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RESEARCH ARTICLE

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APPLICATION OF A PHYSIOTHERAPEUTIC PROTOCOL FOR NON-SPECIFIC HEADACHE WITH MUSCLE TENSION IN STUDENTS OF A PUBLIC UNIVERSITY

Raissa de Souza Natividade Lopes*¹, Isabelle Farias Gomes¹, Welliton Werveson Pereira de Souza², George Alberto da Silva Dias³, Angélica Homobono Nobre⁴

¹Physiotherapy student at Universidade do Estado do Pará, Brazil; ²Doctorate Degree in Tropical Diseases from Universidade do Estado do Pará, Brazil; ³PhD in Social Sciences from Universidade Federal do Pará, Brazil

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*Corresponding author:

Raissa de Souza Natividade Lopes,

ABSTRACT

Introduction: Tension headaches represents 69% of cases, when chronic it compromises quality of life resulting in decreased concentration and performance, making university students a risk group due to academic activities. In addition to drug treatment, physiotherapy can be used as a conservative treatment. **Objective:** To analyze the effect of a physical therapy for non-specific headache associated with muscle tension in students of a public university. **Material and Methods:** Quasi-experimental research, 24 physiotherapy students with nonspecific headache at least once a week, associated with muscle tension were included. They underwent 10 sessions of physiotherapeutic protocol composed of techniques of manual therapy and thermotherapy, being evaluated by the Visual Analogue Scale of pain and a questionnaire on headache aspects. **Results:** The average age of the students was 21.12 ± 2.54 years, 22 women. After the protocol, 29.16% did not report a headache attack, of those who still had headache, the intensity of pain significantly reduced ($p = 0.0002$) and 72.8% of the students reported considerable improvement in aspects of daily life, however, one month after treatment 47% reported a decrease in the improvement obtained. **Conclusion:** The proposed treatment obtained positive results, however, the improvement was attenuated after one month, suggesting that the treatment should be associated with changes in habits and lifestyle.

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INTRODUÇÃO

Headache is a head pain that affects a large part of the world population. It is estimated that about 84% of women and 70% of men have or have had headache, which represents a serious public health problem. According to one study, headache associated with muscle tension or tension-type headache (TTH) represents 69% of headaches. It usually begins in adolescence, reaching a peak around the third decade of life (Oliveira *et al.*, 2016; Cruz *et al.*, 2017). The *International Headache Society* (2018) classifies tension headache as Non Frequent Episodic, which occurs in the entire population and generally has little impact on the individual; Frequent Episodic, which may be associated with disability, requiring treatment; and Chronic TTH, which is configured as a serious disease, causing a significant decrease in quality of life and high disability, which may result in a decrease in performance at work and/or in college, as it alters mood and reduces the ability

to concentrate, in addition to increase the risk of absenteeism (Lima *et al.*, 2014; Lopes *et al.*, 2015; *International Headache Society*, 2018). Pathophysiology involves complex mechanisms of peripheral and central pain production pathways. The peripheral mechanism is understood as a pressure-induced pain, in which the palpation of the pericranial myofascial tissues, with consequent sensitization of A-delta and C fibers, responds with an increase in sensitivity. While the central mechanisms involve several factors, such as the psychological element itself (stress, depression and anxiety) (Ashmawi *et al.*, 2016; Cruz *et al.*, 2017). This mechanism has an intimate relationship with TTH, although its form of action is not fully understood. Other possible causes still being studied are the change in the pain tolerance limit and the amount of endogenous substances such as endorphin in the liquid (Cruz *et al.*, 2017; Rizzoli *et al.*, 2018). The individual affected by TTH presents typically bilateral pain in the frontal, parietal, occipital and/or temporal region, as pressure or tightness of light to moderate intensity lasting from minutes to days. Pain does not

