

# Comparison of the effectiveness of dry needling and deep friction massage on trigger point size, pain level, and range of motion in low back pain patients

Comparación de la eficacia de la punción seca y el masaje de fricción profunda en el tamaño del punto gatillo, el nivel de dolor y el rango de movimiento en pacientes con dolor lumbar

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## SUMMARY

**Objective:** Low Back Pain (LBP) is a common musculoskeletal disorder causing pain, muscle spasms, and a restricted range of motion (ROM). This study aimed to evaluate the effectiveness of Dry Needling (DN) and Deep Friction Massage (DFM) in modifying trigger point size, reducing pain, and improving range of motion (ROM) in LBP patients using a muscle ultrasonography-based approach. **Methods:** Thirty-two LBP patients were randomly assigned to two groups (n=16 each). The DN group received dry needling, while the DFM group underwent deep friction

massage. The intervention was administered in a single session (pre–post), with a duration of approximately 20 to 30 minutes. Pain levels were assessed using the Visual Analog Scale (VAS), ROM was measured with a goniometer, and trigger point size was evaluated by ultrasonography. **Results:** Post-intervention, neither the DN ( $0.48\pm 0.51$ ) nor the DFM ( $0.27\pm 0.29$ ) group showed a statistically significant reduction in trigger point size ( $p>0.05$ ), though DN demonstrated a greater reduction. Both DN ( $3.31\pm 0.81$ ) and DFM ( $2.19\pm 0.54$ ) significantly reduced pain ( $p<0.05$ ), with DN exhibiting a superior effect. No significant improvements in lumbar ROM (flexion, extension, lateral flexion, or rotation) were observed in either group ( $p>0.05$ ). **Conclusion:** Both DN and DFM effectively reduce pain in LBP patients, with DN demonstrating greater pain relief and faster muscle relaxation. While both interventions influenced trigger point size and ROM, DN had a more pronounced effect. However, neither

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*intervention significantly improved ROM. Further research is needed to investigate the long-term effects and optimize treatment protocols for improved patient outcomes.*

**Keywords:** *Low back pain (LBP), trigger point, dry needling (DN), deep friction massage (DFM), range of motion (ROM), muscle USG*

## RESUMEN

**Objetivo:** *El dolor lumbar (LBP) es un trastorno musculoesquelético común que causa dolor, espasmos musculares y restricción del rango de movimiento (ROM). Este estudio tuvo como objetivo evaluar la efectividad de la punción seca (DN) y el masaje de fricción profunda (DFM) en la modificación del tamaño del punto gatillo, la reducción del dolor y la mejora del ROM en pacientes con LBP mediante un enfoque basado en ultrasonografía muscular. Métodos:* Treinta y dos pacientes con LBP fueron asignados aleatoriamente a dos grupos ( $n=16$  en cada uno). El grupo DN recibió punción seca, mientras que el grupo DFM fue sometido a masaje de fricción profunda. Los niveles de dolor se evaluaron mediante la Escala Visual Analógica (VAS), el ROM se midió con un goniómetro y el tamaño del punto gatillo se determinó mediante ultrasonografía. **Resultados:** Después de la intervención, ni el grupo DN ( $0,48 \pm 0,51$ ) ni el grupo DFM ( $0,27 \pm 0,29$ ) mostraron una reducción estadísticamente significativa en el tamaño del punto gatillo ( $p > 0,05$ ), aunque DN presentó una mayor reducción. Tanto DN ( $3,31 \pm 0,81$ ) como DFM ( $2,19 \pm 0,54$ ) redujeron significativamente el dolor ( $p < 0,05$ ), siendo DN el tratamiento con mayor efectividad. No se observaron mejoras significativas en el ROM lumbar (flexión, extensión, flexión lateral o rotación) en ninguno de los grupos ( $p > 0,05$ ). **Conclusión:** Tanto la DN como el DFM son eficaces para reducir el dolor en pacientes con LBP, con DN mostrando un mayor alivio del dolor y una relajación muscular más rápida. Aunque ambas intervenciones influyeron en el tamaño del punto gatillo y el ROM, DN tuvo un efecto más pronunciado. Sin embargo, ninguna de las intervenciones mejoró significativamente el ROM lumbar. Se requieren más investigaciones para explorar los efectos a largo plazo y optimizar los protocolos de tratamiento para mejorar los resultados en los pacientes.

