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META-ANALYSIS AND SYSTEMATIC REVIEW OF THE COMPARISON OF DYNAMIC AND STATIC DRY NEEDLING TECHNIQUES FOR MYOFASCIAL PAIN SYNDROME MANAGEMENT BASED ON VAS SCALE

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ABSTRACT

Myofascial Pain Syndrome (MPS) is a common musculoskeletal pain condition, often occurring in the trapezius muscle, and can lead to decreased function and quality of life for patients. MPS is frequently observed in individuals with poor posture or who engage in repetitive physical activities. Dry needling (DN) is one of the effective methods to address this pain, with two primary techniques: dynamic (peppering) and static. This study aims to compare the effectiveness of these two techniques in reducing pain in patients with MPS, using the VAS scale. The research design is a systematic review and meta-analysis of Randomized Controlled Trials (RCTs), which combines primary data to generate new evidence. The results indicate that static dry needling is more effective in reducing pain compared to the dynamic technique, although the difference is not statistically significant. The static technique resulted in a greater reduction in VAS scores, with a mean difference of -0.86 (95% CI: -2.47 to 0.75) and a p-value of 0.30. Although not significant, the static technique appears more stable, particularly for patients with high tissue sensitivity and low tolerance to needle manipulation. This study contributes to a deeper understanding of the effectiveness of both techniques and may serve as a foundation for further research and the application of more appropriate techniques in myofascial pain management.

KEYWORDS *Dry Needling, Myofascial Pain Syndrome, VAS Scale*

INTRODUCTION

Myofascial Pain Syndrome (*MPS*) is a common musculoskeletal pain condition characterized by the presence of *trigger points* in muscles or *fascia*. This condition can cause local and referred pain, muscle stiffness, and significant functional impairment in patients, impacting their quality of life. One of the most commonly affected muscles is the *trapezius*, which plays a key role in neck and shoulder pain. *MPS* has become a significant health issue, especially among populations engaged in repetitive physical activities or those with poor posture (Hu Gao H. & Wang J., 2017). The prevalence of this syndrome is high worldwide, particularly among individuals aged 30 to 60 years (Espejo-Antúnez Tejeda J. F. & Casas-Barragán A., 2017).

In Asia, the prevalence of *myofascial pain syndrome* is also significant, although specific data on its incidence remains limited. Risk factors such as poor posture, excessive muscle workload, and muscle trauma are often the primary causes of this condition (Fernández-de-las-Peñas Dommerholt J. & Gerwin R. D., 2018). In Indonesia, the prevalence of neck pain related to *myofascial pain syndrome* reaches 40% annually, with workers who maintain static neck

positions for prolonged periods, such as garment workers, experiencing a prevalence as high as 49% (Hong, 2018).

In managing *MPS*, *dry needling* (*DN*) has become a popular method due to its effectiveness and relative safety (Shah Thaker N. et al 2015). *Dry needling* involves inserting a needle into a *trigger point* to release tight muscle bands and reduce pain. This technique includes several methods, such as *peppering* and static techniques. The *peppering* technique involves quick needle movements in and out of the *trigger point*, while the static technique involves inserting the needle into the muscle for several minutes without significant movement (Huber Lin C. C. & Huang W. T., 2019). However, the effectiveness of these techniques remains debated (Hawker Mian S. Kendzerska T. & French M., 2011). Some studies suggest that the *peppering* technique provides quicker pain relief, while the static technique is considered more tolerable for patients due to less discomfort during the procedure (Kim Park J. B. & Lim H. C., 2018). Given these differences, a comparison of the effectiveness of both techniques through *meta-analysis* can provide further insights and help determine which technique is more suitable for managing *MPS* (Dunning Butts R. Mourad F. Young I. & Flannagan S. P., 2019).

