

Effects of the application of a dry needling protocol on tension-type headache associated with myofascial trigger points

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Abstract

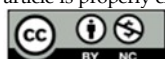
Background: Tension-Type Headache (TTH) is one of the most common and recurrent types of headache, which can be episodic or chronic. It has a significant impact on quality of life, thereby causing deleterious effects on both the work environment and the home environment. **Objective:** To verify the effects of applying a Dry Needling protocol on tension-type headache associated with myofascial trigger points in university students. **Method:** This is a pre-experimental intervention study, conducted in a single pre- and post-treatment group composed of seven participants. A questionnaire was used to characterize the sample, the Headache Impact Test to assess the impact of headaches on the participants' lives, the Visual Analog Scale, and the digital algometer to measure the pressure pain threshold. The data collection instruments were applied pre- and post-intervention. The treatment program was conducted in ten sessions lasting thirty minutes each, using the Dry Needling technique on pre-determined trigger points, with two sessions per week. The results were presented in relative and absolute frequency distribution, as well as mean and standard deviation or median and interquartile range. **Results:** There was an increase in the pressure pain threshold at the analyzed trigger points, indicating a significant improvement in the impact of pain caused by headaches in the sample volunteers, assessed by the Visual Analog Scale ($p=0.003$), by the Headache Impact Test questionnaire ($p=0.0002$), leading to a significant decrease in the weekly frequency of headache days. **Conclusion:** The application of the Dry Needling protocol on myofascial trigger points related to referred head pain showed positive results in the study volunteers, proving effective in the short term for the treatment of tension-type headache.

Keywords: Tension headache; dry needling; musculoskeletal pain.

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Received: 20 Dez, 2024
Accepted: 15 Set, 2026
Published: 16 Set, 2026

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BACKGROUND

The International Headache Society (IHS) classifies headaches into two categories: primary and secondary. The primary headaches occur without a defined etiology through clinical examinations. The main primary headaches include migraine, also known as migraine, tension-type headache (TTH), and cluster headache. On the other hand, secondary headaches arise as a consequence of other diseases, whether they are clinical or neurological¹.

Headache is a pathology that has been used as a subject of study for a long time, due to its incidence of 52% in the global population. According to "The Journal of Headache and Pain," the type of headache with the highest incidence is Tension-Type Headache (TTH) with 26%, even surpassing migraine with 14% incidence². Headaches present various factors with characteristics stemming from musculoskeletal dysfunctions, psychological issues, and also refractory conditions from other pathologies. Also within these factors, oscillating identifications such as intensity, refractory pain, and even vertigo in certain cases are exposed, thus making it a disease of a systematic debilitating nature. The origin of the dysfunction causing TMD remains poorly understood; however, it is noted that various impairments in peripheral systems end up exacerbating the pathology. Thus, the most commonly found findings are muscle tension, which leads to dysfunctions at the myofascial band level, where hyperreactive points called trigger points (TP) are found, presenting a very low pain threshold to pressure (PTP)³.

Physiotherapeutic treatment using manual therapy techniques has already proven effective in reducing the pain of patients with TTS, but a new approach that has been gaining popularity is dry needling, where a filiform needle is inserted into the skin and penetrates deep into the myofascial connective tissue with the aim of inhibiting the hyperactive neuromusculoskeletal pain point. The physiological effects of Dry Needling application on the myofascial band include increased blood flow to the area, thereby improving tissue stiffness caused by the accumulation of calcium molecules in the PG, improving the range of motion (ROM) of the musculoskeletal tissues, and reducing the painful hyperreactivity of the tissue affected by the tensioning, regardless of the triggering factor^{4,5}.

Given the above, the present study aimed to evaluate the effect of a Dry Needling protocol in individuals with tension-type headaches associated with myofascial trigger points.

METHODS

This study was characterized as a pre-experimental study, without blinding, with a quantitative approach and a pre- and post-intervention design, involving 7 participants from August to November 2024.

