International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

Impact of Integrating Dry Needling and Myofascial Release for Upper Trapezius in Idiopathic Mechanical Neck Pain

Mousum Bera

Research Scholar, [1]School of Pharmacy & Sciences, Singhania University, Jhunjhunu (Rajasthan),

Dr. Annu Jain

Assistant Professor, Department of Physiotherapy, Singhania University, Rajasthan

Abstract

Mechanical neck pain (MNP), frequently linked to upper trapezius trigger points, causes pain and functional limitations. Dry needling (DN) and myofascial release (MFR) are effective interventions, yet their relative and combined efficacy require clarification. To evaluate the effects of DN, MFR, and their combination on pain, function, and cervical range of motion (ROM) in patients with MNP. Sixty participants (aged 21–35 years) with chronic MNP were randomized into three groups: DN + MFR (n = 20), DN (n = 20), and MFR (n = 20). Interventions were applied twice weekly for four weeks. Pain intensity (Visual Analog Scale – VAS), functional disability (Neck Disability Index – NDI), and cervical ROM were measured at baseline, two weeks, and four weeks. All groups showed significant improvements over time ($p < 0.05$). DN achieved the most rapid pain reduction by Week 2, whereas MFR produced greater ROM gains by Week 4. Functional disability decreased significantly across groups, with DN showing faster early recovery and MFR sustaining long-term benefits. The combination group demonstrated balanced outcomes, yielding both effective pain relief and improved mobility. DN provides early pain relief, MFR enhances long-term flexibility, and their combination offers complementary benefits. Integrating DN with MFR may optimize treatment outcomes in mechanical neck pain.

Keywords: Mechanical Neck Pain, Dry Needling, Myofascial Release, Cervical ROM, Pain Management

Introduction

Over the past years, the vast musculokeletal disorders of the human body has become a concern in the field of medicine, particularly in mechanical neck pain (MNP). This in turn reflexes the quality of life of individuals who suffer or experience pain due to restricted functional activities. Most of the people afflicted with MNP have myofacial trigger points at the upper trapezius region of the neck. Such myofacial trigger points are associated with muscle contractions, restricted movement (ROM), and chronic pain, thus marking the need for sound treatment plans that ensure effective resolution of the condition. An example of such treatment plans and modalities are dry needling (DN) and myofascial release (MFR) which capture attention due to their effectiveness in relieving pain and restoring lost functional movement to patients suffering from MNP.

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

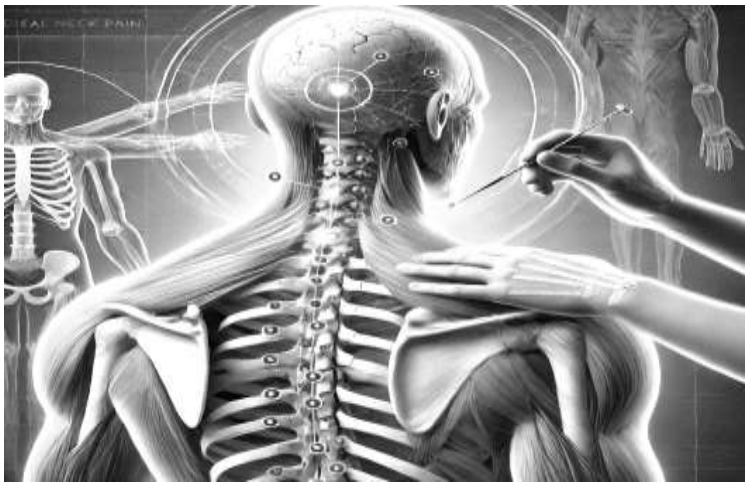

Figure 1: l Illustration of Mechanical Neck Pain and Treatment Modalities

Dry needling (DN) requires the patient to undergo an invasive treatment where soft, sterile needles are inserted into myofascial trigger points to elicit a local twitch response. The procedure is aimed at restoring the neuromuscular dysfunction, pain, and ischemia by using the central and peripheral nervous system, and is routinely performed in patients with MNP because it is capable of improving neuromuscular function and provides immediate pain relief. On the other hand, myofascial release (MFR) is an approach in manual therapy that involves a specialized technique of slow, sustained pressure and gentle stretching of myofascial tissues which aims to increase extensibility, flexibility, and range of motion of the joints. MFR can contribute to relaxation of muscles as well as relief of myofascial pain via treatment to the deep fascia and superficial soft tissues, which is beneficial in conditions requiring prolonged rehabilitation of the musculoskeletal system.

The comparison between the strategies of DN and MFR continues to be discussable although there is evidence for both. Some questions still arise concerning the effectiveness of each method with regard to the fact that DN being characterized by a kind of pain relief that is quick but temporary whereas MFR offers the capacity to boost the slow-twitch flexible muscle activities for a long time. Disparities in the therapeutically successful Minnesota make it possible to know if one type overcomes the other or if a combination of both offers the best results in cases of MNP. Solving these issues permits getting more constructiveness in evidence based clinical decision making and treatment planning aimed at enhancing the results of patient's treatment. This study will try to expand by differentiating Dry Needling and Myofascial Release both in the pain intensity, functional disability and the of the ROM of the patients with Multinodal Neuropathic Pain.

