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EFFECTS OF INTEGRATED NEUROMUSCULAR INHIBITION TECHNIQUE ON UPPER TRAPEZIUS TRIGGER POINTS IN PATIENTS WITH NON-SPECIFIC NECK PAIN: RANDOMIZED CONTROLLED TRIAL

Original Research

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ABSTRACT

Background: Non-specific neck pain is a prevalent musculoskeletal disorder significantly affecting daily function and quality of life. Myofascial trigger points in the upper trapezius are a common source of persistent pain, often requiring targeted interventions for effective management. Conventional physical therapy modalities, including heating, posture correction, and electrical stimulation, are frequently used; however, their efficacy in complete symptom resolution remains variable. Integrated neuromuscular inhibition technique (INIT) has emerged as a promising approach for trigger point deactivation, yet its comparative effectiveness remains underexplored.

Objective: To evaluate the effect of INIT on upper trapezius trigger points in patients with non-specific neck pain compared to conventional physical therapy alone.

Methods: A single-blinded randomized controlled trial was conducted over nine months at the Physical Therapy Department, JIMS Hospital, Jacobabad. A total of 58 participants were randomly allocated into two groups. Group A (n=29) received conventional physical therapy, including 30-minute sessions of heating, posture corrective exercises, transcutaneous electrical nerve stimulation (TENS), traction, short-term immobilization, acupuncture, chiropractic treatment, and massage, five times per week for eight weeks. Group B (n=29) received the same protocol with an additional 20–30 minutes of INIT per session. Outcome measures included the Neck Disability Index (NDI) and Numeric Pain Rating Scale (NPRS), assessed pre- and post-treatment. Non-parametric statistical tests were applied, with a significance threshold of $p<0.05$.

Results: At baseline, the mean NPRS score was 7.19 ± 0.66 in Group A and 6.75 ± 0.73 in Group B. Post-treatment, NPRS scores significantly improved to 0.80 ± 0.40 in Group A and 0.91 ± 0.28 in Group B ($p<0.05$). NDI scores also improved from 28.64 ± 3.20 to 12.00 ± 2.40 in Group A and from 30.36 ± 3.70 to 10.00 ± 2.10 in Group B ($p<0.05$). Inter-group comparison showed significantly greater improvements in Group B ($p<0.05$).

Conclusion: INIT, when combined with conventional physical therapy, is more effective than conventional treatment alone in reducing pain and disability associated with non-specific neck pain. The addition of INIT demonstrated superior outcomes in pain reduction and functional recovery, suggesting its potential integration into routine rehabilitation protocols.

Keywords: Acupuncture, Chiropractic, Myofascial Pain Syndromes, Neck Disability Index, Neuromuscular Therapy, Physical Therapy Modalities, Trigger Points

INTRODUCTION

Non-specific neck pain is a prevalent musculoskeletal disorder that imposes a significant economic burden on healthcare systems and adversely affects daily functioning. Among the various contributing factors, myofascial trigger points (MTrPs) are implicated in approximately 54% of chronic head and neck pain cases. These hyperexcitable spots within taut bands of skeletal muscle fibers elicit pain upon contraction, elongation, or palpation, often leading to referred pain patterns (1). The upper trapezius muscle is particularly prone to MTrPs, with an estimated prevalence of 34.7% in individuals experiencing myofascial pain (2). Despite their clinical significance, the exact pathophysiology of MTrPs remains incompletely understood. A prevailing hypothesis suggests that excessive acetylcholine release or a deficiency in acetylcholinesterase may contribute to sustained muscle contraction and the formation of taut bands, disrupting normal neuromuscular function (3,4). Additionally, peripheral muscle overactivity, central nervous system sensitization, and autonomic nervous system involvement have been implicated in the chronicity of MTrPs (5). These factors collectively contribute to persistent muscle tension, pain, and functional impairment. Various therapeutic interventions have been explored for the management of MTrPs, ranging from non-invasive strategies such as massage, ischemic compression, and spray-and-stretch techniques to invasive procedures including dry needling and trigger point injections (6,7). One emerging modality is extracorporeal shockwave therapy (ESWT), which has demonstrated efficacy in promoting tissue regeneration, reducing neurotransmitter release, and enhancing fibroblast proliferation, ultimately facilitating pain relief and muscle recovery (8,9). Another promising approach is the integrated neuromuscular inhibition technique (INIT), a manual therapy modality designed to deactivate MTrPs through a combination of ischemic compression, strain-counterstrain, and muscle energy techniques (10). INIT, as described by Chaitow, is based on the principles of reciprocal inhibition and post-isometric relaxation, allowing for the resolution of muscle spasms and pain modulation (11). Studies have indicated that a single session of INIT can effectively reduce pain and pressure pain threshold (PPT) in individuals with chronic myofascial neck pain (CMNP) (12). Additionally, comparative research suggests that INIT is superior to muscle energy techniques in improving pain, disability, and cervical range of motion (ROM) (13). Furthermore, its efficacy has been shown to be comparable to that of laser therapy in the treatment of upper trapezius MTrPs.