worsen with routine physical activity, but it may or may not be associated with mild nausea, photophobia or phonophobia (Xavier *et al.*, 2015); *International Headache Society*, 2018; Rizzoli *et al.*, 2018). As a treatment for headache, joint and myofascial techniques appear to be beneficial based on the principle of being more linked to mechanoreceptor stimuli, suppressing pain through the gates mechanism, with presynaptic inhibition in the dorsal root ganglion and also by the release of endogenous opioids (Almeida *et al.*, 2014). Several techniques of manual therapy are addressed regarding their beneficial effect on headache symptoms, such as: joint manipulation and mobilization, craniocervical exercises, muscle inhibition, massages, among others, with greater effects being observed when the treatment uses combinations of different manual therapy techniques (Cumplido *et al.*, 2018). In addition to manual therapy, thermotherapy is also a promising resource with regard to headache associated with muscle tension, since, due to its vasodilation effects, increased blood flow and, consequently, improved oxygenation and elimination of metabolic waste, there are a decrease in nerve conduction of pain, decrease in joint stiffness and muscle relaxation (Furlan *et al.*, 2015). Based on evidence that proves the high prevalence of TTH in the population and the impacts caused by it, the objective of this study was to analyze the effect of a physical therapy protocol for non-specific headache associated with muscle tension in students at a public university.

MATERIAL AND METHODS

Ethical aspects: The research started after approval by the Research Ethics Committee of Universidade do Estado do Pará (UEPA) (Opinion nº 3.130.518). This is a quasi-experimental study, following the norms of Resolution 466/12 of the National Health Council, concerning research with human beings. All participants signed the Free and Informed Consent Form. Just as this study was approved by the Brazilian Registry of Clinical Trials (ReBEC), with the registration number: RBR-7dg79b, from the year 2019.

Sample: Twenty-four undergraduate physiotherapy students, from the first to the fifth year, from Universidade do Estado do Pará, participated in the study from February to June 2019, selected by means of non-probabilistic sampling for convenience. Included in the research were students regularly enrolled in the course, of both sexes, who had non-specific headache at least once a week, associated with muscle tension in the neck, shoulders or back of the body. Excluded of the research were those with a closed diagnosis of specific headache, headache less frequently than once a week; individuals with headache not associated with muscle tension in the neck, shoulders or back of the body; individuals who were not available twice a week to apply the physical therapy protocol and who had contraindications to the use of infrared.

Evaluation procedures: For the selection of university students, an online form was sent to determine the research sample. The form consisted of three questions: (1) "Do you have non-specific headache at least once a month?", (2) "Do you have non-specific headache at least once a week?" and (3) "Do you feel muscle tension in your neck, shoulders or back?" Those who answered positively to the three questions were selected to participate in the survey. 88 forms were answered, of which 45 individuals were excluded (25 reported headache associated with muscle tension monthly, 5 reported weekly headache not associated with muscle tension, 12 reported only muscle tension and 3 reported absence of headache and muscle tension), leaving 43 students able to participate in the research, who reported headache associated with muscle tension weekly. Of these 43, 14 did not accept to participate in the research, 5 withdrew during the application of the protocol, being the final sample of 24 students, as shown in

figure 1. Those who participated in the study were subjected to a questionnaire about aspects of headache. This was composed of five topics, being (1) Student identification (identification number, age and sex), (2) Headache aspects (type of pain, pain location, pain intensity according to the Visual Analogue Scale [VAS], duration of pain, frequency of pain and associated muscle tension), (3) Headache history and outcomes (headache duration, headache presence before university, frequency and intensity of headache before university and interference in aspects of life), (4) Aspects of headache after the end of the intervention and (5) Aspects of the headache one month after the end of the intervention. The first three topics were applied before the beginning of the physical therapy intervention.