Based on this background, the research question is formulated as follows: What is the difference in effectiveness between dynamic and static *dry needling* techniques in reducing pain on the *VAS* scale in patients with *myofascial pain syndrome*? This study aims to compare the effectiveness of dynamic and static *dry needling* techniques in reducing pain in patients with *myofascial pain syndrome*, measured using the *Visual Analog Scale* (*VAS*) (Shah Gilliams E. A., 2017). Specifically, the study seeks to analyze the differences in effectiveness between the two techniques in pain reduction for this condition (Kietrys Palombaro K. M. Azzaretto E. Hubler R. Schaller B. Schlussel J. M. et al., 2013).

In the field of education, this research is expected to enhance theoretical knowledge about more effective *dry needling* techniques for managing *myofascial pain syndrome (Shah Flaws B. H., 2015; Shah Gerwin R. D., 2020)*. It may also serve as a reference for understanding the mechanisms of *dry needling* therapy using dynamic and static techniques in pain management (Quintner Bove G. M. & Cohen M. L., 2015; Woo & Park H. S., 2018; Xiao Liu H. & Ma X., 2020). From the perspective of community healthcare, this research provides scientific evidence that can improve healthcare services. By understanding the effectiveness of both techniques, healthcare providers can choose the most appropriate and effective method to assist patients with *myofascial pain syndrome* (Rodríguez & González M., 2020; Rodríguez Carballido J. & Álvarez P., 2020; Yoon Kim J. H. & Lee D. H., 2014). This study contributes to providing an empirical foundation for further research on *dry needling* techniques in managing *myofascial pain syndrome*. The findings can be used as a basis for future studies focusing on innovations or optimizations of these techniques in various clinical conditions involving *myofascial pain*.

Research conducted by Kietrys et al. (2013) investigated the use of *dry needling* in treating *myofascial pain syndrome* and demonstrated the effectiveness of this technique in reducing pain levels in patients. Similarly, Simons et al. (2016) explored the role of *trigger point dry needling* in the management of musculoskeletal pain, emphasizing its ability to improve muscle function and reduce pain intensity. However, these studies did not specifically compare the dynamic (*peppering*) and static techniques of *dry needling* in terms of pain reduction, which constitutes the novelty of the current study(Garvey Marks M. R. &

Wiedenfeld S. A., 2019). This research contributes to existing literature by focusing on comparing the effectiveness of dynamic and static *dry needling* techniques, specifically targeting pain reduction in *myofascial pain syndrome* patients, and providing insights into which method is more suitable for pain management (Garvey Marks M. R. et al. 2016).

The objectives of this research are to compare the effectiveness of dynamic and static *dry needling* techniques in reducing pain in patients with *myofascial pain syndrome*, using the *Visual Analog Scale* (*VAS*) as the measurement tool. The expected benefits of this research include enhancing theoretical knowledge about the comparative effectiveness of *dry needling* techniques, providing evidence-based recommendations for healthcare providers on which technique to employ, and contributing to the development of more effective pain management strategies for musculoskeletal conditions. This research also aims to guide future studies on optimizing *dry needling* techniques for various clinical applications.

RESEARCH METHOD

The design of this study is a *systematic review* and *meta-analysis* of *Randomized Controlled Trials* (*RCTs*) that examine the effectiveness of dynamic versus static techniques in *dry needling* for the management of *myofascial pain syndrome*, based on the *VAS* scale. A *systematic review* is an approach that systematically examines, evaluates, classifies, and categorizes the results of previous primary studies. *Meta-analysis* is an analytical method that combines primary data extracted according to the same research objectives and hypotheses to generate new evidence-based conclusions. This study will be conducted from May 2024 to August 2024.

RESULT AND DISCUSSION

Description

This study is a *systematic review* and *meta-analysis* designed to evaluate the effectiveness of static and dynamic *dry needling* techniques in reducing pain in patients with *myofascial pain syndrome*. The article identification process involved systematic searches in various databases, including *PubMed*, *Google Scholar*, *Wiley Online Library*, *ResearchGate*, *ScienceDirect*, and *Neurona*. Out of the 937 articles initially identified, 102 were duplicates and removed. The remaining 835 articles were screened based on titles and abstracts. Of these, 831 articles were excluded at this stage because they did not meet the pre-established inclusion criteria. Four relevant articles were then evaluated based on full-text review.