The research was approved by the Research Ethics Committee of the Catholic University of Pelotas (CEP/UCPel), with CAAE No. 80624124.4.0000.5339 opinion No. 6.957.349. All research participants signed the Informed Consent Form.

The data collection targeted health science students from a university in the city of Pelotas, RS. Individuals of both sexes, aged between 18 and 30 years, who met the criteria for tension-type headache (TTH) according to the International Headache Society (IHS) classification, presented a headache intensity equal to or greater than 4 according to the visual analog scale (VAS), and had a pressure pain threshold (PPT) lower than 2 kg/f in 4 tender points with referred pain to the head were included. Individuals with secondary tension-type headache (TTH) due to other comorbidities, those diagnosed

with extruded disc herniation and/or cervical myelopathy, and those with needle phobia, which would prevent the application of the needling protocol, were excluded.

The individuals who showed interest and met the criteria of the International Headache Society (IHS) were invited to participate in a pre-selection, where the sample profile and headache characterization questionnaire was administered, containing questions about demographic data such as age, sex, and information about headache characteristics; frequency, perception of tension in the pericranial and neck muscles. The digital algometer DD-2000 Instrutherm® was used to measure the pressure pain threshold (PPT) in the myofascial trigger points (TPs). Two PGs present in the upper trapezius muscles on the right side (PG1, PG2), upper trapezius muscles on the left side (PG3, PG4), suboccipital muscles on the left side (PG5, PG6), suboccipital muscles on the right side (PG7, PG8); left temporal (PG9, PG10), right temporal (PG11, PG12); sternal part of the left sternocleidomastoid (PG13), clavicular part of the left sternocleidomastoid (PG14), sternal part of the right sternocleidomastoid (PG15), clavicular part of the right sternocleidomastoid (PG16) were evaluated. Also, for the assessment of pain intensity, the VAS was used, which ranges from 0 to 10, with higher values indicating greater pain intensity. The Headache Impact Test (HIT-6) was used to measure the severity of the headache and its impact on quality of life. The recommended response weights for the items are: never = 6, rarely = 8, sometimes = 10, very frequently = 11, and always = 13. The HIT-6 score was calculated as the sum of the response weights of the six items, ranging from 36 to 78, with a higher score indicating greater disability due to headache. Each of the six HIT-6 questions received a score between 6 and 13. The four categories of headache impact severity are: little or no impact (49 or less), some impact (50-55), substantial impact (56-59), and severe impact (60-78).

After completing the selection of participants with the filling out of questionnaires and the LDP assessment, the participants received ten sessions over five weeks, with two sessions per week and a total of thirty minutes each, divided into fifteen minutes for the application of the protocol in the prone position and another fifteen minutes for the application in the supine position.

The treatment protocol was carried out as follows: The application of Dry Needling was performed based on the MTrPs located in areas that, according to the literature, cause referred pain to the head, specifically the upper trapezius, suboccipital, temporal muscle, and sternocleidomastoid. After identifying the trigger points, before starting, the practitioner would sanitize their hands and the area to be treated, using protective barriers (mandrel and gloves).

Next, disposable and sterile needles were used. Being then inserted directly into the skin and muscle until reaching the trigger point. The needle should remain in place for 15 minutes or until a local contraction response, known as a "twitch response," is obtained. This response indicates that the trigger point has been reached and released. After the necessary time, the needles were removed and discarded as contaminated material, and then the application site was sanitized again.

Subsequent to the conclusion of data collection, the results were presented in relative and absolute frequency distributions, as well as mean and standard deviations or median and interquartile range. To verify the normality of the sample, the Shapiro-

Wilk test was used. The outcome variables with parametric distribution were analyzed using the paired T-test, while the variables with non-parametric behavior were analyzed using the paired Wilcoxon test. Statistical significance was set at $p < 0.05$ throughout the analysis. The statistical analyses were conducted using Stata Statistical Software (version 14.0) for Windows.

RESULTS

In total, ten volunteers met the conditions for participation in the study; however, due to the lack of continuity in the intervention by three of them, the final sample consisted of seven participants, of whom six (85.2%) were female and one (14.2%) was male. The age range of the participants varied between 20 and 25 years, with the highest frequency being 23 years (42.6%).

