

Current Perspective on Myofascial Trigger Point Intervention in Headache Management

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Abstract

Headache represents one of the most common neurological issues globally, with Tension-Type Headache (TTH) being the most widespread subtype. The presence of Myofascial Trigger Points (MTrP) in the cervical muscles is viewed as one of the key causes of TTH symptoms. Intervention that are effective in addressing MTrPs are necessary to decrease pain and related disability. This study aimed to compare the levels of effectiveness of Myofascial Release (MFR) and Post-Isometric Relaxation (PIR) in individuals with TTH related to suboccipital trigger points. A comparative experimental design was adopted in which thirty individuals between the ages of 40 - 55 years were divided into two groups of 15 individuals each. Group A was given MFR via the cranio-base release method, and Group B was given PIR, which included the use of suboccipital muscle contractions against resistance and followed by relaxation. Treatment was done daily with eight sessions. The intensity of pain was measured with the Visual Analogue Scale (VAS), and disability was measured with the Headache Disability Inventory (HDI) at the baseline, mid-intervention, and after the intervention. The two intervention showed a high level of improvement in both VAS scores, though Group A showed improvement earlier on Day 2 and Day 4. Significant changes in pre- and post-values were highly significant and supported by paired t-tests ($p = 0.0001$). But HDI scores did not exhibit statistically significant changes within or between the groups in the process of the study. In short, MFR and PIR are efficient in decreasing the severity of a headache in patients with TTH, but no significant improvement in disability was observed in the short term. Both intervention are valuable in clinical practice as they are available and non-pharmacological methods of managing headache.

Key Words: Tension-Type Headache, Myofascial Trigger Points, Myofascial Release, Post-Isometric Relaxation, Headache Disability Inventory

Introduction

Headache disorders are among the most widespread neurological problems all over the world, impacting people of varying ages and drastically affecting the quality of life [1]. Tension-Type Headache (TTH) is always said to be the most frequent among the other subtypes, with lifetime prevalence rates of between 30 % and 78 % in the population-based surveys [2]. The episodes are often defined as bilateral, pressing, or tightening pain of moderate to mild intensity, which is not worsened by normal physical exercise [3]. TTH is not as disabling as migraine, but due to its regular occurrence, TTH leads to loss of productivity, psychological stress, and escalated healthcare expenses [4]. The pathophysiological processes of TTH are not limited to psychosocial stresses, but include peripheral and central processes of sensitisation. It is assumed that Myofascial Trigger Points (MTrPs) in the musculature of the head, neck, and shoulders play a central role [5]. The existence of a tight band is linked to a hyperirritable focus of skeletal tissue, which is called an MTrP that causes pain when compressed and usually presents with a typical pattern of referred pain [6]. Suboccipital referred pain, such as that, can radiate into occipital and temporal regions, and appear to be TTH-like. This relationship demonstrates that MTrPs are clinically significant and need to be identified and treated as the possible causes of the symptoms of headache [7]. Several studies have been conducted to examine the association between MTrPs and headache. Pericranial manual palpation studies always show increased pericranial muscle tenderness in people with TTH than in headache-free controls [8]. MTrPs have been experimentally provoked and again have been demonstrated to reproduce those symptoms of headache, further supporting their contributory role [9]. Referred pain patterns created by suboccipital trigger points are often bilateral, which is also consistent with the clinical manifestation of TTH [10].

Treatment of MTrPs has changed from passive stretching to systematic manual therapy. Post-isometric relaxation, which is also known as Muscle Energy Technique (MET), is the voluntary isometric contraction of the affected muscles against controlled resistance by the therapist [11]. This tightening stimulates Golgi tendon organs, which causes reflex inhibition of the muscle and resultant lengthening [12]. It has been reported before that MET decreases muscle hypertonicity, recovers mobility, and reduces pain in musculoskeletal conditions, such as chronic headache [13]. Myofascial Release (MFR) is another commonly used intervention that is used to bring standard tension to muscular and fascial structures [14]. Both direct and indirect methods are effective in pain reduction, range of motion, and neuromuscular improvement [15]. MFR of suboccipital trigger points has also been linked to fewer and milder episodes of TTH, which is probably

achieved by altering the frequency and intensity of sensory input and inhibiting central sensitisation [16]. Comparative trials show that both MET and MFR are useful in musculoskeletal dysfunctions, but few studies have systematically assessed their comparative usefulness in the management of headache [17].