After in-depth assessment, two articles were excluded for not meeting the inclusion criteria. Finally, two *Randomized Controlled Trials* (*RCTs*) were included in the final analysis. These two articles were highly relevant to the research focus and provided adequate data for further analysis. This strict selection process ensures that only studies with high methodological quality are included, so that the *meta-analysis* results provide strong and valid evidence. The selected research articles were recorded and compiled using *Convidence*, and those meeting the inclusion criteria were entered into a *Microsoft Excel* sheet. Each article was incorporated into the *PRISMA* flow diagram for data search, selection, extraction, and eligibility assessment to meet the inclusion criteria for the *systematic review* and *meta-analysis*. After identifying the eligible articles, the analysis was performed using the *RevMan* version 5.4.1 application.

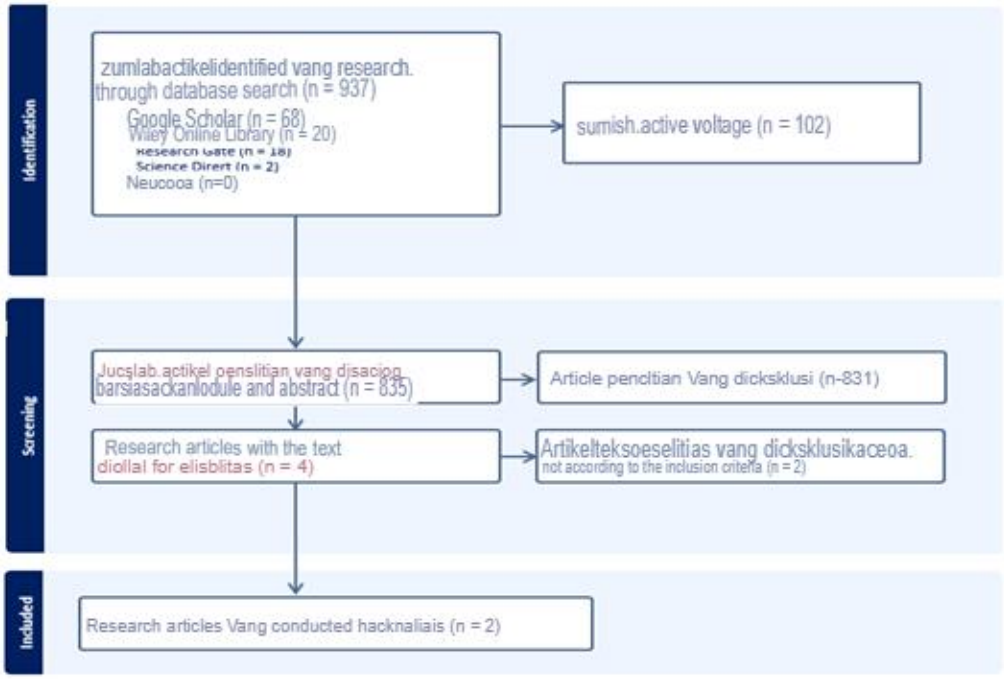

Figure 1. Research Literature Selection Process with PRISMA Flowchart

Study Characteristics

This study obtained two research articles, as shown in Table 3, both focusing on *dry needling* for *myofascial pain syndrome*. All included studies were *Randomized Controlled Trials* (*RCTs*). The studies were conducted in Turkey, with sample ages ranging from 20 to 55 years, all diagnosed with *myofascial pain syndrome*. The studies were conducted in 2017 and 2024.