Table 1. Presents the demographic characteristics and characterization of Tension-Type Headache of the study participants (n=7).

Variables	N(%)
Age	
25	1 (14,2)
23	3 (42,6)
22	1 (14,2)
20	2 (28,4)
Perception of muscle tension	
Tension of the Pericranial Musculature - Pre-intervention with Dry Needling	
Level	1 (14,2)
Moderate	3 (42,6)
Severe	2 (28,4)
None	1 (14,2)
Tension of the Pericranial Musculature - Post-Intervention with Dry Needling	
Level	3 (42,6)
Moderate	4 (56,8)
Severe	0 (0)
None	0 (0)
Neck Muscle Tension - Pre-Intervention with Dry Needling	
Level	0 (0)
Moderate	4 (56,8)
Severe	2 (28,4)
None	1 (14,2)

Neck Muscle Tension - Post-Intervention with Dry Needling

Level	2 (28,4)
Moderate	5 (56,8)
Severe	0 (0)
None	0 (0)

Weekly frequency of days with headaches before and after the Dry Needling intervention.

	Pre-intervention	Post-intervention	p-value
Days of pain per week	3 (2-4)*	1 (0-3)*	0,03#

Note: * minimum and maximum value; # = Wilcoxon test.

Table 2. Comparison between pre- and post-intervention moments with Dry Needling on trigger points (TPs) presented in means, and respective standard deviations.

Muscle	Trigger point	Pre	Post	P
Upper trapezius D	PG1	1,07±0,28	1,62±0,19	0,04
Upper trapezius D	PG2	1,27±0,25	1,7±0,79	0,21
Upper trapezius E	PG3	1,06±0,25	1,54±0,37	0,02
Upper trapezius E	PG4	1,12±0,25	1,96±0,78	0,02
Suboccipital E	PG5	0,94±0,45	1,42±0,63	0,01
Suboccipital E	PG6	0,95±0,4	1,5±0,59	0,07
Suboccipitalis D	PG7	1,04±0,46	1,6±0,62	0,1
Suboccipitalis D	PG8	1,06±0,61	1,51±0,7	0,17
Temporal E	PG9	0,79±0,31	1,24±0,49	0,07
Temporal E	PG10	0,68±0,3	1,36±0,67	0,03
Temporal D	PG11	0,71±0,48	1,29±0,44	0,04
Temporal D	PG12	0,82±0,41	1,33±0,5	0,04
Sternocleidomastoid sternal E	PG13	0,41±0,14	0,75±0,32	0,01
Esternocleido clavicular E	PG14	0,55±0,15	0,94±0,44	0,03
Sternocleidomastoid sternal D	PG15	0,49±0,14	0,71±0,17	0,02
Sternocleidomastoid sternal D	PG16	0,55±0,22	0,88±0,41	0,09

Table 3. Comparison of the degree of headache intensity according to the VAS pre- and post-intervention, presented in means and respective standard deviations.

	Pre-intervention	Post-intervention	p-value
EVA	7±1,63	2,29±1,89	0,003

Note: Visual analog scale (EVA)

Table 4. Comparison of the degree of impact of headache on the participants' lives with the Headache Impact Test (HIT-6) pre- and post-intervention, presented in means and respective standard deviations.

	Pre-intervention	Post-intervention	p-value
HIT-6	61,14±5,46	47,29±5,88	0,0002

Note: HIT-6 - Quality of Life Questionnaire for Chronic Headache.

DISCUSSION

In our study, there was a higher prevalence of women in the total number of participants (n=7), with six (85.2%) being female and one (14.2%) being male. Flores et al. report that chronic and episodic tension-type headaches are predominant in females, also highlighting that episodic tension-type headaches are more prevalent in individuals with higher educational levels, being more common in women as well⁶.