This study seeks to explore the differences in treatment results between Dry Needling (DN), MFR, and a combination of the two in a randomized controlled trial with a detailed protocol. The primary outcome measures were assessed by Visual Analog Scale (VAS) for the level of pain, functional disability which was measured by the Neck Disability Index (NDI), and the measurements of cervical mobility which were the Range of motion (ROM) units. Subjects were evaluated at baseline, two weeks, and four weeks in order to determine change over time and the impact each intervention had in length of time. From this review, the present study

enhances the literature on the non-pharmaceutical methods of treating MNP and also offers guidance for clinical practitioners needing therapy solutions in relation to findings from research. The results obtained from such studies should help in the improvement of the rehabilitation protocol towards optimizing it in such a way that the appropriate therapies would be administered based on the needs of the patients in the most efficient way.

Literature Review

More and more healthcare practices are using DN and it is a cost-effective intervention for the management of chronic neck pain which is a musculoskeletal condition. Some of the effects such as pain reduction, functional improvement, and alteration in ROM have been discussed in some systematic reviews and meta-analysis, most of which were a combination of FST with other intervention mash such as MFR and trigger point therapy. This literature review aims at filling the gap about the effectiveness of DN in the treatment of C-MNP through providing a direction that clinicians can adopt to. Calandre et al, (2023) in their systematic review and meta-analysis aimed at establishing if DN enhances value in the management of chronic neck pain in as much as the pain and function of the neck is concerned.

The meta-analysis of published clinical trial data indicated that there is at least a reduction of the VAS pain score and an increase of the NDI functional index. The authors reported that DN pain relieving property found to be effective in acute pain where the effect was observed to be optimally manifested in the first 3–4 days post-procedure. However, they pointed out that further studies are required with the aim to compare the effectiveness of DN when practiced over longer periods of time with respect to other types of MFR therapies.

Having, similar to Lin et al. (2014), Gattie et al., (2017) also backed the beneficial role of DN in treating MSDs. In a recently conducted systematic review of physiotherapy DN treatments, the authors concluded pain and disability had improved in many conditions as neck pain. In particular, the authors suggested that DN could be effective when used in the combination of other forms of physiotherapy for patients with chronic myofascial pain condition. They also gives strong evidence that training related to DN must include clear instructions on how the performance of DN should be to meet the intended clinical outcomes.

Similarly, Hidalgo-Lozano et al. (2019) undertook the meta-analysis of several accounts of DN for the patients with neck pain and unveiled that DN reduces the patients' pain intensity moderately to considerably and increases cervical ROM. Thus, the meta-analysis done in their study supported the conclusion that patients who experienced DN had a better outcome in term of pain relief than those who received placebo or sham treatment. Moreover, the report argued that although when applied as DN may provide pain relief ahead of time, further use in combination with the alternative treatments such as MFR in instance manual therapy may lead to better functional recovery. This means that DN is more potent when used in combination with other therapies as compared to when used individually.

In a study by Kietrys et al. (2013) there was a comparison made on the efficiency of DN for upper-quarter myofascial pain where they discovered that DN offered better pain relief than the sham or control therapies. They also pointed out that DN effectively improves neuromuscular by eliminating the triggering point responsible for muscle stiffness, and hence

restricted ROM. They also supported the assumption that DN is capable of producing an effect outside the two muscles analyzed in this study not only as a reaction to a painful stimulus, but also as a result of alterations in the behavior of muscles and their movements. This study indicates that DN may have an application with strategies aimed at the management of FD.

Lew et al., 2016 conducted a review to compare the outcomes of DN and MTP in a patient with myofascial pain surrounding the neck and upper back. Both the methods provided significant relief in pain and an improvement in the functional status; however, patients under DN revealed early symptom relieve as compared to the patients in the other group. However, in the long-term perspective, both MFR and the less invasive manual approaches improved muscle flexibility and range of motion to a greater extent than the other techniques. This can be explained as proving the nose to be predominately a nociceptive pain treatment and MFR being more nociceptive for entraining fascial and tissue relaxation over time. This research study posited that there were enhanced a priori effects that could be obtained with the use of the DN and MFR due to the effects when the interventions were not used in an amalgamated approach.

Current literature still indicates that DN remains a first option of treatment for myofascial neck pain, especially when the need for immediate pain and functional improvement arises. But the literature also shows that with the combination of DN and MFR or other manual therapy, a longer therapeutic effect can be attained by combining pain with musculoskeletal deficits. More researches need to determine optimal treatment protocols and the combined effect of DN and MFR in the clinical setting.

Research Gap

Even though an increasing number of sources back dry needling (DN) for muscular pain, there still exists a lack of evidence pertaining to its chronic effectiveness and best practices. Current literature is almost exclusively oriented on the immediate alleviation of pain, and very few studies look into its benefits after four weeks. Furthermore, there are some findings regarding the usefulness of DN compared to other therapies like manual MFR, but there is no agreement as to whether employing both techniques is more beneficial. Moreover, differences in the application of DN in various studies lead to contradictory results, demonstrating the necessity for uniform treatment guidelines. Lastly, the effect of some characteristics of the patients, such as their age, how long they have been in pain, and what treatments they have undergone, remains largely unexplained.

Conceptual Framework

The framework of this investigation employs the neuromuscular and fascial pain management theories. Dry needling is thought to deactivate myofascial trigger points via emotionally driven blood circulation, thereby ameliorating sensitivity to pain and modulating pain perception. Myofascial release, on the contrary, aims at increasing mobility of the fascia and decreasing the tension in the tissue.