Given the growing evidence supporting manual therapy techniques in the management of CMNP, a multimodal approach integrating therapeutic exercise (TE) with INIT could yield enhanced clinical outcomes. While the combination of TE with other manual therapy modalities, such as mobilization and connective tissue massage, has been explored, the synergistic effects of INIT and TE remain under-investigated. The present study aims to evaluate the efficacy of INIT combined with TE in improving pain, disability, muscle tenderness, cervical ROM, and quality of life in individuals with CMNP. It is hypothesized that the integration of INIT into a TE regimen will produce superior therapeutic benefits compared to TE alone.

METHODS

This single-blinded randomized controlled trial was conducted at the Physical Therapy Department of JIMS Hospital, Jacobabad, over a period of nine months. The study aimed to evaluate the effects of the integrated neuromuscular inhibition technique (INIT) in combination with conventional physical therapy on patients with non-specific neck pain associated with myofascial trigger points in the upper trapezius muscle. Ethical approval was obtained from the institutional review board, and all participants provided informed consent before enrollment. The sample size was calculated using the Neck Disability Index (NDI) as the primary outcome measure. Based on the statistical estimation, 24 sample size were calculated per group. To account for a potential 20% dropout rate, the final sample size was increased to 29 participants per group, ensuring adequate power for statistical analysis (14). Participants were randomly allocated into two groups: Group A, which received conventional physical therapy, and Group B, which received conventional physical therapy in addition to INIT.

Group A underwent conventional physical therapy consisting of 30-minute sessions, five times per week, for eight weeks. The treatment protocol included low-level heating at the neck for 5–10 minutes, posture corrective exercises, alignment and neck-strengthening exercises, transcutaneous electrical nerve stimulation (TENS), cervical traction, short-term immobilization, acupuncture, chiropractic adjustments, and massage therapy. Group B received the same conventional physical therapy regimen but with an additional 20–30 minutes of INIT per session. INIT, a manual myofascial trigger point deactivation technique, was applied to enhance therapeutic