The characteristics of the two studies analyzed show that both focused on patients with *myofascial pain syndrome* diagnosed using clear criteria. The first study, conducted by Ozlem et al. in 2017, involved 54 patients who received static and dynamic *dry needling* interventions. The primary outcomes measured were pain reduction using the *Visual Analogue Scale* (*VAS*) and patients' daily functioning during a 12-week follow-up period. The second study, conducted by Emre et al. in 2024, involved 38 patients with *myofascial pain syndrome*. This study also compared static and dynamic *dry needling* techniques, with pain reduction measured using the *VAS*, and additional outcomes such as joint range of motion (*ROM*) and patients' quality of life assessed using the *EQ-5D*. The follow-up period for this study was one month. Both studies used an intervention population and outcomes that were highly relevant to the research aim of evaluating the effectiveness of *dry needling* in managing *myofascial pain*.

Table 1. Study Characteristics

No	Researcher	Age	Number of sample	Intervention	Comparator	Outcome Parameters	Outcome
1	Ozlem et al. Turki (2017)	20-50	54	Dynamic dry needling technique	Static dry needling technique	Pain score based on VAS, daily function	Improvement in pain scale after 12 weeks
2	Emre et al. Turki (2024)	25-55	38	Dynamic dry needling technique	Static dry needling technique and combination	VAS score, Range of Motion (ROM), quality of life	Improvement in pain scale after 3 months

Source: processed data

Risk of Bias Assessment

The risk of bias in this study was assessed using *RoB2* (*Risk of Bias 2.0*), a tool specifically designed to evaluate the risk of bias in *Randomized Controlled Trial* (*RCT*)-based studies. This tool assesses the risk of bias across five main domains: (1) the randomization process, (2) deviations from the intended interventions, (3) missing outcome data, (4) outcome measurement, and (5) selection of reported outcomes. Based on the assessment results for both studies included in the analysis:

In both studies, the randomization process was reported to have been well executed. The study by Ozlem et al. (2017) used a computer-based randomization method to ensure a balanced distribution between the intervention groups, as confirmed in their methodology report. Meanwhile, Emre et al. (2024) also used a random number-based randomization with allocation concealment to prevent potential bias in participant group placement. There was no evidence of baseline imbalance between groups, indicating that the randomization process was successful.

Deviations from the intended interventions were not found in either study. The research protocols were followed as planned, and no reports were made of participants receiving different treatments from those initially outlined in the study design. To maintain consistency, both studies ensured that trained practitioners delivered the interventions to the participants. This is crucial to ensure that the study results reflect the true effects of static and dynamic *dry needling* techniques.

Both studies reported high participant retention rates, with minimal data loss. In the Ozlem et al. (2017) study, only one participant dropped out during the 12-week follow-up for reasons unrelated to the study. The Emre et al. (2024) study did not report any data loss during the one-month follow-up. The analysis was performed using the *intention-to-treat* (*ITT*) principle, where all participant data were analyzed according to their original group, minimizing the risk of bias due to missing data.

Outcome measurement was consistently conducted in both studies using the *Visual Analogue Scale* (*VAS*) as the primary tool to evaluate pain intensity. The use of the *VAS* scale provided valid and reliable results, as it has been widely used in pain research and is well-recognized in the scientific community. Additionally, measurements were performed by evaluators who were blinded to group allocations, minimizing the risk of measurement bias.

There is no indication that the reported outcomes in either study differed from the initial protocol. All predefined outcomes, including *VAS* scores, *range of motion* (*ROM*), and quality of life (*EQ-5D*), were fully reported. This suggests that the risk of bias in this domain is also low.

Overall, both studies show a low risk of bias across all domains evaluated using *RoB2*. The visual representation of the risk of bias assessment for both studies is displayed in the *RoB2* and *RoB2-Cluster* diagrams, showing green in all categories, indicating a very low risk of bias. This provides confidence that the data from both studies can be relied upon to support the *meta-analysis* results and final conclusions. The low risk of bias assessment ensures that the findings of this study have strong internal validity and high relevance for application in clinical populations. The overall bias selection can be seen in Figures 2 and 3.