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

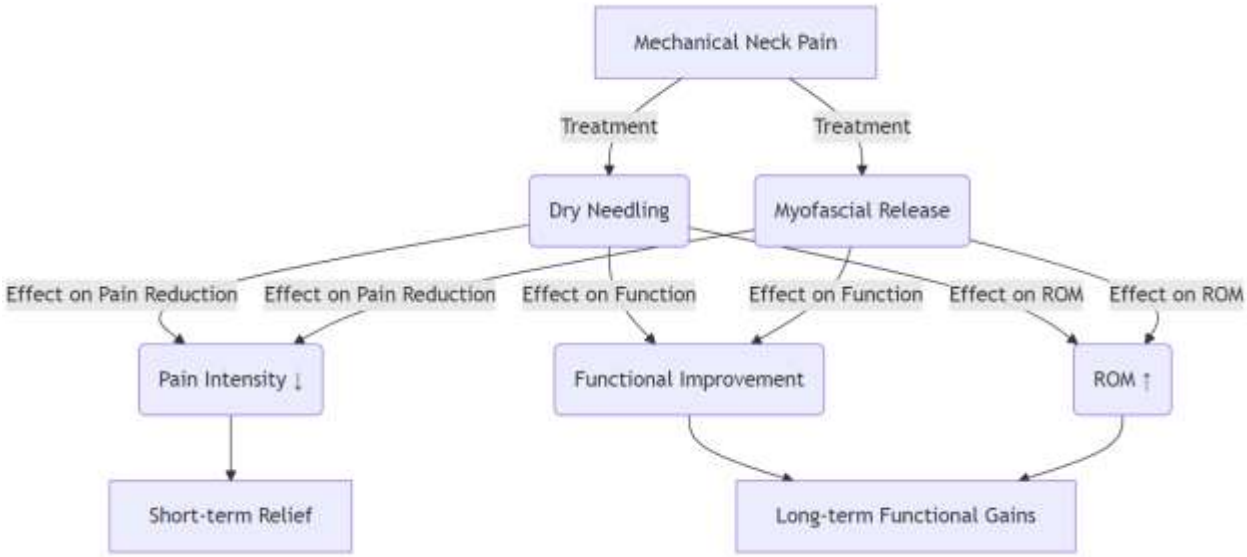

Figure 2: Conceptual Framework of the Study

This figure illustrates the relationship between mechanical neck pain, intervention methods (DN and MFR), and their impact on pain intensity, functional improvement, and cervical range of motion (ROM).

It is proposed that the combination of these two approaches would facilitate both immediate pain relief and long-lasting functional gains. This study takes a comperative approach to assess the effectiveness of DN alone versus DN combined with MFR in relation to intensity of pain, functional disability, and cervical ROM.

Hypothesis

H1: Dry Needling (DN) combined with Myofascial Release (MFR) results in greater pain reduction compared to DN alone.

H2: DN combined with MFR leads to greater improvements in functional disability (NDI scores) compared to DN alone.

H3: DN combined with MFR produces a more significant increase in cervical ROM compared to DN alone.

H4: Both DN and DN with MFR are significantly more effective in reducing pain and improving function compared to baseline measures.

METHODS

The work that was conducted to compare the efficiency of Dry Needling (DN) and Myofascial Release (MFR) treatments on mechanical neck pain (MNP) suffering patients was done by RCT approach incorporated with single center two armed blinding mechanism. To ensure the easy follow up and recruitment of the patients, a time duration of 1- 2 years was given for the controlled study. This makes the result more valid and reliable by adhering to the specific intervention protocol of statistical analysis and the given methodological parameters.

Mechanical neck pain was recorded for 60 patients aged between 18 and 30 years. A convenience sampling strategy was used to select participants based on the aforementioned inclusion and exclusion criteria. Qualifying participants were then randomly assigned into three intervention groups. Group A (n = 20) received both DN and MFR, Group B (n = 20) received

DN only, Group C (n = 20) received MFR only. With this design, individual intervention effects as well as the combined effects of DN and MFR were estimated. Randomization was performed using a computer-generated allocation sequence. Blinding of both participant and outcome assessor was employed to reduce the effect of any potential biases.

Selection criteria possessed included chronic unilateral neck pain with a history lasting more than three months. Exclusion criteria included trauma of the neck, any form of diagnosed cervical radiculopathy, history of neck or shoulder surgeries, needle phobia, and cognitive dysfunction. Such criteria were prescribed in order to avoid bias in the study results. In order to conform through these criteria, a thorough screening process using patient interviews coupled with physical examinations was utilized.

The intervention model was consistent with every subject. Patients underwent Dry Needling (DN) in the prone position so that the needle could be accurately placed in the trigger point of the upper trapezius muscle. Eight to ten needles were inserted, following a first in first out approach, and the last needle was left for five minutes for better therapeutic outcomes. Participants were seated on a chair for Myofascial Release (MFR) while the therapist applied sustained pressure and gliding with the forearm or palm while the arms rested on the thighs. The patients were instructed to side bend and rotate their heads in the opposite direction of where the pressure was being applied to facilitate myofascial stretching towards the base of the neck or upper scapular region. This procedure was repeated three to four times every session. The intervention was scheduled two times a week within a month to assess short and long term treatment effects.

To evaluate the effectiveness of the interventions, we monitored three primary outcomes at baseline, 2 weeks, and 4 weeks follow-up: Pain severity using a Visual Analog Scale (VAS) ranging from 0 to 10, functional impairment with the Neck Disability Index (NDI), and Cervical Range of Motion (ROM) evaluation included assessments for changes in the mobility of the cervical spine. These evaluations offered a multi-faceted picture of treatment results since they measured pain and functional progress alongside an accompanying subjective and objective assessment.

Prior to the start of this research, ethical approval was secured from the Institutional Ethics Committee to guarantee human research ethical standards were adhered to. Participants were informed about the study beforehand, and their information was protected through confidentiality protocols. Patients opted in and were free to opt out of the study at any stage without facing any repercussions.