Despite these developments, there are still gaps in knowledge about the clinical superiority of a particular intervention. Some studies focus on the possible use of MFR to activate trigger points and relieve referred pain, and studies that focus on MET and its advantages to the neuromuscular system [18]. Nonetheless, the variability in the study designs, small samples, and the lack of long-term follow-up limit the conclusive results. So, it is justified to conduct additional analysis to understand whether one method will be more advantageous in minimising the intensity of pain and disability related to TTH [19]. Even though tension-type headache is very common and has a tight connection to myofascial trigger sites, there is no consensus on the approach to intervention [20]. Both Myofascial Release and Post-Isometric Relaxation work on muscular dysfunction, but there is relatively little available comparative data [21]. Lack of strong evidence poses doubts in the clinical decision-making process and could reduce the formulation of standardised guidelines about the application of physical therapy in the treatment of TTH [22]. To manage this gap, it is necessary to maximise the effectiveness of the treatments, decrease the burden of headache, and enhance the quality of patient life.

The objective of the study is to compare the effectiveness of Myofascial Release and Post-Isometric Relaxation among patients with tension-type headache that has suboccipital trigger points. The aim is to identify how every intervention affects the intensity of pain by using the Visual Analogue Scale and functional disability by means of the Headache Disability Inventory. By assessing the variation in these parameters during the treatment period, the study will identify which of the techniques is more beneficial clinically and therefore provide a more accurate guide on the use of TTH in therapeutic practice.

Methodology

Study Design

Two physiotherapeutic intervention were compared in terms of their effectiveness in tension-type headache as part of an experimental study. The design was geared towards systematic randomisation of the participants into two intervention groups so that it would ensure similarity of baseline characteristics. The program of standard conditions was an eight-day-long treatment between the two groups. The method has also facilitated intra-group and inter-group differences to be measured in terms of validated outcome measures. It had been ensured that the rigor of the methods used in the study had been taken care of through strict adherence to ethical guidelines and the informed consent procedures, but the short-term design offered the ability to observe the short-term therapeutic effects of manual therapy intervention.

Sample

The residential areas in Dehradun were conveniently sampled to recruit 30 participants aged 40-55 years. The inclusion criteria were strict to retain all the respondents who had bilateral location of the headache, suboccipital trigger points, and mild to moderate intensity, as well as not aggravated by routine physical activities. People with cervical malignancies, recent fractures, migraine, or above the normal levels of analgesic inhibition were excluded. This was informed consent. The demographic information, such as the age and the baseline level of pain, was taken. The sample size was too small, yet sufficient in the given sense of comparative analysis in the short run in the selected experimental design.

Group Allocation

Each group contained 15 randomly determined participants. Myofascial Release (MFR) therapy using the cranio-base release technique was performed on Group A, and Post-Isometric Relaxation (PIR) on the suboccipital muscles was performed on Group B. It was distributed to keep a balanced distribution of age and division of genders, and to minimise confounding factors. The results were rated using the same schedules as the two groups were rated at the baseline, treatment, and completion. The parallel group design may be applicable in the determination of relative effectiveness and avoiding external influences. This separation allowed attributing the observed differences to particular intervention procedures that were employed.

Outcome Measures

Outcome assessment was done using two fairly tested outcome assessment tools. The Visual Analogue Scale (VAS), which is a 10-point scale between no pain and the worst-imaginable pain, was used to assess the pain, with the respondents rating the intensity of pain. Headache Disability Inventory (HDI) was used to measure functional disability, a questionnaire consisting of 25 questions, which comprised emotional and physical effects of headache. It was scored on a scale where 0 (no disability) to 100 (severe disability) was awarded as the overall score. These included baseline, mid-intervention, as well as post-intervention measurements that offered certain objective and quantifiable information on subjective pain and functional limitations.