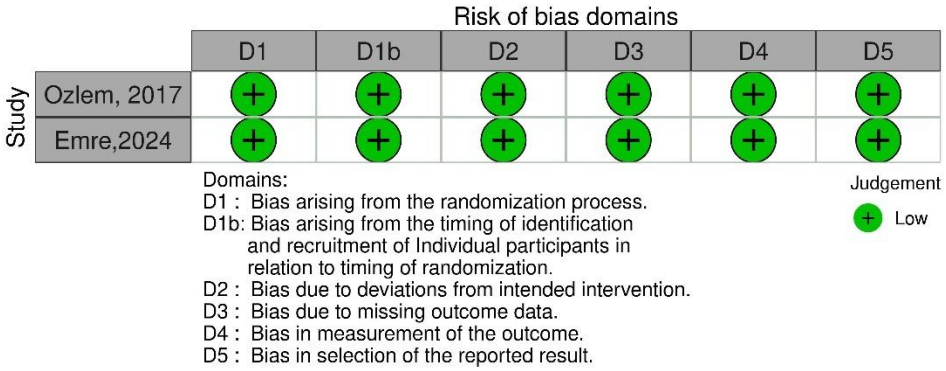

Figure 2. Summary of Risk of Bias Assessment for Dry Needling as a Treatment for Myofascial Pain Syndrome

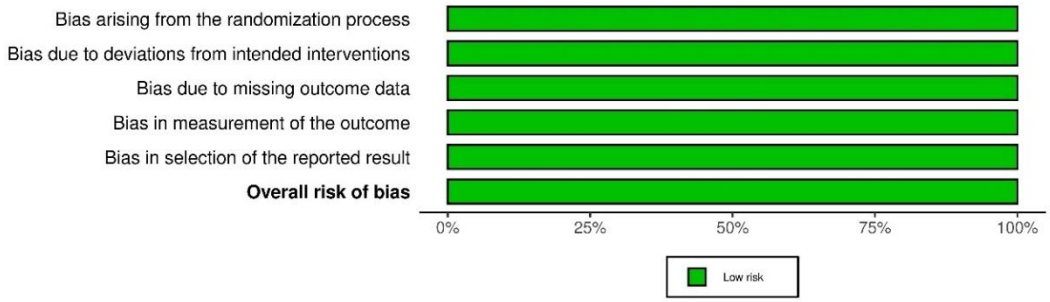

Figure 3. Risk of Bias Graph for Dry Needling Research Articles as a Treatment for Myofascial Pain Syndrome

Meta-Analysis of Dry Needling Techniques in Myofascial Pain Syndrome Using the VAS Scale

The results of the *meta-analysis* indicate that both static and dynamic *dry needling* techniques are effective in reducing pain in patients with *myofascial pain syndrome*. This analysis produced a mean difference of 0.86, with a *confidence interval* (*CI*) ranging from -0.75 to 2.47. Although the static *dry needling* technique showed a trend of being more effective compared to the dynamic technique, this difference was not statistically significant, with a *p*-value of 0.30. The heterogeneity between studies was very low, with an I^2 value of 0%, indicating that the results across studies were consistent. This provides confidence that both

techniques have equivalent effectiveness in reducing *myofascial pain*. As shown in Figure 4, the *forest plot* also supports this conclusion, as no significant differences were found between the two techniques based on the *VAS* scale.

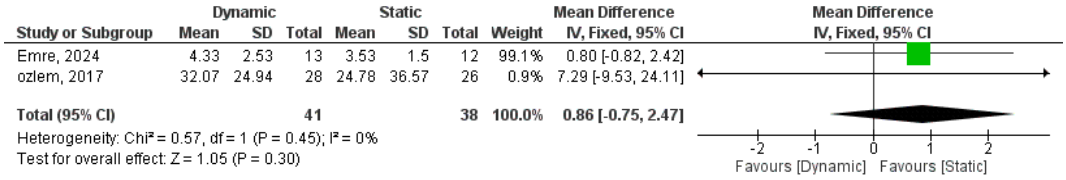

Figure 4. Forest Plot Results

Evidence Quality Assessment

The quality of evidence in this study was assessed using the *GRADEpro* (*Grading of Recommendations, Assessment, Development, and Evaluations*) approach to evaluate the level of confidence in the results of the *meta-analysis*. This assessment aims to ensure that the conclusions drawn are based on valid and reliable evidence. The quality of evidence was evaluated across several key domains: study design, risk of bias, inconsistency, indirectness, imprecision, and other considerations, as shown in Table 5.