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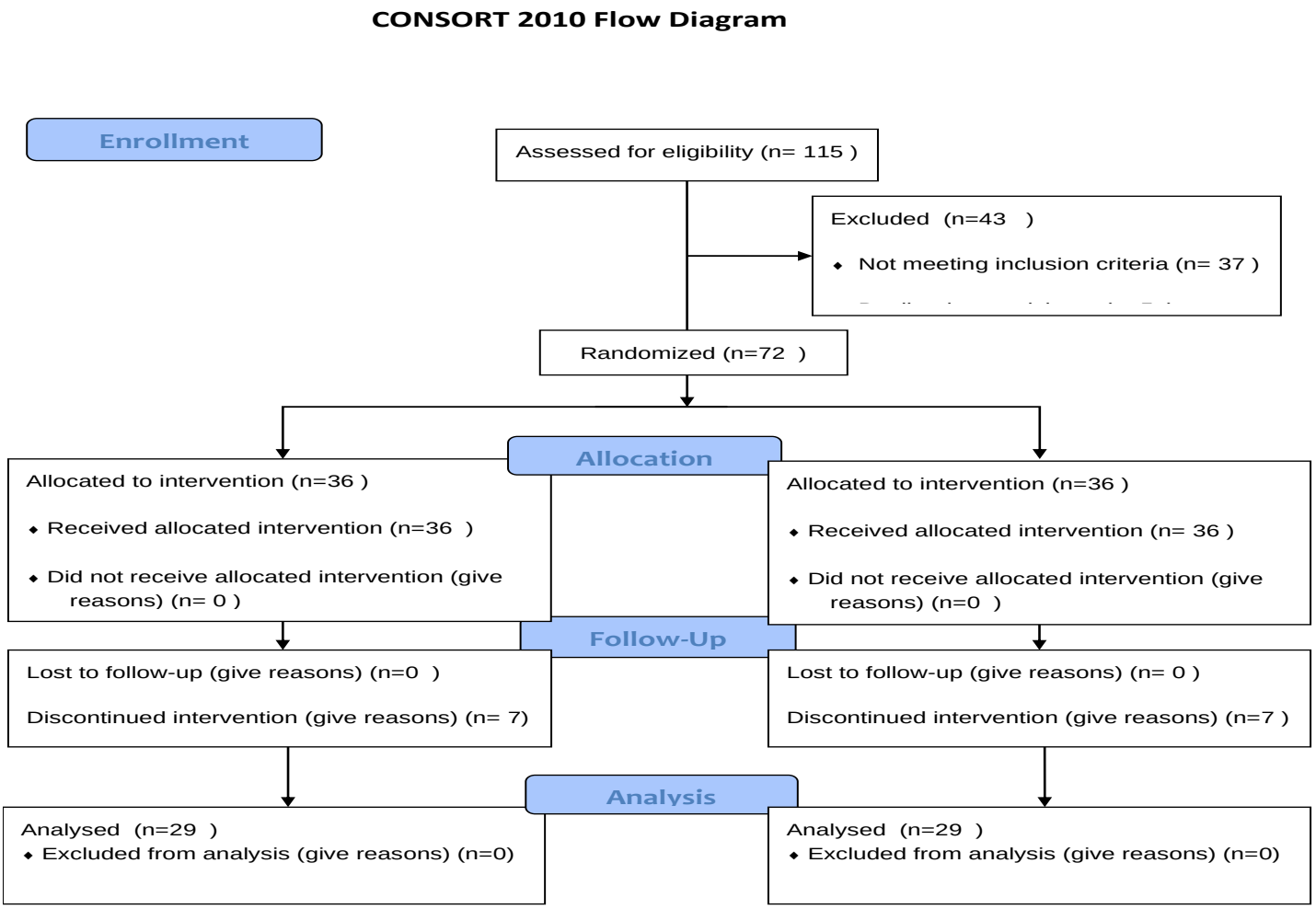
outcomes by integrating ischemic compression, strain-counterstrain, and muscle energy techniques (3,4). Data collection was performed using standardized tools, including a structured proforma and validated questionnaires to assess pain, disability, range of motion, and quality of life. The primary outcome measure was the NDI, while secondary outcome measures included pressure pain threshold (PPT), cervical range of motion (CROM), and visual analog scale (VAS) scores. Statistical analysis was conducted using appropriate parametric and non-parametric tests, with a significance level set at $p<0.05$.



RESULTS

The study included 58 participants diagnosed with non-specific neck pain, with individuals from both genders distributed equally across two groups. The mean age of participants was 37.98 ± 6.83 years. The mean body mass index (BMI) was recorded as 1.82 ± 0.38. Participants were randomly allocated into two groups: Group A, which received conventional physical therapy, and Group B, which received conventional physical therapy combined with the integrated neuromuscular inhibition technique (INIT). Each group comprised 29 participants. Outcomes were assessed using the Numeric Pain Rating Scale (NPRS) and the Neck Disability Index (NDI), with pre- and post-intervention values recorded. Baseline measurements for NPRS showed a mean rank of 26.69 in Group A and 32.31 in Group B. Post-treatment, the mean rank for Group A increased to 44.00, while it significantly decreased to 15.00 in Group B. The mean rank difference between pre- and post-treatment values was -17.31 for both groups. The intra-group analysis demonstrated a statistically significant improvement, with a p-value of <0.05.

For NDI, the mean rank at baseline was 28.64 in Group A and 30.36 in Group B. After treatment, the mean rank in Group A was recorded as 41.62, whereas in Group B, it decreased to 17.38. The mean rank difference for both groups was -12.98. The intra-group comparison showed a statistically significant difference ($p<0.05$), indicating a substantial reduction in disability scores following the interventions. Normality tests using the Kolmogorov-Smirnov and Shapiro-Wilk tests confirmed that the data were not normally distributed. Therefore,

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non-parametric tests were applied. The intra-group analysis was performed using the Wilcoxon signed-rank test, while the inter-group comparison was assessed using the Mann-Whitney U test. The significance level was set at 0.05 for all statistical analyses. The Friedman test indicated a significant reduction in pain intensity over the four-week period in both groups (p=0.000). In Group A, pain intensity decreased from a mean of 7.19 at baseline to 0.80 by the fourth week. In Group B, pain intensity declined from 6.75 at baseline to 0.91 at the end of the intervention period. Similarly, disability scores showed progressive improvement, with a greater reduction observed in Group B compared to Group A.