Intervention Protocol

The Myofascial Release Group A had their cranio-base release technique. The patient was on his back, and the therapist exercised controlled pressure and traction on the suboccipital area with three sessions a day and eight consecutive days. Group B was subjected to Post-Isometric Relaxation, which included the suboccipital muscles contraction against the resistance of the therapist in 3-5 seconds, followed by relaxation and passive stretch of their muscles, repeated three times in a session in 8 days. The two intervention were also carried out in a standard way. The duration of treatment, repetitions, and the position of the therapist remained constant enough that the results of the two intervention strategies can be compared.

Data Collection

The data was measured at three levels, which include the baseline (Day 0), mid-intervention (Day 4), and post-intervention (Day 8). The Day-to-day pain scores were recorded with the help of the VAS, and the Disability scores were recorded on Days 0, 4, and 8 with the help of HDI. A scoring rubric was made to bring uniformity in recording the data. The participants were followed up on the medication side effects and the protocol adherence. Some of the data collected were demographic data, pre- and post-treatment VAS, and HDI. It was a structured and systematic collection process that enabled to analysis of effects of treatments within-group and between-groups over the eight days of intervention.

Statistical Analysis

Data was analysed using SPSS 11.5. Mean and standard deviation as descriptive statistics were used to investigate demographic and baseline variables. Paired t-tests were used to test differences between groups before and after treatment, and independent t-tests were used to test difference between groups before and after intervention. The repeated measures of the HDI were compared to the one-way ANOVA, and where it was necessary, the pairwise comparison to the post hoc test was done. Statistical significance was established at a level of $p < 0.05$. This strict statistical model provided an accurate explanation of the findings that additionally enabled concluding the personal and comparative efficiency of Myofascial Release and Post-Isometric Relaxation intervention.

Results

Demographic Characteristics

The sample was not biased in any way, where 30 people were selected to take part in the study (15 in Group A (Myofascial Release) and 15 in Group B (Post-Isometric Relaxation)). Group A had a mean age of 46.4 ± 3.66 years, and Group B had a mean age of 47.3 ± 5.49 years. The demographic group is what allowed for to support of the comparability of the groups, where the difference in the results could not be explained by the parameters of the baseline. The inclusion criteria matched the values of age; the population was middle-aged and had more chances to experience the symptoms of tension-type headache. Table 1 shows the mean age and the standard deviation of the participants in the two intervention groups. The data are useful in confirming that the two groups were balanced at the baseline and that the results of treatment were not influenced by the age bias.

Table 1: Mean Age of Participants

Group	Mean Age (Years)	SD	n
A (MFR)	46.4	3.66	15
B (PIR)	47.3	5.49	15

Within-Group Pain Analysis

The paired t-tests showed statistically significant improvement in the intensity of pain in both groups on every day of intervention. Group A In Group A, VAS scores declined gradually between Day 0 and Day 8 ($p = 0.0001$). On the same note, improvements were also significantly evident in Group B ($p = 0.0001$). These results underscore the usefulness of the two intervention in reducing pain perception throughout the eight days of the treatment, and the trends in improvement are also consistent throughout the treatment days. Table 2 shows the within-group comparison of the intensity of pain on the VAS on all intervention days. The two groups showed significant improvements in both groups between baseline and post-intervention, and demonstrated that both methods were successful in lowering headache.