Individuals with CTT frequently exhibit changes in the myofascial musculature, caused by muscle tensions, which leads to the development of PGs in the neck and head regions⁷. Tension-type headache is the most prevalent type of headache and is commonly associated with myofascial pain syndrome and the presence of active myofascial trigger points⁸. A population study conducted by Aaseth et al. with a sample of thirty thousand individuals showed that pericranial muscle sensitivity is highly linked to the intensity and frequency of tension-type headaches, corroborating the results of the present study which demonstrated a reduction in the pathophysiological mechanisms of pericranial muscle tension associated with this pain condition⁹. In the present study, there was a reduction in the perception of tension in the pericranial muscles at severe tension levels, which were present in 28.4% of the participants in the pre-intervention phase, were completely eliminated in the post-intervention phase. Moderate tension increased from 42.6% to 56.8% of the participants, while mild tension rose from 14.2% to 42.6% of the participants.

In a longitudinal study conducted by Lebedeva et al., with a sample of ten thousand and forty-two students with a female prevalence and an average age of 20.6 years, a significant association was thus evidenced in the psychosocial reports of tension-type headache in students^{10,11}. These reports of tension headaches in students mainly occur in those who face the pressure of demands, thus triggering psychosocial factors related to tension headaches, such as: anxiety, irritability, inadequate sleep, tendency to conflicts, personal issues, excessive work, poor financial situation, among others. In this way, an environment conducive to the emergence of tension headaches can be created, which directly affects the quality of life of these individuals¹². García-Pérez-de-Sevilla et al. conducted a descriptive observational study with twenty-two participants, which investigated hypervigilance in the neck musculature and reported that this characteristic, which is linked to the perception of tension, has a very relevant psychosocial aspect associated with it¹³. very relevant psychosocial characteristic associated¹³. Thus, these findings align with the results obtained in the present study regarding the perception of tension in the neck muscles reported by the participants, where severe tension, present in 28.4% in the pre-intervention phase, was eliminated, but moderate tension was identified in 56.8% of the participants at both times, as there

may be interference from other factors beyond CTT that contribute to this result, such as environmental and psychosocial factors that also modify the perception of muscle tension in these participants.

Although Dry Needling is widely used in clinical practice, the scientific evidence of its efficacy still faces challenges, mainly due to the difficulty in objectively measuring pain⁽¹⁴⁾. With the aim of evaluating more precisely, this study used the digital algometer as an analysis tool. This approach allows for a more objective quantification of the results obtained with the treatment.

Monti-Ballano et al. conducted a single-blind randomized controlled clinical trial, with thirty-two individuals randomly assigned to a control group and an intervention group with Dry Needling. The presence of active trigger points in 15 head and neck muscles, headache intensity, and perceived clinical change were evaluated. A single dry needling technique was administered to each active trigger point in three sessions. Significant differences were observed in the post-treatment measures favoring the dry needling group, including reductions in headache pain intensity scores ($p = 0.034$) and the total number of active trigger points ($p = 0.039$). The VAS reduced from 19.19 ± 19.05 to 10.50 ± 16.79 post-treatment, the VAS value in the intervention group was significantly lower than in the control group ($p < 0.034$). And regarding the values of algometry pre and post-treatment in the intervention group, it went from 17.56 ± 8.15 to 13.25 ± 9.47 post-treatment, and the value of the total number of PGs in the intervention group was significantly lower than the pre-treatment measure ($p = 0.039$). There were no significant differences between the pre- and post-treatment measures in the control group for the VAS or the total number of PGs¹⁵.

These findings are in line with the data obtained in this study, where a statistically significant difference between pre- and post-intervention in LDP was evidenced. Among the analyzed trigger points, PG1 (right upper trapezius), PG3 (left upper trapezius), PG4 (left upper trapezius), PG5 (left suboccipital), PG10 (left temporal), PG11 (right temporal), PG12 (right temporal), PG13 (left sternocleidomastoid sternal portion), PG14 (left sternocleidomastoid clavicular portion), and PG15 (right sternocleidomastoid sternal portion) showed statistically significant increases in LDP ($p < 0.05$). As well as the VAS averages decreased from 7 ± 1.63 pre-intervention to 2.29 ± 1.89 post-intervention ($p = 0.003$), indicating a substantial reduction in the intensity of pain perceived by the participants¹⁶.