Table 1: Demographics Table

Variable	Group A	Group B	Total
Total Participants	29	29	58
Group A Participants	29	-	29
Group B Participants	-	29	29
Mean Age (Years)	37.98 ± 6.83	37.98 ± 6.83	37.98 ± 6.83
BMI (Mean ± SD)	1.82 ± 0.38	1.82 ± 0.38	1.82 ± 0.38

Table 2: Friedman's Test and Statistics

Group		Mean Rank	Mean	Standard Deviation	DF	P Value
Group A	Pain Intensity at Baseline	4.97	7.1944	0.66845	4	0.000
	Pain Intensity at 1st week	4.03	6.1667	0.50709		
	Pain Intensity at 2nd week	3.00	5.0833	0.55420		
	Pain intensity at 3rd week	2.00	2.9444	0.58282		
	Pain Intensity at 4th week	1.00	0.8056	0.40139		
Group B	Pain Intensity at Baseline	4.99	6.7500	0.73193	4	0.000
	Pain Intensity at 1st week	4.01	5.7778	0.72155		
	Pain Intensity at 2nd week	3.00	4.4722	0.55990		
	Pain Intensity at 3rd week	2.00	2.4722	0.50631		
	Pain Intensity at 4th week	1.00	0.9167	0.28031		

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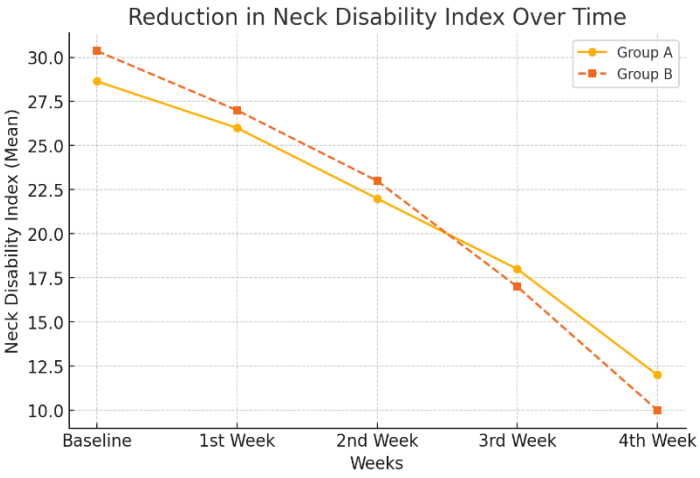

Figure 2 Reduction in Neck Disability index Over Time

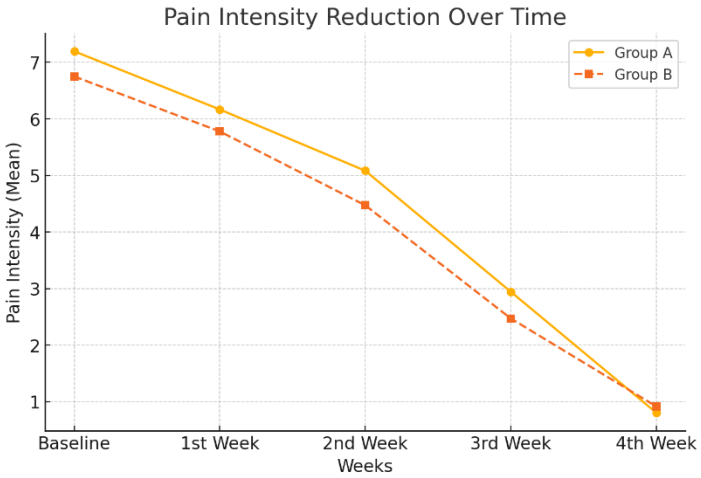

Figure 1 Pain Intensity Reduction Over Time

DISCUSSION

The findings of this study demonstrated a significant improvement in both Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) scores following treatment, with greater improvements observed in the group receiving integrated neuromuscular inhibition technique (INIT) alongside conventional physical therapy. The significant difference in post-treatment values between the two groups suggests that INIT may offer additional benefits in reducing pain and improving neck function compared to conventional therapy alone. These findings align with previous research indicating that INIT effectively alleviates myofascial trigger points and enhances functional recovery in patients with non-specific neck pain (13,15). The results corroborate existing evidence supporting the efficacy of INIT in reducing pain intensity, improving cervical range of motion, and enhancing overall functional capacity. Prior studies have reported similar outcomes, emphasizing the role of INIT in reducing muscular tension, increasing pressure pain threshold, and improving neuromuscular function in individuals with myofascial pain syndrome (12). The present study reinforces these findings by demonstrating that INIT, when combined with conventional therapy, produces superior pain relief and functional recovery compared to conventional therapy alone (16).