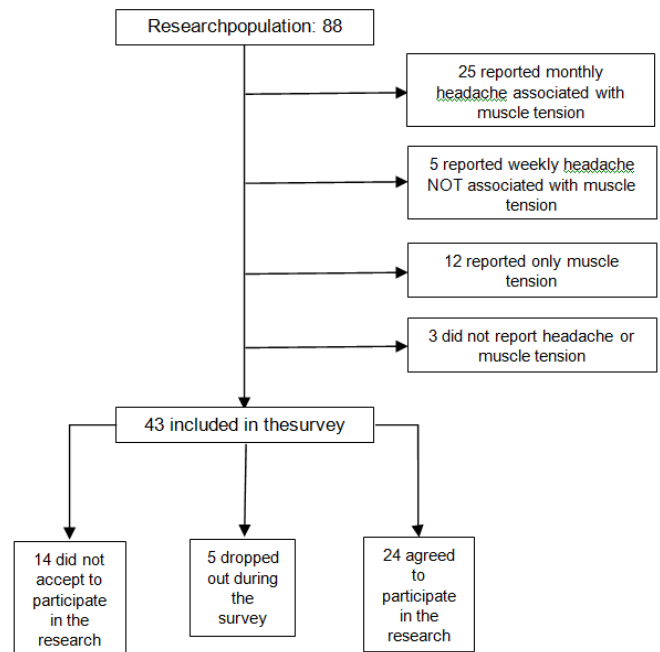


Figure 1. Flowchart and research design

Intervention procedures: The physical therapy protocol consists of applying infrared to the area of greatest muscle tension according to each patient (neck, shoulders or back) for 10 minutes, active stretches (in a flexion, extension and lateral inclination of the neck, in 3 series of 15 seconds each); inhibition of trigger points by typing-pressure and movement, depending of the evaluation through palpation in each session, the target muscles being: sternocleidomastoid, suboccipitals, upper trapezius and rhomboids; myofascial release of the sternocleidomastoid, upper trapezius and rhomboid muscles; cervical mobilization in extension and myofascial release on the face, the target muscles being: frontal and temporal. 10 sessions of physical therapy intervention were carried out, twice a week.

Statistical analysis: Excel® 2010 software was adopted for data entry and table preparation, as well as BioEstat 5.0 for statistical analysis. Categorical variables were presented as frequencies and numerical variables using measures of central tendency and dispersion. In order to verify the normality of the data, the D'Agostino test was used. Thus, for statistical inference the Chi-square test, Test G (Adherence) and analysis of variance (ANOVA) were used. The alpha level of significance was set at 5% ($p \leq 0.05$).

RESULTS

Of the 24 subjects involved, 22 (92%) were female and 2 (8%) were male ($p=0.001$) with an average age of 21.12 ± 2.54 years. During the initial evaluation and the reevaluations after the immediate end and after a month of the physical therapy

intervention, the students informed the form and location of their pain, which may present in more than one in the same individual, so it was allowed to check more than one alternative. It was possible to verify the reduction of pain, mainly of the pressure type, which represented 83% among the types analyzed, reducing to 63% after the immediate end and 33% after one month; and the location in the frontal region, which represented 75% among the analyzed locations, reducing to 29% after one month (Table 1). The intensity of pain decreased significantly after the immediate end and after one month of treatment compared to the period before treatment ($p < 0.0001$), however this reduction was not significant when statistically comparing the immediate end with the period after one month of the end of treatment. The reduction in pain intensity as a whole was significantly relevant ($p = 0.0002$). The other variables, such as duration and frequency of the headache crisis, showed, before treatment, a prevalence of 1-3 hours (54%) and 1-3 times a week (58%), respectively. At the end of the treatment, there was a change in the prevalence of the duration of the crisis, now 46% of students with 10-30 minutes of crisis, thus showing a decrease in the duration of the crisis, while the frequency was maintained 1-3 times per week, but with an increase (83% of the population), implying that individuals with higher frequencies had a reduction in the condition, joining those who already had a minimum frequency of 1-3 times a week.

Table 1: Distribution of students regarding the type, location and intensity of headache before, immediately at the end and 1 month after application of the protocol. Belém. Pará. Brazil, 2019

Variables	Before	After	1 month	P-value
Types of pain				
Pressure	20 (83%)	15 (63%)	8 (33%)	-
Hooked	4 (17%)	1 (4%)	-	
Weight	8 (33%)	7 (29%)	9 (38%)	
Pulsation	7 (29%)	4 (17%)	3 (13%)	
Burning	-	-	-	
Pain location				
Right				
Frontal	18 (75%)	9 (38%)	7 (29%)	-
Parietal	7 (29%)	3 (13%)	1 (4%)	
Temporal	8 (33%)	6 (25%)	5 (21%)	
Occipital	9 (38%)	7 (29%)	6 (25%)	
Left				
Frontal	18 (75%)	10 (42%)	7 (29%)	-
Parietal	8 (33%)	4 (17%)	1 (4%)	
Temporal	9 (38%)	6 (25%)	7 (29%)	
Occipital	9 (38%)	7 (29%)	7 (29%)	
Pain intensity	$5,6 \pm 1,73^a$	$3,4 \pm 2,06^b$	$3,3 \pm 1,72^c$	0,0002*

(-) It was not possible to perform statistical analysis; * Statistically significant result (ANOVA test). Significant comparisons: a x b ($p < 0.0001$); a x c ($p < 0.0001$); b x c (Not significant).