**Palabras clave:** *Dolor lumbar (LBP), punto gatillo, punción seca (DN), masaje de fricción profunda (DFM), rango de movimiento (ROM), ultrasonografía muscular.*

## INTRODUCTION

Low Back Pain (LBP) is one of the most prevalent musculoskeletal disorders, affecting approximately 40 % of the global population during their lifetime. This condition is a leading cause of global disability, most frequently affecting individuals aged 20 to 40 years. The World Health Organization (WHO) reported that in 2020, low back pain (LBP) affected 619 million people worldwide, with projections indicating that this number is expected to rise to 843 million cases by 2050, due to population growth and aging. In Indonesia, the prevalence of LBP reaches 18 %, with hospital visit rates related to LBP ranging from 3 % to 17 % (1).

The causes of LBP vary and include primary factors, such as repetitive activities, non-ergonomic working postures, and muscle injuries, as well as secondary factors, including mechanical pressure, vibrations, and microclimate conditions (2). LBP often originates from untreated musculoskeletal problems, leading to complications in muscles and skeletal structures (3). If left unaddressed, the condition may exacerbate damage, resulting in conditions such as hernia nucleus pulposus (HNP), scoliosis, and other neural complications (4).

One condition closely related to LBP is Myofascial Pain Syndrome (MPS), which occurs due to trigger points (TPs) in muscles experiencing tension or injury. Trigger points are hypersensitive areas within a taut band of muscle fibers that can induce local and referred pain when stimulated (5). Treatment of TPs includes invasive methods, such as dry needling (DN) and injections, as well as non-invasive methods, including electrotherapy, ultrasound, manipulation, strengthening exercises, and manual therapy, like Deep Friction Massage (DFM) (6).

Dry Needling (DN) is an innovative technique involving the use of filament needles to mechanically stimulate muscle tissue without biological agents, aiming to alleviate pain and improve function (7). Studies have demonstrated DN's effectiveness in reducing pain in musculoskeletal cases, including LBP (10). Meanwhile, Deep Friction Massage (DFM),

introduced by James Cyriax, aims to increase blood flow, reduce tissue adhesions, and relieve pain (9). Comparative studies, such as the one conducted by Nisa et al. (2022), reveal that DN outperforms DFM in alleviating pain in certain conditions (10).

Ilayaraja et al. (2020) found that both low-level laser therapy and dry needling effectively reduced pain and improved lumbar ROM in non-specific LBP patients. Nisa et al. (2022) reported similar results for deep friction massage and dry needling in lateral epicondylitis, with dry needling providing superior pain relief (10). While both DN and DFM aid pain reduction and ROM, direct comparisons in LBP management remain limited, requiring further research (8,6).

Assessing DN and DFM efficacy in trigger point size, pain, and ROM requires objective tools (11). Muscle ultrasonography (USG) detects trigger points, assesses muscle parameters, and provides real-time evaluation, making it ideal for musculoskeletal assessment and clinical rehabilitation (12,13). Ultrasonography (USG) aids in diagnosing and monitoring MTrPs by detecting hypoechoic areas and measuring size changes (14). It evaluates the effectiveness of therapy, including dry needling, making it a key diagnostic and assessment tool.

This study assessed pain using the Visual Analog Scale (VAS), range of motion (ROM) using a goniometer, and trigger point (TP) size using ultrasonography. The findings aim to guide physiotherapists in selecting optimal interventions and supporting evidence-based rehabilitation protocols.

## SUBJECT AND METHODS

### Design

This clinical trial was registered at UMIN-CTR (trial registration number UMIN000057073), and Research involving the use of human samples has received ethical approval from the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University (protocol code: 151024092320 with the approval number of 3102/UN4.14.1/TP.01.02/2024). Using a quasi-experimental pretest-posttest design, this study

compares dry needling and deep friction massage on TP size, pain, and ROM in LBP patients.

### Participants

All participants provided informed consent before the study. The total sample size consisted of 32 participants diagnosed with Low Back Pain (LBP). The sample selection process adhered to specific inclusion criteria: participants aged between 20 and 55 years, including both males and females, with the presence of nodules or trigger points detected via muscle ultrasonography (USG) in the back muscles, and limitations in range of motion (ROM). Participants exhibiting conditions such as Delayed Onset Muscle Soreness (DOMS) or those who had consumed medication within five hours before therapy were excluded from the study. The 32 participants were evenly divided into two groups, each consisting of 16 participants. The participants were categorized into two groups: the DN group, which received the dry needling intervention, and the DFM group, which received the deep friction massage intervention.