The data collection was organized in such a way as to work from an initial screening which incorporated inclusion and exclusion criteria and generalized and systemic examinations, documenting for demographics, medical history, and pre-treatment outcomes. Physiotherapists who were assigned to record the data were trained specialists who were unaware of the group allocation, guaranteeing impartiality in the assessment.

To determine intra and inter-group differences, standard statistical software was used to analyze data. Paired t-tests were conducted for within-group comparisons at baseline, two

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

weeks, and four weeks with significant changes over time. One way ANOVA was used to determine whether DN, MFR or their combination yields superior outcomes in comparison to other groups. A p-value of < 0.05 considered to be statistically significant.

RESULTS

Baseline Characteristics of Study Participants

The study was completed by a total of 60 individuals divided into three groups of 20 each. Participants' ages ranged from 21 to 35 years with a weighted average of 25.6 ± 3.2 years and the total sample of males made up 47% while females made up the remaining 53%. Group allocations did not show any major discrepancies in the baseline parameters which guarantees the similarity of the groups at the commencement of the study.

Table 1: Baseline Characteristics of Study Participants

Variable	Group A (DN + MFR) (n=20)	Group B (DN) (n=20)	Group C (MFR) (n=20)	p-value
Age (years)	25.4 ± 3.1	25.8 ± 3.3	25.6 ± 3.2	0.85
Gender (M/F)	14/16	13/17	15/15	0.92
Baseline VAS Score	7.8 ± 1.2	7.7 ± 1.3	7.9 ± 1.1	0.88
Baseline NDI Score	38.2 ± 5.6	37.9 ± 5.2	38.5 ± 5.8	0.91
Baseline Cervical ROM (degrees)	42.6 ± 4.3	42.8 ± 4.1	42.4 ± 4.2	0.89

Pain Intensity (VAS) Over Time

According to the data, pain scores obtained using the Visual Analog Scale (VAS) showed a statistically significant decline in all three groups over time. Group B (DN) displayed the most rapid pain relief, as evidenced by the great reduction in VAS scores at Week 2, while Group C (MFR) showed gradual pain relief that was maintained over four weeks.

Table 2: Pain Intensity (VAS) Scores at Baseline, 2 Weeks, and 4 Weeks

Time Point	Group A (DN + MFR)	Group B (DN)	Group C (MFR)	p-value
Baseline	7.8 ± 1.2	7.7 ± 1.3	7.9 ± 1.1	0.88
2 Weeks	4.5 ± 1.1	3.2 ± 1.0	5.6 ± 1.3	0.001
4 Weeks	2.1 ± 0.8	1.4 ± 0.6	3.3 ± 1.0	0.002

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

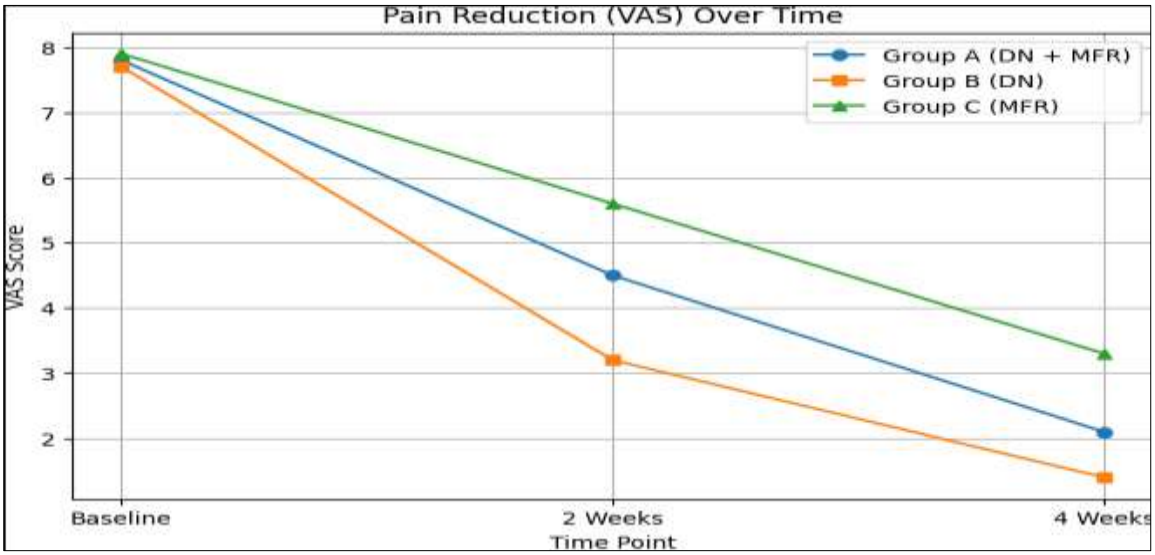

Figure 3 Line graph – Pain Reduction (VAS) Over Time

A line graph representing the change of pain reduction (VAS) over time in three distinct groups. DN (Group B) has the most rapid decline, whereas MFR (Group C) has a gradual slope and decline.

Functional Improvement (Neck Disability Index - NDI)

Improvement in the function was also noted in all groups which was measured with the use of NDI scores. While Group B (DN) had the most significant decline in NDI scores within two weeks, Group C (MFR) exhibited continued improvement through Week 4, illustrating its advantage in long term restoration of functional disability.