The HIT-6 questionnaire is considered an efficient, reliable, and valid tool for screening and monitoring outcomes in patients with headaches¹⁷. The reduction in the impact of pain on daily life is one of the main objectives in the treatment of CTT, as this condition significantly interferes with daily activities, professional performance, and social interactions. Castien et al. conducted a study to determine the minimum clinically important change in HIT-6 scores in patients with chronic tension-type headache. The data were obtained from a pragmatic multicenter randomized controlled trial (RCT) and a parallel prospective cohort study involving a total of 186 participants with chronic tension-type headache who received manual therapy or usual care from their general practitioner over an 8-week treatment period. The average HIT-6 score of the participants at baseline was 62 points on a scale ranging from 36 to 78 points, as a result,

the study reveals that the ideal cutoff for the HIT-6 was -8 points, on a total scale of 42 points. The study concludes that a clinically relevant improvement in patients with TTH is reflected by a decrease of at least 8 points in the HIT-6¹⁸.

Therefore, the study conducted by Castien et al. reinforces our findings, where the application of the protocol also promoted a significant reduction in the impact of headache on the participants' quality of life, as assessed by the Headache Impact Test (HIT-6), with a decrease in the average score from 61.14 ± 5.46 to 47.29 ± 5.88 post-intervention ($p=0.0002$). This positive impact on the HIT-6 reflects the clinical relevance of Dry Needling as a resource that goes beyond pain reduction, by addressing the disability and functional limitation often associated with TTH¹⁹.

Gildir et al. coordinated an experimental, randomized, double-blind clinical trial where the Dry Needling technique was applied to a sample of 168 patients with the aim of exploring the efficacy of dry needling on trigger points in patients with chronic tension-type headache. The study aimed to analyze the reduction in the frequency, intensity, and duration of headaches. In one of the groups, dry needling was performed, and in the other, dry needling was simulated, administered in 3 sessions per week for 2 weeks. In the dry needling group, the intensity, frequency, and duration of headache pain and the scores of the Short Form-36 subscales were significantly improved after treatment ($P < 0.05$). The report of weekly pain caused by tension-type headache at the beginning of treatment with the Dry Needling control group was 4.6 days, and at the end of the 6 sessions, the report of pain incidence in the week was 1.6 days²⁰.

The study by Gildir and collaborators mentioned earlier strengthens the results of the present study, which indicated a significant decrease in the weekly frequency of headache days reported by participants, from 3 days per week (interquartile range 2-4) pre-intervention to 1 day per week (interquartile range 0-3) post-intervention ($p = 0.03$). The results suggest that Dry Needling treatment at trigger points in patients with tension-type headaches is effective in reducing the frequency of headaches.

CONCLUSION

The results obtained in the study showed a significant reduction in pain levels, the frequency and impact of tension-type headache on the participants' quality of life, as well as an increase in the pressure pain threshold in myofascial trigger points. Although the study presented statistically relevant results, some limitations should be considered, such as the limited sample size; however, the improvement in the headache condition was significant, indicating that dry needling positively supports the improvement of the pain condition. Future studies with a larger number of participants and experimental designs, such as clinical trials, could strengthen the evidence on the efficacy of Dry Needling in TTH. Furthermore, investigating the long-term effects of this technique to better understand its impacts.

Author Contributions: G.F.D and P.P.V: Participated in the development and planning of the study, conducted the data collection, analysis, and interpretation, contributed to the writing of the article, and approved the final version for publication; D.Z, F.M.S, and C.C.B: Were involved in the structuring of the study, as well as in the data collection, analysis, and interpretation, also contributing to the writing and approval of the final version of the article; C.R: Contributed to the definition and planning of the study, performed the data interpretation, conducted a critical review of the content, participated in the writing, and approved the final version of the manuscript.

Financial Support: This study was conducted with the authors' own resources and received no external funding.

Conflict of interest: The authors declare that they have no conflict of interest.

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