### Outcome Measure

This study assessed pain using the Visual Analog Scale (VAS), range of motion (ROM) with a goniometer, and trigger point size via ultrasonography. Pain intensity was classified as no pain (0-4 mm), mild (5-44 mm), moderate (45-74 mm), or severe (75-100 mm). ROM was measured using standard goniometric values: 30°-0°-90° (flexion/extension), 30°-0°-30° (side flexion), and 45°-0°-45° (rotation). Trigger point size was evaluated using the Versanna Essential USG system (10 Hz, SN: 6023709WX0). A licensed physiotherapy professional carried out the intervention. Before the procedure, all participants received a thorough explanation of the study protocol. Those who agreed to participate provided written informed consent. Each intervention session was conducted once, with a duration of approximately 20 to 30 minutes. Afterward, pain levels, TP size, and ROM were reassessed and documented.

**Data Analysis**

Data were analyzed using IBM SPSS 25.0. Normality was tested with Shapiro-Wilk. Pre-post VAS and ROM were compared using paired t-tests, and trigger point size was compared using the Wilcoxon test. Between-group VAS and ROM used independent t-tests, while trigger point size used the U Mann-Whitney test. Results are represented as mean ± SD, with significance at  $p < 0.05$ .

**Informed consent:** Informed consent was obtained from all respondents participating in this study.

**RESULT**

Table 1 presents respondent characteristics by age and gender. In the dry needling group (mean age  $34 \pm 9.14$  years, range 21-48), there were 9 males and 7 females. In the DFM group (mean age  $29 \pm 8.57$  years, range 20-45), there were 4 males and 12 females.

**Analysis of Pre-Post Trigger Point Size and Comparison of Differences in Trigger Point Size Between the Dry Needling Group and the Deep Friction Massage Group**

Figures 1, 2 and 3 shows that before the trigger point examination on the back muscles using muscle ultrasonography (USG), in the dry needling group, trigger point size increased from  $0.82 \pm 0.45$  to  $1.14 \pm 0.63$  post-intervention, showing a significant difference ( $p < 0.05$ ) based on the Wilcoxon test.

The DFM group's size increased from  $1.36 \pm 0.61$  to  $1.53 \pm 0.59$ , with no significant difference ( $p > 0.05$ ). The Mann-Whitney U test showed mean changes of  $0.48 \pm 0.51$  (DN) and  $0.27 \pm 0.29$  (DFM), indicating a greater impact of dry needling, though the between-group difference was not statistically significant ( $p > 0.05$ ).

Thus, the change in trigger point size between the dry needling and DFM groups was not statistically significant. However, empirical data suggested that the average increase in trigger point size was more prominent in the dry needling group than the DFM group.

Table 1. Clinical characteristics of the 32 patients

	DN	DFM	Min	Max
Total Sample (N)	16	16	-	-
Gender (M/F)	9/7	4/12	-	-
Age (DN/DFM)	$34 \pm 9.14$	$29 \pm 8.57$	21/21	45/48

M: Male; F: Female; Data are presented as mean ± SD where applicable.

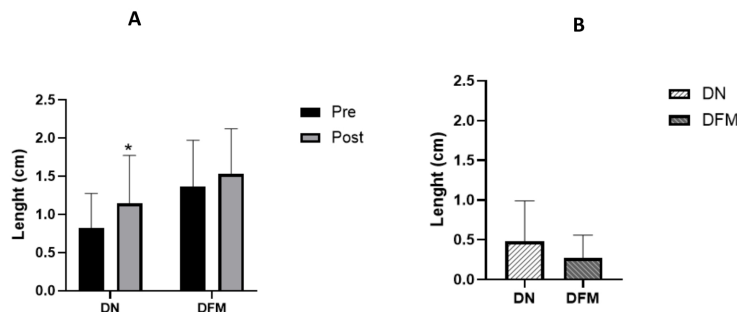


Figure 1. (A) illustrates the comparison of pre- and post-test trigger point sizes in the dry needling (DN) and deep friction massage (DFM) groups. (B) shows the  $\Delta$  (delta) change represents the difference in trigger point size between post- and pre-intervention values scores between the DN and DFM groups ( $\Delta = \text{Post} - \text{Pre}$ ). The trigger point sizes are measured in centimeters (cm). Length represents the unit of measurement for trigger point size in centimeters. \* $p < 0.05$  indicates a statistically significant result.