Table 2: Paired Sample t-Test of VAS Within Groups

Day	Group A (t, p)	Group B (t, p)
0	6.778, 0.0001	4.141, 0.001
1	5.289, 0.0001	5.788, 0.0001

2	5.506, 0.0001	10.460, 0.0001
3	5.379, 0.0001	7.889, 0.0001
4	8.146, 0.0001	5.833, 0.0001
5	7.716, 0.0001	6.061, 0.0001
6	9.851, 0.0001	6.131, 0.0001
7	8.018, 0.0001	5.830, 0.0001
8	8.264, 0.0001	8.261, 0.0001

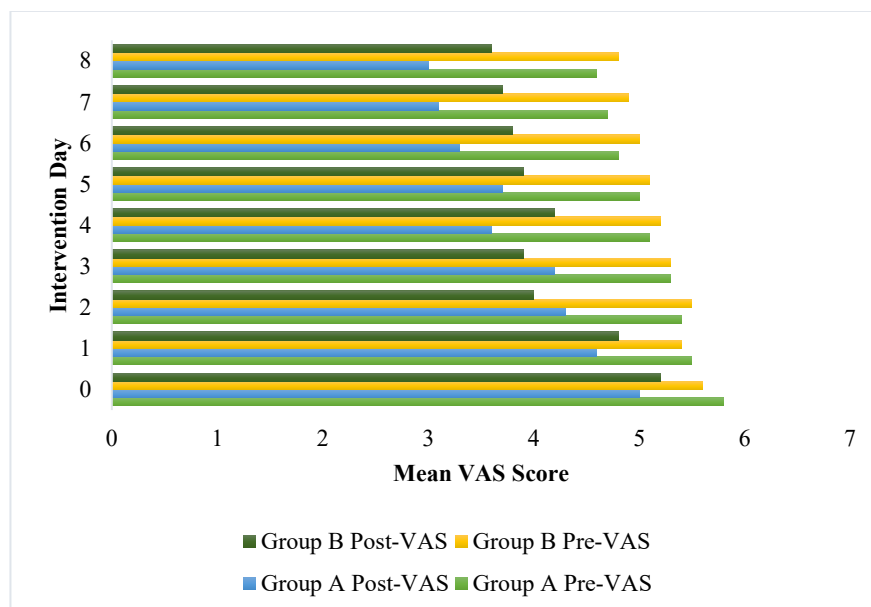


Figure 1: Mean Pre- and Post-Intervention VAS Scores Across Days in Both Groups

Figure 1 shows the outcomes of the two intervention groups' mean pre-treatment and post-treatment VAS ratings over the course of eight days. Both groups displayed the same improvement in pain, where Group A (Myofascial Release) displayed a little more intense pain reduction than Group B (Post-Isometric Relaxation).

Between-Group Pain Comparison

Independent t-tests revealed some differences in intervention on the select days. Significant outcome were found on Day 2 and Day 4 ($p < 0.05$), with Group A recording significant improvements as compared to Group B. On other days, the two groups showed much improvement, but not intergroup differences. In general, the results indicate that Myofascial Release showed a slightly faster and higher impact in the reduction of the level of pain detection than Post-Isometric Relaxation. Table 3 shows the between-group comparison of the VAS scores using daily sessions. There was a statistically significant difference at Day 2 and Day 4, indicating that Myofascial Release generated a slightly earlier effect than Post-Isometric Relaxation.

Table 3: Independent t-Test of VAS Between Groups

Day	Pre (t, p)	Post (t, p)
0	1.695, 0.101	3.077, 0.005
1	1.699, 0.100	2.617, 0.014
2	2.208, 0.036	2.873, 0.008
3	1.033, 0.311	2.318, 0.028
4	2.008, 0.054	4.258, 0.0001
5	0.159, 0.874	2.229, 0.034
6	0.866, 0.394	1.263, 0.217
7	0.913, 0.369	0.812, 0.424
8	0.441, 0.663	0.397, 0.694