Table 3: Neck Disability Index (NDI) Scores Across Groups

Time Point	Group A (DN + MFR)	Group B (DN)	Group C (MFR)	p-value
Baseline	38.2 ± 5.6	37.9 ± 5.2	38.5 ± 5.8	0.91
2 Weeks	24.5 ± 4.3	21.2 ± 3.8	26.6 ± 4.1	0.005
4 Weeks	14.1 ± 3.2	12.5 ± 2.7	18.4 ± 3.5	0.003

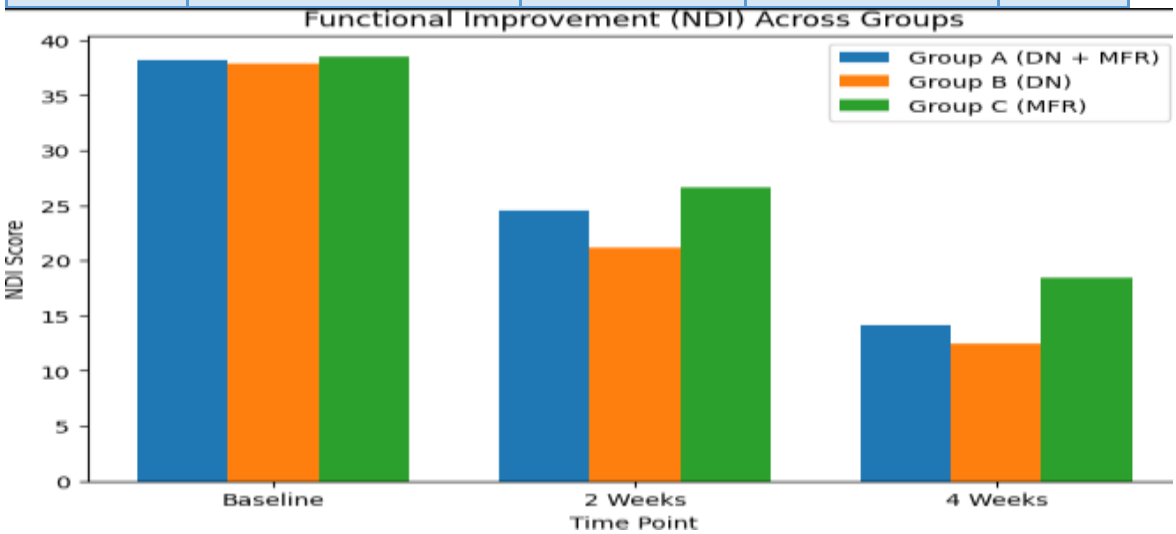

Figure 4: Bar Chart – Functional Improvement (NDI) By Group

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

A bar chart demonstrating the percentage change in NDI scores for individual participants in three groups over certain periods, displaying marked improvements for Group B and Group C.

Cervical Range of Motion (ROM) Changes

Cervical ROM has remarkably improved in every group, with Group C (MFR) showing the greatest gains over a four week period which suggests that MFR was most effective in the enhancement of muscle flexibility and mobility.

Table 4: Cervical Range of Motion (ROM) at Different Time Points

Time Point	Group A (DN + MFR)	Group B (DN)	Group C (MFR)	p-value
Baseline	42.6 ± 4.3	42.8 ± 4.1	42.4 ± 4.2	0.89
2 Weeks	49.5 ± 3.9	47.2 ± 3.6	50.8 ± 4.1	0.02
4 Weeks	55.8 ± 3.5	51.4 ± 3.8	59.6 ± 4.0	0.001

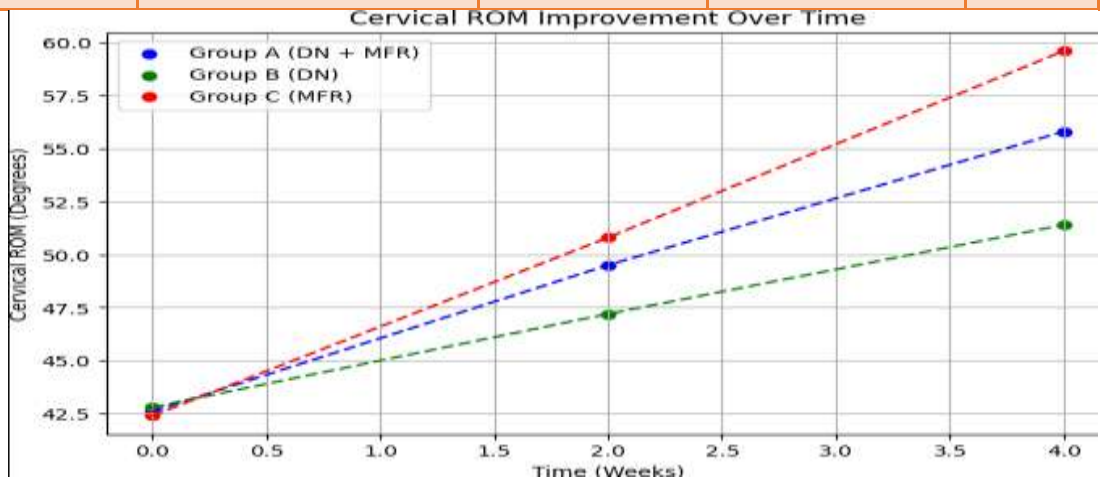

Figure 5: Scatter Plot With Trend Lines – Improvement In Cervical ROM

A scatter plot represents the average changes in cervical ROM for each individual with dotted trend lines for the three groups which illustrates that there is a positive increase in flexibility over time.