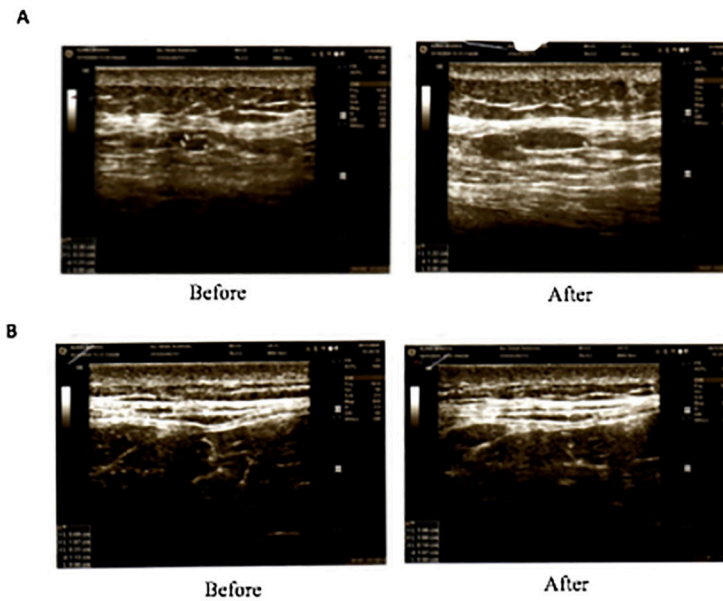


Figure 2. **(A)** presents ultrasonography (USG) imaging of the lower back muscles before and after the dry needling (DN) intervention, showing an increase in trigger point size from 0.38 cm to 1.22 cm. This enlargement is likely due to local inflammation as a physiological response to the intervention. **(B)** illustrates the USG imaging of the lower back muscles before and after DN, demonstrating a reduction in trigger point size from 1.13 cm to 1.07 cm. This decrease may be influenced by acute and chronic factors related to the patient’s condition, which can affect the muscle’s overall response to the therapy.

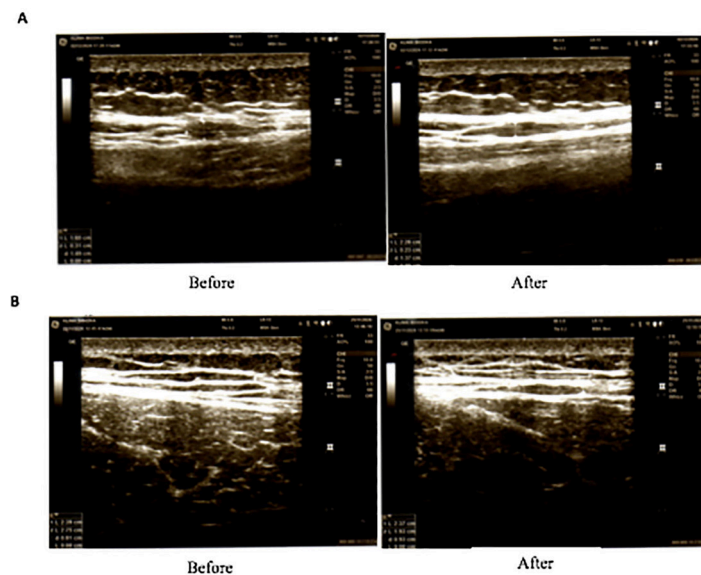


Figure 3. **(A)** presents USG imaging of the lower back muscles before and after DFM, showing an increase in trigger point size from 1.60 cm to 2.22 cm. This enlargement is likely due to local inflammation triggered by repeated pressure during the procedure. **(B)** illustrates a reduction in trigger point size from 2.75 cm to 1.93 cm following the DFM intervention. This outcome suggests that the effectiveness of DFM may vary depending on the intensity, technique, and pressure applied during the treatment.

