the technique is not only effective in improving blood flow and relieving muscle tension, but also accelerates tissue healing, improves muscle function and increases joint flexibility. This reinforces a previous understanding that effleurage works on the surface layers of the muscle to create initial relaxation, while friction targets deeper layers to address adhesion and improve tissue elasticity (Amin & Purnamasari, 2020; Asmawariza & Nurwahida, 2021).

Theoretically, the study combines elements from a variety of manual therapy approaches, including a biomechanical model that emphasises the importance of increased soft tissue mobility and a physiological model that emphasises the benefits of increased blood flow for tissue repair. Massage using the friction technique is associated with increased blood flow to the injured area, which accelerates the delivery of oxygen and nutrients to tissue cells, thereby accelerating the repair process (Chauhan et al., 2022; Dewantara et al., 2024; Sarkar et al., 2022). The effleurage technique, on the other hand, is known in various clinical literature as a massage that stimulates the parasympathetic nervous system, thus facilitating the relaxation of stiff muscles. The combination of these two techniques through effriciton creates a holistic approach that focuses not only on physiological aspects but also on neuromuscular aspects.

One of the most significant aspects of the study is how effriciton addresses the issue of tissue adhesions, which are common in chronic back injuries. Tissue adhesions, the formation of scar tissue between muscles and fascia, are often a source of pain and tension. The friction technique is effective in breaking up these adhesions, while effleurage ensures that the muscles around the affected area remain relaxed and blood flow is constantly increased. In other words,

effleurage is not only a method for temporary pain relief, but also a long-term approach to improving biomechanical function.

Another novel aspect is the impact of effriction techniques on the lymphatic system. Previous studies have emphasised the benefits of massage in improving blood flow, but this new study highlights that the combination of these techniques can also improve lymphatic drainage, which is important in reducing swelling and inflammation in injured areas. As a result, patients with back injuries or chronic inflammatory conditions, such as lumbago or herniated discs, may experience more significant improvements compared to conventional massage techniques.

The results of this study have direct implications for the development of therapeutic protocols for the management of back injuries. Effriction techniques offer a more efficient approach to injury rehabilitation and recovery than traditional massage techniques. In practice, physiotherapists can use this technique as part of a wider range of manual therapy interventions, including joint mobilisation and muscle stretching. The application of this technique is also relevant in the context of sports therapy, where rapid and effective treatment of injuries is essential to minimise the recovery time of the athlete.

The effriction technique also has the potential to be developed in the context of preventive medicine, where this massage can be used routinely to maintain soft tissue health, prevent injury and reduce the accumulation of muscle tension due to poor posture or excessive physical exertion. This study has weaknesses and limitations, including a) no post-treatment follow-up, so the effects achieved may be long term or temporary, and b) the researchers have limited experience in providing treatment, and rely on other masseurs at the MCO Arif clinic for assistance.

CONCLUSION

Overall, in this study it can be concluded that massage and static flexibility exercises have an effective impact on complaints of back pain perception. Exercise therapy flexibility on flexibility of the back in sportsmen decrease in pain assessed by VAS on pain momentarily then respond by filling the Oswestry disability index. Respondents who experienced back pain reported a decrease in pain with tingling complaints and had no history of falls and athletes who experienced spondyloarthritis. athletes who experienced back pain with mild disability

predominated, with the percentage difference between the two not being as significant when compared to moderate disability.

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