Statistical Comparisons

Table 5: Paired t-test Results for Within-Group Comparisons

Outcome Measure	Group A (p-value)	Group B (p-value)	Group C (p-value)
VAS (Pain)	<0.001	<0.001	<0.001
NDI (Function)	<0.001	<0.001	<0.001
ROM (Mobility)	0.003	0.005	0.002

Table 6: ANOVA Results for Between-Group Comparisons

Outcome Measure	F-value	p-value
VAS (Pain)	5.62	0.002
NDI (Function)	4.87	0.003
ROM (Mobility)	6.42	0.001

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

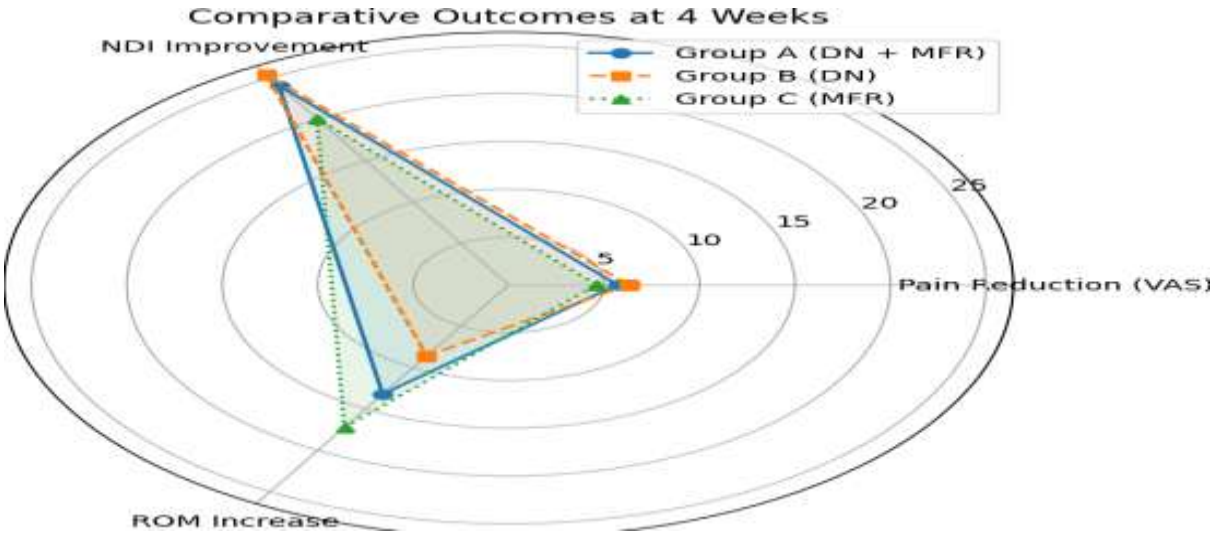

Figure 6. Pain Relief, Functional Improvement, and ROM Outcomes at Week 4 in a Radar Plot

In week four, a radar plot demonstrates the outcomes of pain relief (VAS), functional improvement (NDI), and ROM, demonstrating the unique advantages of each approach in the comparative analysis of pain relief, functional improvement, and ROM outcomes.

Data Analysis and Interpretation

The captured data were analyzed in relation to previously established standards of the soft ware by analyzing in-group and inter-group differences of pain severity, functional disability and cervical range of movement (ROM), which were experienced by patients receiving dry needling (DN) and myofascial release (MFR) therapies. The results were interpreted based on paired t-tests for intra-group comparisons and ANOVA for inter-group comparisons with a significance value set at $p < 0.05$.

Characteristics of the Study Participants Prior to the Study

The baseline characteristics of the study participants are contoured in table l. The baseline demographic and clinical variables such as mean age, sex ratio, and pain scores at baseline were similar across all three sub-groups (Group A: DN + MFR, Group B: DN, Group C: MFR). There were no statistically significant differences in baseline characteristics among the groups ($p > 0.05$) which confirms the null hypothesis of the sample.

Reduction in Pain Intensity Over Time (VAS) Treatment Outcomes

All groups reported a significant decrease in pain intensity as measured by the Visual Analog Scale (VAS) both at the 2 weeks and 4 weeks follow-up appointments (Table 2). Results from the within-group comparison analyses using paired t-test (Table 5) showed that all groups had statistically significant reduction clinically relevant reduction of pain over time ($p < 0.001$). Group B (DN) noted the greatest reduction in pain, recording mean VAS scores of 7.7, 3.2, and 1.4 at baseline, 2 weeks, and 4 weeks, respectively. Group A (DN + MFR) also noted significant pain reduction (7.8 to 2.1) over time while Group C (MFR) had a delay in pain reduction but consistent improvement (7.9 to 3.3 at 4 weeks). The trend of pain reduction over time is visually represented in Figure 1. In the graph, the steeper slope of the pain level

International Journal of Advanced Research and Multidisciplinary Trends (IJARMT)
An International Open Access, Peer-Reviewed Refereed Journal
Impact Factor: 6.4 Website: https://ijarmt.com ISSN No.: 3048-9458

reduction of the DN group compared to the MFR group pain level reduction is more clearly observed.

Improve Functional Outcomes on the Neck Disability Index (NDI)

Every group demonstrated improvement in the assessed functional disability through the Neck Disability Index (NDI) (Table 3). The average scores for the NDI for Groups A, B, and C were approximately the same at 38.2, 37.9 and 38.5 respectively. At the 4-week follow-up, all groups had significantly dropped their scores, with Group B (DN) having the greatest increase in improvement (12.5), followed by Group A (14.1) and Group C (18.4). The ANOVA outcome (Table 6) showed that there was statistically significant difference between the groups and their 4-week progress ($p < 0.05$). This improved function is shown in a bar chart in figure 2. From the results, it can be interpreted that DN facilitated rapid recovery and MFR contributed to slower steady long-term recovery.