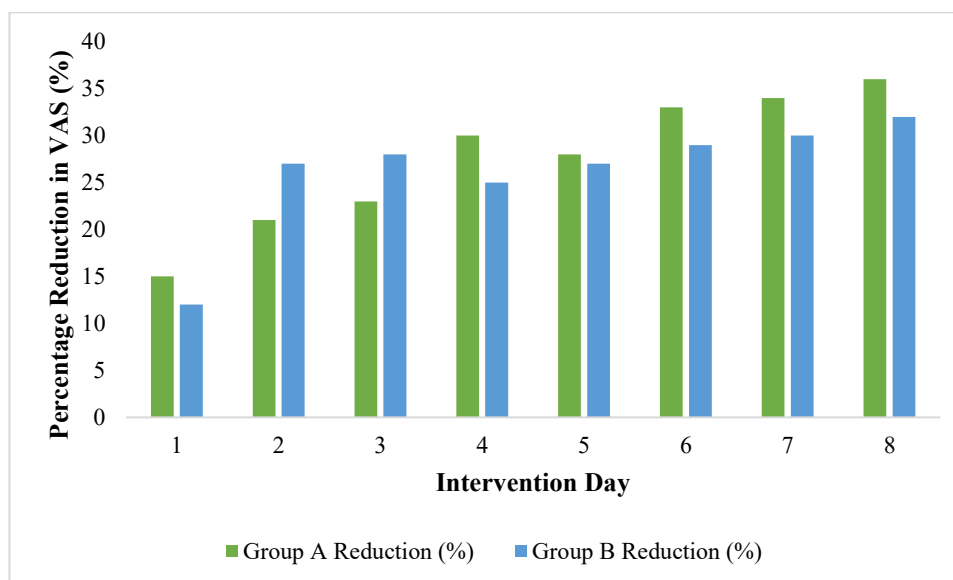


Figure 2: Percentage Reduction in VAS Scores Across Days in Both Groups

Figure 2 shows the result of a percentage change in the VAS pain scores relative to baseline and between the two intervention groups. Group A exhibited a more significant decrease on Days 4, 6, and 8, whereas Group B started better but did not show any further improvement. The outcome of this study suggest that the two intervention were effective, but Myofascial Release yielded a little higher cumulative reduction.

Disability Outcome

The ANOVA and multiple comparisons of HDI scores showed that there were no statistically significant changes in groups ($p > 0.05$). Group A did not display significant differences between Day 0, Day 4, and Day 8, whereas Group B demonstrated the same changes with non-significant differences. Comparison between groups ensured that there were no statistical differences in any of the stages. These findings imply that the reduction in pain intensity was significant, but the index of functional disability was not significantly reduced over a short period of intervention. Table 4 shows the ANOVA and multiple comparison findings of HDI scores amongst groups and within groups. No statistically significant differences were noted, meaning that the outcome of disability did not change significantly in the short term of intervention.

Table 4: HDI Analysis Within and Between Groups

Group	ANOVA F, p	Multiple Comparison p-values (0 vs 4 vs 8 days)
A	0.591, 0.558	>0.05 (all comparisons)
B	0.703, 0.501	>0.05 (all comparisons)
A vs B	Independent t-test (0, 4, 8 days) = $p > 0.05$	