**Analysis of Pre-Post VAS Scores and Comparison of VAS Score Differences in the Dry Needling and Deep Friction Massage Groups**

Figure 4 revealed that before the dry needling intervention, the Visual Analog Scale (VAS) score for the dry needling group was  $6.69 \pm 1.19$ . After the intervention, the score decreased to  $3.31 \pm 1.40$ , indicating a reduction in pain levels as measured by the VAS following the dry needling intervention. Similarly, in the DFM group, the VAS score before the DFM intervention was  $5.38 \pm 1.14$ , which decreased to  $3.38 \pm 1.20$  after

the intervention. This also suggests a reduction in pain levels following the DFM intervention. Both intervention groups exhibited significant changes ( $p < 0.05$ ), demonstrating substantial pain reduction in response to both dry needling and deep friction massage techniques.

A parametric independent t-test showed a significant difference in post-intervention VAS scores between the dry needling ( $3.31 \pm 0.81$ ) and DFM ( $2.19 \pm 0.54$ ) groups ( $p < 0.05$ ), indicating dry needling is more effective in reducing pain.

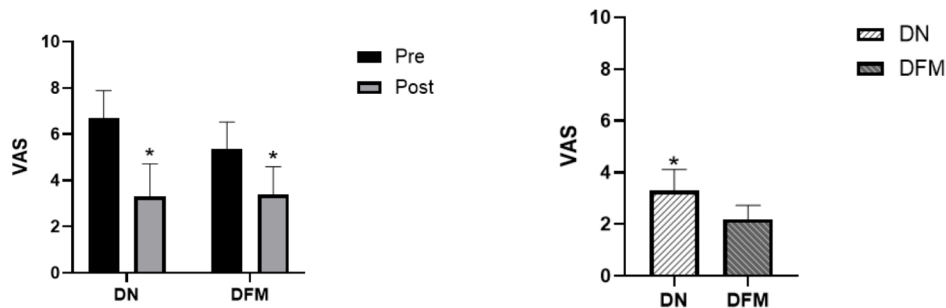


Figure 4. (A) illustrates the comparison of pre- and post-test pain levels measured using the Visual Analog Scale (VAS) in the dry needling (DN) and deep friction massage (DFM) groups. (B) the  $\Delta$  (delta) change represents the difference between the DN and DFM groups' post- and pre-intervention values scores ( $\Delta = \text{Post} - \text{Pre}$ ). The asterisk  $*p < 0.05$  indicates a statistically significant result.

**Analysis of Pre-Post Lumbar ROM (Flexion, Extension, Lateral Flexion, and Rotation) and Comparison of ROM in the Dry Needling and Deep Friction Massage Groups**

As shown in Figure 5, in the dry needling group, ROM improved post-intervention: flexion ( $77.6 \pm 6.63$  to  $84.1 \pm 4.72$ ), extension ( $21.2 \pm 4.32$  to  $26.2 \pm 3.27$ ), lateral flexion ( $23.3 \pm 2.91$  to  $26.4 \pm 2.96$ ), and rotation ( $29.3 \pm 7.33$  to  $35.4 \pm 7.52$ ), indicating overall ROM enhancement.

For the deep friction massage group, the range of motion (ROM) for flexion before the intervention was  $78.1 \pm 4.65$ , increasing to  $84.5 \pm 4.29$  after the intervention. For extension, the pre-intervention range of motion (ROM) was  $21.3 \pm 3.89$ , improving to  $26.2 \pm 3.19$  post-

intervention. Lateral flexion ROM improved from  $23.6 \pm 2.57$  to  $26.8 \pm 2.39$ , and rotational movement improved from  $35.1 \pm 3.39$  to  $39.6 \pm 3.72$ . These results demonstrate increased ROM across all movements following the deep friction massage intervention. Dry needling and deep friction massage interventions significantly improved ROM for lumbar movements ( $p < 0.05$ ).

A parametric independent t-test showed no significant differences in lumbar ROM between the dry needling and DFM groups ( $p > 0.05$ ). ROM values for dry needling: extension  $27.5 \pm 3.72$ , flexion  $83.1 \pm 7.53$ , lateral flexion  $26.8 \pm 3.69$ , rotation  $40 \pm 6.31$ . For DFM: extension  $26.1 \pm 4.99$ , flexion  $78.3 \pm 17.30$ , lateral flexion  $25.1 \pm 5.96$ , rotation  $34.8 \pm 8$ .