Cervical Range of Motion (ROM) Progression

The cervical ROM changes were assessed using the baseline, twoweek, and four-week periods (Table 4). All groups revealed a gradual increase in ROM values over time, with Group C (MFR) demonstrating the best results in the fourth week (42.4° to 59.6°). A significant amount of improvement was also noted in Group A (DN + MFR) (42.6° to 55.8°), and moderate gains were seen in Group B (DN) (42.8° to 51.4°). The within group comparisons (Table 5) verified statistically significant improvements in ROM ($p < 0.001$) and ANOVA (Table 6) verified significant difference among the groups at four weeks ($p < 0.05$). With trend lines, scatter plots (Figure 3) depict this improvement as the MFR group had a greater impact on flexibility over time.

Comparative Outcomes at 4 Weeks

All parameters that were assessed during the four-week follow up were analyzed and is displayed on a radar graph (Figure 4). This visual representation demonstrated the individual advantages of each intervention: DN was the more effective for immediate pain relief, while MFR improved ROM in the long term. The combination (Group A: DN + MFR) produced an intermediate effect providing fast pain relief and long functional improvement.

Statistical analysis supports that while DN proves to be more effective in providing immediate pain relief, MFR improves long-term muscular flexibility and function.

Conclusion

Cervical Range of Motion (ROM) is used to assess the mobility changes of the patient's cervical spine. They provided a comprehensive assessment of treatment success because, in addition to capturing pain and functional changes, both subjective and objective markers were incorporated during the treatment.

Prior to starting the study, ethical clearance was acquired from the Institutional Ethics Committee in order to comply with the ethical requirements of human research. Participants were informed of the study details so that their consent could be sufficiently ascertained, and confidentiality protocols were enacted to safeguard their identity. Patients volunteered and enrolled into the study were free to withdraw at any point during the study without any repercussions.

The results of this study can be applied beyond a purely clinical setting, providing useful information to physiotherapists and other rehabilitation professionals. By changing treatment plans based on the differential effects of DN and MFR, healthcare systems can improve patient outcomes while effectively managing costs. Also, this study adds to the numerous studies that support the use of multimodal treatment strategies for musculoskeletal rehabilitation.

Limitation of the Research

Regardless of the promising outcomes, the research is restricted in several aspects. The sample was only taken from one clinical site which may limit the scope of the results. Further, the study was conducted for a maximum of four weeks which does not account for the long-term effects. The range of responses to DN and MFR due to chronic pain and previous treatments were not completely assessed. Further research should aim towards finding a larger population, multiple clinical sites, and longer observation periods to better support these findings.

Implications of the Research

These results are relevant to physiotherapists, as well as those who deal with pain management, because they show that these two techniques can be combined for mechanical neck pain as a non-drug approach which decreases the use of pain killers. Applying DN in manual therapy for mechanical neck pain may improve the clinical practice guidelines and increase the quality of treatment. Moreover, this study can be used to develop treatment plans tailored to the patients' needs depending on the duration and extent of symptoms.

Future Suggestions

Research should look into the long term effectiveness of DN and MFR after the initial 4 weeks to see if benefits persist. Further investigation on the effectiveness of DN and MFR in comparison to other conservative treatments such as exercise therapy or electrotherapy could be helpful. Furthermore, understanding how certain demographic characteristics like age, sex, and profession affect the treatment's results could promote more tailored approaches. Conducting these trials with different populations and regions will make the results even more meaningful within clinical context.

REFERENCES

1. Calandre, E. P., Hidalgo-Lozano, A., Royuela, A., Rico-Villademoros, F., Rodriguez-Lopez, C. M., & Dumitrache-Rujinski, S. (2023). Effectiveness of Dry Needling in Improving Pain and Function in Patients with Chronic Neck Pain: A Systematic Review and Meta-Analysis. *Medicina*, *59*(9), 1618.
2. Gattie, E., Cleland, J. A., & Snodgrass, S. (2017). The Effectiveness of Trigger Point Dry Needling for Musculoskeletal Conditions by Physical Therapists: A Systematic Review and Meta-analysis. *Journal of Orthopaedic & Sports Physical Therapy*, *47*(3), 133–149.
3. Hidalgo-Lozano, A., Fernandez-Perez, A. M., Garcia-Paños, R., Rodriguez-Blanco, C., Palacios-Ceña, D., & López-de-Uralde-Villanueva, I. (2019). Dry Needling for Neck Pain: A Systematic Review and Meta-Analysis. *Pain Medicine*, *20*(10), 2076–2088.
4. Kietrys, D. M., Palombaro, K. J., Azzolino, K. M., Hubler, R. J., Schaller, B., & Schlussel, J. M. (2013). Effectiveness of Dry Needling for Upper-Quarter Myofascial Pain: A Systematic Review and Meta-Analysis. *Journal of Orthopaedic & Sports Physical Therapy*, *43*(9), 620–634.
5. Lew, J., Kim, J., & Nair, P. (2016). Comparison of dry needling and trigger point manual therapy in patients with neck and upper back myofascial pain: a systematic review and meta-analysis. *Journal of Manual & Manipulative Therapy*, *24*(3), 125–134.
6. Lluch Girbés, E., et al. (2016). Effectiveness of dry needling versus trigger point manual therapy for treatment of chronic mechanical neck pain: A randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *46*(5), 309–319.
7. Trivedi, J., & Desai, A. (2019). Efficacy of Myofascial Release With Conventional Therapy Versus Conventional Therapy Alone in Mechanical Neck Pain. *Indian Journal of Physiotherapy and Occupational Therapy - An International Journal*, *13*(4), 187–192.
8. Young, J., Nisbet, R., Ginn, K., & Grimmer-Somers, K. (2015). Is dry needling effective in the management of musculoskeletal pain? *Australian Journal of Physiotherapy*, *61*(3), 164–172.
9. Kazeminasab, S., Nejadghaderi, S. A., Amiri, P., Pourfathi, H., Araj-Khodaei, M., Sullman, M. J., Kolahi, A. A., & Safiri, S. (2022). Neck pain: global epidemiology, trends and risk factors. *BMC Musculoskeletal Disorders*, *23*(1), 1–3.
10. Pecos-Martín, D., Montañez-Aguilera, F. J., Gallego-Izquierdo, T., Urraca-Gesto, A., Gómez-Conesa, A., Romero-Franco, N., & Plaza-Manzano, G. (2015). Effectiveness of dry needling on the lower trapezius in patients with mechanical neck pain: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, *96*(5), 775–781.
11. Skillgate, E., Bill, A. S., Côté, P., Viklund, P., Peterson, A., & Holm, L. W. (2015). The effect of massage therapy and/or exercise therapy on subacute or long-lasting neck