The mechanisms underlying the observed improvements can be attributed to the multimodal approach of INIT, which integrates ischemic compression, strain-counterstrain, and muscle energy techniques. These techniques collectively facilitate muscle relaxation, improve local circulation, and reduce trigger point hypersensitivity, thereby contributing to pain reduction and enhanced mobility. This aligns with research highlighting the role of neuromuscular inhibition techniques in modulating nociceptive input and promoting muscle relaxation, leading to significant improvements in pain and disability scores (14). Additionally, studies examining similar manual therapy techniques have reported comparable outcomes, further supporting the effectiveness of INIT in managing chronic myofascial pain (15,17). The greater improvement observed in the group receiving INIT may be attributed to its direct effect on myofascial trigger points, which conventional therapies alone may not adequately address. Previous randomized controlled trials have demonstrated that combining manual therapy techniques with exercise therapy leads to better outcomes than exercise therapy alone, particularly in patients with persistent musculoskeletal pain (16). This study adds to the growing body of evidence suggesting that a comprehensive approach incorporating both passive and active therapeutic interventions is more effective in addressing the multifaceted nature of myofascial pain syndromes (18).

Despite the promising results, certain limitations must be acknowledged. The study duration was relatively short, and long-term follow-up assessments were not conducted, limiting the ability to determine the sustained effects of INIT over time. Additionally, the sample size, although statistically sufficient, may not fully capture the variability in treatment response among different populations. Future studies should consider larger sample sizes and extended follow-up periods to evaluate the long-term efficacy and potential recurrence rates following INIT intervention (19). Another limitation of this study is the reliance on subjective outcome measures, such as NPRS and NDI, which may introduce variability due to individual perception of pain and disability. Although these tools are widely validated,

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incorporating objective measures, such as electromyographic analysis or biomechanical assessments, could provide a more comprehensive understanding of the physiological changes associated with INIT. Furthermore, while the study demonstrated significant intra-group and inter-group differences, the underlying mechanisms contributing to these improvements were not directly assessed. Future research should explore the neurophysiological effects of INIT to better understand its impact on pain modulation and muscle function (20).

The clinical implications of these findings suggest that INIT may be a valuable addition to conventional physical therapy for managing non-specific neck pain associated with myofascial trigger points. The observed improvements in pain reduction and functional capacity indicate that integrating INIT into standard rehabilitation protocols could enhance patient outcomes and facilitate faster recovery. Given the increasing prevalence of chronic musculoskeletal pain, exploring cost-effective and non-invasive therapeutic options such as INIT is essential for optimizing rehabilitation strategies (9,12). Overall, the study supports the efficacy of INIT in improving pain and disability outcomes in patients with non-specific neck pain. The findings highlight the importance of a multimodal treatment approach that targets both muscular and neuromuscular dysfunction to achieve optimal clinical outcomes. Further research is warranted to explore the long-term benefits, potential mechanisms, and broader applicability of INIT in diverse patient populations.

CONCLUSION

The findings of this study suggest that the integrated neuromuscular inhibition technique is a more effective intervention for managing non-specific neck pain compared to conventional treatment alone. Participants who received this technique alongside standard physical therapy demonstrated greater improvements in pain reduction, functional mobility, and overall rehabilitation outcomes. These results highlight the clinical relevance of integrating targeted manual therapy approaches into routine musculoskeletal care. By addressing both muscular dysfunction and neuromuscular imbalances, this technique offers a valuable addition to current rehabilitation protocols, potentially enhancing recovery and improving the quality of life for individuals suffering from chronic neck pain.

AUTHOR CONTRIBUTIONS

Author	Contribution
Nargis Jamali*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
M Behzad Ali	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Syeda Nayab Raza	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Ramsha Ali	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Sana Muneeb	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Adnan Hashim	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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