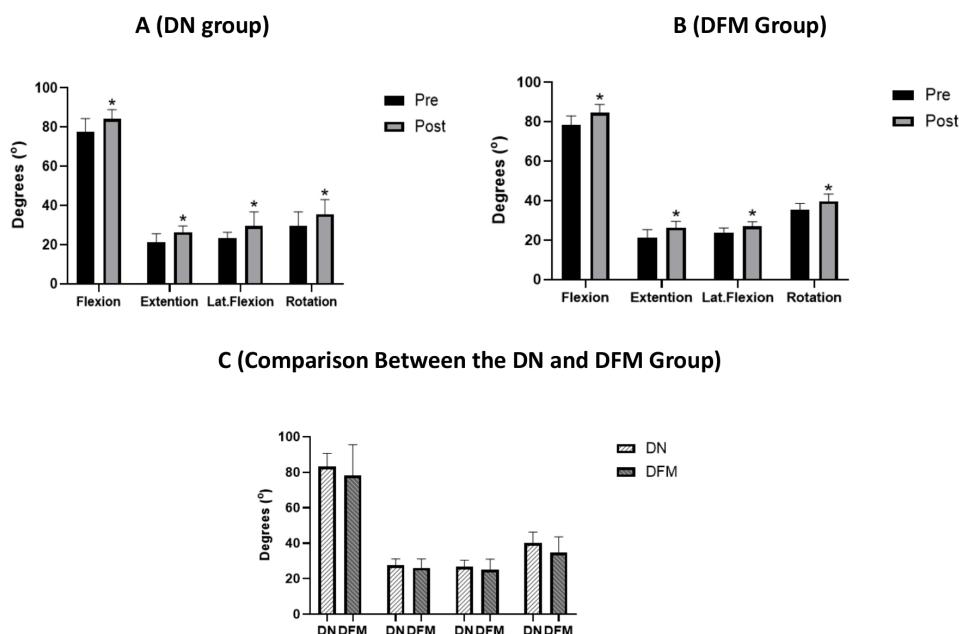


Figure 5. (A) illustrates the comparison of pre – post intervention Range of Motion (ROM) values in the dry needling (DN) group. (B) presents the comparison of pre – post intervention ROM values in the deep friction massage (DFM) group. (C) shows the  $\Delta$  (delta) change represents the difference of ROM between post- and pre-intervention values scores between the DN and DFM groups ( $\Delta = \text{Post} - \text{Pre}$ ). ROM measurements were conducted using a goniometer. \*P (<0.05) indicates statistically significant results.

## DISCUSSION

### Analysis of Pre-Post Trigger Point Size and Comparison of Differences in Trigger Point Size Between the Dry Needling Group and the Deep Friction Massage Group

This study examines the differences in trigger point size before (pre-test) and after (post-test) a dry needling intervention. The results reveal variability in responses, with four trigger points decreasing in size while twelve others increased. After conducting research and examination using muscle USG, the most frequently detected trigger points in the back muscles were found in the quadratus lumborum and erector spinae. These findings suggest that individual responses to dry needling may vary, potentially influenced by acute or chronic factors. Previous studies indicate that dry needling can induce microtrauma, triggering

a localized inflammatory response within the tissue. This reaction is typically temporary and considered part of the healing process.

The DN group showed a significant increase in trigger point size ( $p < 0.05$ ), from 0.82 cm to 1.14 cm, likely due to microtrauma-induced inflammation. However, four of the 16 samples showed an immediate size reduction without enlargement, possibly due to the patient's condition. Regarding the trigger points subjected to dry needling intervention, the localized inflammatory response observed post-treatment is attributed to microtrauma, which stimulates the tissue healing process. This response involves the release of inflammatory mediators that enhance pain sensitivity and may cause mild, temporary, localized edema or swelling (15). Additionally, a meta-analysis by Gattie et al. (2017) highlighted variations in the therapeutic effects of dry needling across heterogeneous populations. Acute effects, such

as increased pain or trigger point enlargement, were more frequently observed in patients with heightened sensitivity or long-standing chronic conditions (16).

Dry needling effectively manages LBP by relieving muscle spasm, restoring function, and reducing pain. It disrupts the spasm cycle by triggering physiological responses through the insertion of a needle. These mechanisms begin with the mechanical effect (mechanotransduction) induced by the needle insertion, followed by a local twitch response (LTR) when the needle tip contacts the hypercontracted nodule. Ultimately, an analgesic effect is achieved through the stimulation of C fibers, A-delta fibers, and A-beta fibers (17).