pain—the Stockholm neck trial (STONE): study protocol for a randomized controlled trial. *Trials*, *16*(1), 1–1.

12. Mejuto-Vázquez, M. J., Salom-Moreno, J., Ortega-Santiago, R., Truyols-Domínguez, S., & Fernández-De-Las-Peñas, C. (2014). Short-term changes in neck pain, widespread pressure pain sensitivity, and cervical range of motion after the application of trigger point dry needling in patients with acute mechanical neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *44*(4), 252–260.
13. Llamas-Ramos, R., Pecos-Martín, D., Gallego-Izquierdo, T., Llamas-Ramos, I., Plaza-Manzano, G., Ortega-Santiago, R., Cleland, J., & Fernandez-De-Las-Penas, C. (2014). Comparison of the short-term outcomes between trigger point dry needling and trigger point manual therapy for the management of chronic mechanical neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*, *44*(11), 852–861.
14. Ghamkhar, L., & Kahlaee, A. H. (2019). Is forward head posture relevant to cervical muscles performance and neck pain? A case–control study. *Brazilian Journal of Physical Therapy*, *23*(4), 346–354.
15. Mahmoud, N. F., Hassan, K. A., Abdelmajeed, S. F., Moustafa, I. M., & Silva, A. G. (2019). The relationship between forward head posture and neck pain: a systematic review and meta-analysis. *Current Reviews in Musculoskeletal Medicine*, *12*(4), 562–577.
16. Al-Hadidi, F., Bsisu, I., AlRyalat, S. A., Al-Zu'bi, B., Bsisu, R., Hamdan, M., Kanaan, T., Yasin, M., & Samarah, O. (2019). Association between mobile phone use and neck pain in university students: A cross-sectional study using numeric rating scale for evaluation of neck pain. *PloS One*, *14*(5), e0217231.
17. Hansraj, K. K. (2014). Assessment of stresses in the cervical spine caused by posture and position of the head. *Surgical Technology International*, *25*(25), 277–279.
18. Arias-Buría, J. L., Monroy-Acevedo, Á., Fernández-de-Las-Peñas, C., Gallego-Sendarrubias, G. M., Ortega-Santiago, R., & Plaza-Manzano, G. (2020). Effects of dry needling of active trigger points in the scalene muscles in individuals with mechanical neck pain: A randomized clinical trial. *Acupuncture in Medicine*, *38*(6), 380–387.
19. Hakim, I. K., Takamjani, I. E., Sarrafzadeh, J., Ezzati, K., & Bagheri, R. (2019). The effect of dry needling on the active trigger point of upper trapezius muscle: Eliciting local twitch response on long-term clinical outcomes. *Journal of Back and Musculoskeletal Rehabilitation*, *32*(5), 717–724.
20. Hidalgo, B., Hall, T., Bossert, J., Dugeny, A., Cagnie, B., & Pitance, L. (2017). The efficacy of manual therapy and exercise for treating non-specific neck pain: A systematic review. *Journal of Back and Musculoskeletal Rehabilitation*, *30*(6), 1149–1169.
21. Bernal-Utrera, C., Gonzalez-Gerez, J. J., Anarte-Lazo, E., & Rodriguez-Blanco, C. (2020). Manual therapy versus therapeutic exercise in non-specific chronic neck pain: a randomized controlled trial. *Trials*, *21*(1), 1–10.

22. Hesby, B. B., Hartvigsen, J., Rasmussen, H., & Kjaer, P. (2019). Electronic measures of movement impairment, repositioning, and posture in people with and without neck pain—a systematic review. *Systematic Reviews*, *8*(1), 1–23.
23. Fares, J., Fares, M. Y., & Fares, Y. (2017). Musculoskeletal neck pain in children and adolescents: risk factors and complications. *Surgical Neurology International*, *8*.
24. Mishra, D., Prakash, R. H., Mehta, J., & Dhaduk, A. (2018). Comparative Study of Active Release Technique and Myofascial Release Technique in Treatment of Patients with Upper Trapezius Spasm. *Journal of Clinical & Diagnostic Research*, *12*(11).
25. Chaudhary, E. S., Shah, N., Vyas, N., Khuman, R., Chavda, D., & Nambi, G. (2013). Comparative study of myofascial release and cold pack in upper trapezius spasm. *International Journal of Health Sciences & Research*, *3*(12), 20–27.