The two studies analyzed in this *meta-analysis* are *Randomized Controlled Trials* (*RCTs*), which are considered high-validity study designs for assessing intervention effectiveness. The risk of bias in both studies was rated as low because randomization, allocation concealment, and outcome measurement procedures were consistently conducted according to the study protocols. No indications of significant deviations from the planned interventions or missing data were observed, supporting the internal validity of the study results.

In the domain of inconsistency, no significant variation was found between the results of the two studies. The very low heterogeneity ($I^2 = 0\%$) indicates that the results from both studies were highly consistent and support the conclusion that both *dry needling* techniques (static and dynamic) have similar effectiveness in reducing *myofascial pain*.

Indirectness, or the relevance of the population, intervention, comparator, and outcomes to the research question, was also not a concern. Both studies used a population of patients with *myofascial pain syndrome*, with interventions being static and dynamic *dry needling* techniques, and the primary outcome being changes in the *Visual Analogue Scale* (*VAS*) score, all of which are fully relevant to the research objectives.

In the domain of *imprecision*, there was a moderate level of uncertainty, as indicated by the relatively wide *confidence interval* (*CI*) ranging from 0.75 lower to 2.47 higher. Nevertheless, the results still support the conclusion that both *dry needling* techniques provide benefits in pain reduction, even though no statistically significant difference was found between them.

Additionally, other considerations, such as the strong association between the intervention and the reported outcomes, further strengthen confidence in the study results. The sample size analyzed (38 patients for the static technique and 41 patients for the dynamic technique) adds weight to the quality of the data produced.

Overall, the *GRADE* assessment indicates that the quality of evidence from this *meta-analysis* is moderate. This provides a high level of confidence that the reported results reflect the true effects of the interventions on the relevant clinical population. However, to further strengthen these findings, additional studies with larger sample sizes and a wider range of study designs are needed. This study ensures that the *meta-analysis* results can be relied upon as a basis for clinical decision-making in the management of *myofascial pain syndrome*.

Table 5. GRADEpro Evidence Quality Assessment

Outcome	Pain Scale Improvement (VAS)
No. of studies	2
Study design	randomised trials
Risk of bias	not serious
Inconsistency	not serious
Indirectness	not serious
Imprecision	not serious
Other considerations	strong association
No. of patients - Static dry needling	38
No. of patients - Dynamic dry needling	41
Effect - Relative (95% CI)	-
Effect - Absolute (95% CI	0 (0.75 lower to 2.47 higher)
Certainty	⨁⨁⨁◯
Certainty Level	Moderate
Importance	

Discussion

This study aims to evaluate the effectiveness of dynamic *dry needling* (*D-DN*) compared to static *dry needling* (*S-DN*) in reducing pain in *myofascial pain syndrome*, measured using the *Visual Analog Scale* (*VAS*). Based on the results from the *forest plot* generated from the *meta-analysis*, the *S-DN* technique shows greater effectiveness compared to *D-DN* in pain reduction, although this result is not statistically significant. This discussion will link the *forest plot* results with the findings from the two analyzed journals, namely the studies by Emre (2024) and Özlem (2017).

The *forest plot* results show a total mean difference of -0.86 (95% *CI*: -2.47 to 0.75), with an effect direction favoring the *S-DN* technique as a more effective method than *D-DN* in reducing *myofascial pain*. The *confidence interval* crossing zero indicates that this difference is not statistically significant ($p = 0.30$). The heterogeneity value ($I^2 = 0\%$) indicates that the results of both studies are quite consistent, despite differences in methodology and sample size.