Inserting a needle during dry needling can effectively release myofascial trigger points (MTrPs) if it elicits a local twitch response (LTR). LTR is a spinal reflex associated with motor end plate dysfunction and hypersensitivity, which can induce the relaxation of muscle fibers at the affected site (18). Muscle relaxation reduces capillary constriction, improves microcirculation, and enhances tissue oxygenation. Additionally, dry needling contributes to the restoration of sarcomere length by reducing actin-myosin overlap, lowering acetylcholine levels, and decreasing the concentrations of neurotransmitters such as calcitonin gene-related peptide (CGRP), substance P, various cytokines, and interleukins in the extracellular fluid of trigger points (4). Consequently, improved muscle blood flow and oxygenation facilitate the reduction of sarcomere contracture and the restoration of end plate function (17).

The deep friction massage (DFM) group results demonstrated a varied response, with five trigger points decreasing in size, ten increasing in size, and one remaining unchanged following the pre–posttest. Statistical analysis revealed no significant difference in trigger point size before and after the DFM intervention ( $p > 0.05$ ). This variability may be attributed to the pressure applied during therapy and the physiotherapist's proficiency in executing the procedure. Nevertheless, DFM operates through a mechanism that can help alleviate muscle spasms and eliminate trigger points.

DFM is a conventional therapeutic technique that involves ischemic compression as a pressure-based treatment. It is widely recognized as one of the most recommended non-invasive treatment options for managing trigger points (19,11). The therapeutic effects of DFM include reducing muscle tension, enhancing local circulation, and stimulating the tissue healing process (19). This study also compared the effects of dry needling and DFM by analyzing differences in the data obtained from both groups. The results indicated that neither dry needling nor DFM produced a statistically significant reduction in trigger point size ( $p > 0.05$ ).

However, the data suggest that the dry needling group exhibited a more remarkable numerical change than the DFM group. While both methods influenced trigger point size, dry needling demonstrated greater effectiveness in quantitative terms. Dry needling has the advantage of directly targeting the affected tissue through needle penetration, which facilitates muscle relaxation, improves local circulation, and reduces pain through neurological mechanisms (20). In contrast, although effective, DFM tends to produce slower results due to its reliance on manual repetitive pressure applied to the muscle tissue. Additionally, the variability in DFM outcomes may be influenced by the level of pressure exerted during therapy (21).

#### **Analysis of Pre-Post VAS Scores and Comparison of VAS Score Differences in the Dry Needling and Deep Friction Massage Groups**

The findings of this study indicate that dry needling intervention significantly reduces pain levels in the examined group. A decrease in the Visual Analog Scale (VAS) score demonstrates the clinical and statistical effectiveness of dry needling in pain alleviation. This result is consistent with previous literature, which suggests that dry needling effectively relaxes muscles, deactivates trigger points, and reduces local nerve sensitivity through pain modulation (22). These findings further support the role of dry needling as a therapeutic modality for musculoskeletal pain. The stimulation provided by dry needling enhances local blood flow and oxygenation at

the trigger point, leading to muscle relaxation and pain reduction (7).

The data indicate that the mean pre-treatment VAS score was 6.69, categorized as moderate pain. In contrast, the mean post-treatment VAS score decreased significantly to 3.31 ( $p < 0.05$ ), indicating mild pain. Thus, it can be concluded that dry needling is an effective intervention for reducing pain levels in patients. Dry needling reduces nociceptor sensitivity and boosts endorphin release, alleviating pain. It also enhances blood circulation, aiding muscle recovery by optimizing oxygen and nutrient delivery while removing waste. Needle-induced microtrauma activates C and A-delta fibers, triggering segmental inhibition and improving tissue oxygenation (23).

Similarly, the pre- and post-intervention VAS scores in the deep friction massage (DFM) group demonstrated significant improvements. This outcome is attributed to DFM's ability to stimulate nerve receptors in the skin and subcutaneous tissues, thereby modulating pain impulses and increasing the pain threshold, ultimately reducing pain perception (24). Additionally, DFM facilitates the release of adhesions in soft tissues, which contribute to pain and restricted movement. By minimizing adhesions, tissue mobility improves, leading to a reduction in pain levels (25).