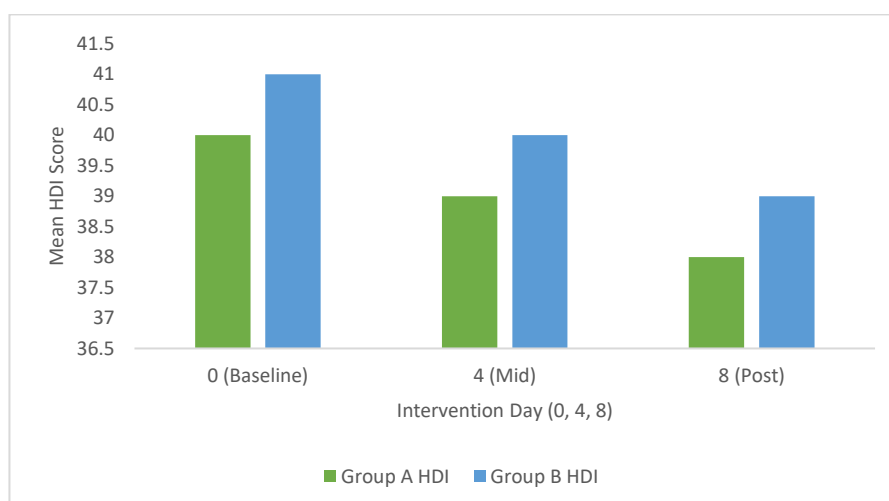


Figure 3: Mean HDI Scores Across Intervention Days in Both Groups

Figure 3 shows the average scores of the HDI of Group A and Group B at the baseline, mid-intervention, and post-intervention. Both sample groups showed a slight decrease in the disability scores over time. Nevertheless, no significant differences between the two groups in general were established.

Overall Pre–Post Comparison

Two-sample t-tests of the baseline and post-intervention scores confirmed the significant differences between the improvement in the two groups. In the case of VAS, $t = 15.025$ ($p = 0.0001$) and $t = 20.455$ ($p = 0.0001$) in Group A and Group B, respectively. Nonetheless, HDI scores failed to provide any significant intergroup differences, with a p-value of more than 0.05 among comparisons. Taken together, the findings indicate that the Myofascial Release and Post-Isometric Relaxation were equally effective in the reduction of pain, but no changes in the disability were significantly recorded in the course of the short study. Table 5 shows the pre-intervention and post-intervention comparison, in general, regarding the outcome of pain and disability. The VAS showed significant decreases in the two groups, and HDI showed no statistically significant changes across and within groups.

Table 5: Summary of Pre–Post Intervention

Outcome	Group A (t, p)	Group B (t, p)	Between Groups
VAS (0–8 days)	15.025, 0.0001	20.455, 0.0001	Significant only on Days 2 & 4
HDI (0–8 days)	NS ($p > 0.05$)	NS ($p > 0.05$)	NS ($p > 0.05$)

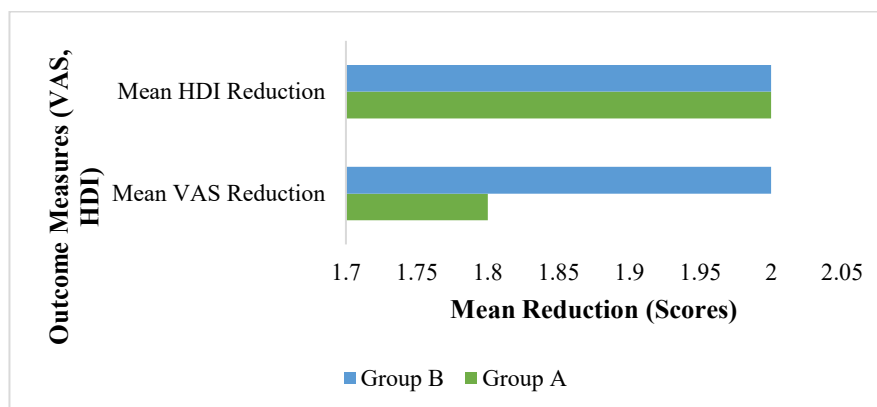


Figure 4: Overall Mean Reduction in VAS and HDI Scores Between Groups

Figure 4 shows the total change in VAS and HDI scores at the baseline and post-intervention in both groups. The intervention had similar outcomes in terms of HDI reduction, and Group B had a marginally better overall increase in VAS than Group A.