In the study by Emre (2024), the *S-DN* technique showed slightly better results compared to *D-DN*. The average *VAS* score in the *S-DN* group was 3.53 ($SD = 1.5$), while in the *D-DN* group, it was 4.33 ($SD = 2.53$). The mean difference of -0.80 (95% *CI*: -2.42 to 0.82) indicates that although pain was reduced more in the *S-DN* group, this result was not statistically significant.

Meanwhile, in the study by Özlem (2017), the *S-DN* technique also showed a greater pain reduction trend compared to *D-DN*. The average *VAS* score in the *S-DN* group was 24.78 (*SD* = 36.57), while in the *D-DN* group, it was 32.07 (*SD* = 24.94). The mean difference of -7.29 (95% *CI*: -24.11 to 5.53) supports the better effectiveness of *S-DN*, although the large variation in results lowers the reliability of this data.

The *S-DN* technique involves needle insertion without active manipulation, allowing for stable stimulation at the *trigger point*. This may reduce tissue irritation often associated with active manipulation, as seen in *D-DN*. The Özlem study used a longer treatment duration (15–20 minutes) compared to the Emre study (10–15 minutes). A longer duration allows sufficient time to modulate pain and reduce abnormal activity at the *trigger point*. The once-weekly frequency for six weeks in the Özlem study provides the body with recovery time between sessions, which may be more effective for pain modulation compared to the twice-weekly frequency in the Emre study. The smaller needles used in the Özlem study (0.25 mm x 40 mm) may provide gentler stimulation compared to the larger needles (0.3 mm x 50 mm) in the Emre study, which may be more suitable for patients with high pain sensitivity. The *S-DN* procedure in the Özlem study was performed by a neurologist with over seven years of experience, while in the Emre study, the procedure was conducted by a trained physiotherapist (Lin Hsieh C. Y. & Yang Y. C., 2021). The greater experience in handling pain disorders in the Özlem study may provide an advantage in selecting the appropriate *trigger points* for intervention (Adah & Haung M., 2018).

Although the *meta-analysis* results suggest that *S-DN* is more effective than *D-DN* in reducing *myofascial pain*, this result is not statistically significant. However, these findings are important for clinical practice, particularly in choosing the *dry needling* technique based on patient needs. The more passive *S-DN* technique may be a better choice for patients with high tissue sensitivity or low tolerance to active needle manipulation (Agustín Ruiz F. A. & Valiente M. J., 2016).

On the other hand, *D-DN* remains relevant in cases where more intense stimulation is required to trigger muscle tension release and improve local circulation. However, treatment frequency and duration should be adjusted to minimize the risk of tissue irritation (Chou Kao M. J. & Lin J. G., 2016).

Further research should consider more uniform designs, including treatment duration and intervals, types of needles used, and the experience of the medical personnel performing the procedures. Larger sample sizes are also needed to improve statistical power and ensure more reliable results. Additionally, combining the *S-DN* technique with other modalities, such as *kinesio taping*, should be explored to assess potential synergistic effects that may be more effective in reducing *myofascial pain*.

Overall, the results of this *meta-analysis* suggest that *S-DN* has greater potential for reducing *myofascial pain* compared to *D-DN*, although these findings require further validation through more extensive and rigorous research. The choice of technique in clinical practice should consider patient characteristics, individual needs, and the experience of medical professionals to achieve optimal outcomes.

CONCLUSION

This study concludes that static *dry needling* (*S-DN*) is more effective than dynamic *dry needling* (*D-DN*) in reducing pain in *myofascial pain syndrome* based on *VAS* scale measurements, although the difference is not statistically significant. The analysis shows that the static technique results in a greater reduction in *VAS* scores compared to the dynamic technique, with a mean difference of -0.86 (95% *CI*: -2.47 to 0.75), despite the *confidence interval* crossing zero and a *p*-value of 0.30. Static *dry needling* provides a more stable effect, particularly for patients with high tissue sensitivity and low tolerance to active needle manipulation, making it suitable for gradual pain reduction. Factors such as treatment duration, therapy frequency, needle type, and the experience of healthcare providers also influence the effectiveness of the intervention.

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