Dry needling reduces pain more effectively than DFM ( $p < 0.05$ ). The DFM group's VAS score dropped from 3.09 to 2.19, while dry needling showed a greater reduction. Dry needling produces a faster and more pronounced analgesic effect by directly alleviating muscle tension, stimulating peripheral nerves, and modulating central pain processing (26). Furthermore, this technique triggers the release of endogenous chemicals such as endorphins, which play a crucial role in pain modulation and relief (27).

In contrast, DFM operates through the principle of manually enhancing muscle tissue function via repeated pressure application. While effective in pain reduction, this method requires a longer duration to achieve optimal effects due to the gradual nature of tissue recovery (28) DFM's relatively moderate outcomes compared to dry needling may also be influenced by the

temporary discomfort or pain experienced due to the intensive pressure applied to the trigger point during therapy sessions.

Based on these findings, dry needling emerges as a viable option for achieving rapid pain relief, particularly for individuals who require significant improvement within a short period. However, DFM remains a valuable supportive therapy, especially for patients who may not be comfortable with invasive techniques such as dry needling. Integrating both methods may offer a more comprehensive approach to pain management.

#### **Analysis of Pre-Post Lumbar ROM (Flexion, Extension, Lateral Flexion, and Rotation) and Comparison of ROM in the Dry Needling and Deep Friction Massage Groups**

The results of this study indicate that neither DN nor DFM produced statistically significant changes in lumbar Range of Motion (ROM) across all movement patterns, including flexion, extension, lateral flexion, and rotation. Data analysis revealed that both interventions had comparable effects on lumbar ROM improvement, with no meaningful differences observed between them.

The mean data shows 27.5 for extension, 83.1 for flexion, 26.8 for lateral flexion, and 40 for rotation in the DN group, for the DFM group, the corresponding ROM values were: flexion 78.3, extension 26, lateral flexion 25, and rotation 34, indicating no significant differences between the dry needling and DFM groups ( $p > 0.05$ ). These findings suggest neither intervention substantially impacted ROM enhancement for these specific movement patterns. Biomechanical constraints may act as limiting factors for ROM improvements without additional interventions. Nevertheless, the data collected during the study demonstrated a trend toward greater ROM improvement in the dry needling group compared to the DFM group across all movements. Although the difference was not statistically significant, this trend suggests that dry needling may exert a more favorable influence on lumbar ROM than DFM. For example, dry needling may induce additional physiological effects, such as more

profound muscle relaxation and increased tissue elasticity, compared to the more superficial effects of DFM (22,29).

The lack of statistically significant differences may also be attributed to various factors, including the severity of participants' conditions and individual responses to therapy. Variations in lumbar biomechanics among individuals can influence the overall outcomes of manual therapy (30,31). Although the observed increase in ROM did not reach statistical significance, the trend suggests potential advantages of dry needling over DFM in improving lumbar movement. However, further research is warranted to investigate additional factors contributing to these differences.

### Limitation

This study has limitations, as both intervention methods were tested only once in a single session, which prevented periodic assessments and potentially affected the comprehensiveness of the findings. Future research should include multiple sessions to more effectively evaluate the long-term effects of dry needling and Deep Friction Massage. Additionally, using Doppler ultrasonography is recommended to enhance the accuracy of outcome measurements by providing detailed visualization of tissue changes and physiological responses.

### CONCLUSIONS

In conclusion, this study demonstrates that both dry needling and deep friction massage are effective in treating Low Back Pain, with dry needling showing superior efficacy in reducing pain and promoting faster improvements in muscle relaxation and blood circulation. While both interventions lead to changes in trigger point size and an increase in range of motion, dry needling produces more significant and immediate effects than DFM. However, neither group showed significant changes in lumbar spine ROM. The results support dry needling as a more direct and efficient modality for reducing pain and restoring muscle function. However, further research is necessary to explore long-term effects

and factors influencing individual responses to both therapies.

**Ethical approval:** This clinical trial was registered at UMIN-CTR (trial registration number UMIN000057073). Research involving the use of human samples has received ethical approval from the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University (protocol code: 151024092320 with the approval number of 3102/UN4.14.1/TP.01.02/2024).

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### Disclosure statement

None of the authors had a financial interest in or received any financial benefit from this research.

### Conflict of interest

The authors declare no conflict of interest.

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