Discussion

The results of this study reveal that MFR and Post-Isometric Relaxation (PIR) resulted in a significant pain reduction in subjects with TTH created by a suboccipital trigger point. In-group analysis showed significant improvement of VAS scores that were highly significant over the period of intervention. Table 5 revealed a decrease in Group A with $t = 15.025$ ($p = 0.0001$) and Group B with $t = 20.455$ ($p = 0.0001$) from the baseline to Day 8. These change cuts are graphically supported in Figures 1 and 2, in which a steady decrease in the mean VAS can be seen through the regular intervals of daily measurement. The between-group comparisons showed that both intervention were equally effective, though MFR caused slightly earlier improvements. Statistically significant differences were observed on Day 2 and Day 4 (Table 3), indicating that MFR was able to activate the deactivation of trigger points or as well as the modulation of pain pathways, quicker than PIR. However, towards the end of the sessions, the two groups were similar regarding pain relief, and either of the two techniques can produce clinically meaningful results in a relatively short time. Conversely, the scores in the Headache Disability Inventory (HDI) did not show any significant intra- or intergroup variations (Table 4). In Group A, there was a slight fall from 40 to 38, in Group B, 41 to 39, which did not represent a statistically significant difference and is expressed in Figure 3. This variance between pain control and disability outcomes raises the possibility that even though the two intervention have the same effect in reducing immediate symptoms, the duration of treatment or multimodal approaches might be needed to affect functional disability. In general, the study demonstrates that both MFR and PIR are effective in TTH management in the short term.

The results highlight the clinical importance of MFR and PIR as a non-drug treatment of headache. These statistically significant pain reductions point to their potential as available manual therapy intervention, especially when patients desire alternatives to drugs. Weakening of the HDI scores means that a more extended period of treatment or a combined treatment can be required to obtain significant functional changes. Clinicians can thus contemplate using this intervention as supplementary to multimodal management strategies, with patient adherence and follow-up being the priority to guarantee long-term gain. Past studies have continually associated myofascial trigger point treatment with a decrease in headache severity. Although the modalities of these studies have been varied, such as the use of manual therapy, stretching exercises, and other muscle relaxation methods, the same pattern of pain scores has been reported to improve [23]. The results of the current study are consistent with this evidence, especially in showing meaningful within-group decreases in VAS. Nevertheless, the small effect on disability measurement amounts to findings that the short-term intervention tends to decrease pain but does not necessarily result directly in functional change [24]. A comparison of the advantages of MFR versus PIR in the earlier generation of pain reduction is in line with reports that direct fascial methods can alter the sensory input faster than the muscle energy techniques [25].

Future studies should focus on adding more participants, periods of intervention, and, to some extent, follow-up assessments to interpret the long-term results. Functional outcomes can be enhanced by conducting more studies on the implications of adopting MFR and PIR as an alternative therapy to other methods, such as relaxation training, postural correction, or exercise. Physiological processes can also be provided by the conduction of objective tests like electromyography or ultrasound examination. This may be enhanced by further extending its generalizability by being applied to other age groups and subtypes of headache. The principles may be utilised in the development of the general principles and provide evidence of the implementation of manual therapies to treat headache.

Conclusion

The study demonstrates the efficacy of two manual therapeutic methods, MFR and PIR, in the treatment of TTH, which has been ascribed to suboccipital trigger points. The outcome analysis showed that the pain intensity decreased significantly in both groups, and this was based on the gradual decrease in VAS scores. It has already been shown that Group A performed better on Day 2 and Day 4, which, consequently, means that MFR might be used to relieve pain faster than PIR. Nevertheless, the variations in VAS scores across the groups were not significant in the long term, which indicates that both of the methods prove equally efficient in eliminating the degree of intensity of the headache when applied as part of a short-term intervention. In both intra- and intergroup, no statistically significant variations were observed between the scores of the HDI. The fact that pain intensity responded to intervention fairly effectively is a good outcome, whereas disability index did not result in major changes in the limited time of treatment. These findings drive the need for intervention in the long term or integration of intervention and complements to influence functional outcomes. The clinical implications apply to the physiotherapy activity where MFR and PIR could be utilised as non-invasive therapy for patients with TTH to attain symptomatic relief. MFR may also be preferred when faster turns are required, and PIR is also a possible solution with similar long-term outcomes. Overall, the study suggests the possibilities of manual trigger point intervention in the treatment of headache and the need to conduct additional studies in the future with a longer duration of treatment, larger sample size, and multidimensional outcomes to establish a complete guideline of clinical intervention.

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