Table 2: Distribution of students regarding headache duration and frequency and location of muscle tension, before, immediately at the end and 1 month after application of the protocol. Belém. Pará. Brazil, 2019

Variables	Before	After	1 month
Duration of the crisis			
10-30 min	3 (13%)	11 (46%)	7 (29%)
1-3 hours	13 (54%)	8 (33%)	7 (29%)
5-10 hours	7 (29%)	-	1 (4%)
> 12 hours	1 (4%)	3 (13%)	1 (4%)
All day	-	-	1 (4%)
Crisis frequency			
1-3 times a week	14 (58%)	20 (83%)	15 (63%)
4-6 times a week	8 (33%)	-	-
Everyday	2 (8%)	-	1 (4%)
Other option	-	2 (8%)	1 (4%)
Muscle tension			
Neck	19 (79%)	11 (46%)	10 (42%)
Shoulder	17 (71%)	13 (54%)	11 (46%)
Back	11 (46%)	3 (13%)	3 (13%)

(-) Numeric data equals zero.

Table 3: Relationship of headache with admission to university. Belém. Pará. Brazil, 2019

Variables	N	%	P-value
Headache before UEPA (n=24)			
Yes	11	46%	0,83*
No	13	54%	
Before UEPA (n=11)			
Frequency			
Higher	-	-	0,07*
Lower	9	82%	
Has not changed	2	18%	
Intensity			
Higher	-	-	0,54*
Lower	7	64%	
Has not changed	4	36%	
Headache time (n=24)			
1-6 months	3	13%	0,28**
6 months-1 year	3	13%	
1-3 years	8	33%	
3-5 years	8	33%	
> 5 years	2	8%	

* Chi-square test; ** G Test (Adherence).

One month after the end of the treatment, the duration of 10-30 minutes and the frequency of 1-3 times a week remained as the majority of the population, representing 29% and 63% respectively (Table 2). The location of the main muscle tension was found in the neck region (79%) before treatment, with the shoulder region being the main one after the immediate end (54%) and after one month (46%). After the immediate end of treatment, 2 students (8.3%) had no more complaints of weekly headache, thus remaining one month after the end, and 5 students (21%) did not present episodes of headache during the month following treatment. In relation to the aspects of daily life, an adaptation of the discourse analysis was made with a closed questionnaire, predicting possible responses after the period of physical therapy intervention. Thus, it was analyzed whether the headache influences "making it difficult", "preventing" or "avoiding" aspects of life such as leisure activities, health care, family care, domestic tasks and performance in studies when the student was not in crisis or just during crises. It was possible to mark more than one answer, so 30 responses were recorded, of which 46.7% represented that the headache made aspects of students' daily life difficult. 20% represented preventing aspects of daily life and another 20% represented avoiding aspects of daily life for fear of triggering a headache crisis. Only 3.3% represented influence in other ways, in this case, mood changes. While 10% had only influence during crises. After the physical therapy intervention, it was analyzed whether there was any improvement, worsening or no difference. It was possible to mark only one answer and 2 people did not have headache anymore, so 22 answers were recorded, of which the majority (72.8%) reported a considerable improvement regarding the negative influence that headache had on the affected aspects of daily life and 18.2% reported little improvement. There was no report of any difference or worsening, and 2 students were not affected in aspects of life when they were not in crisis. One month after the intervention, it was analyzed if there was any improvement, maintenance of the improvement previously obtained, decrease of the improvement or worsening. It was possible to mark only one answer and 7 people did not have headache anymore, so 17 answers were recorded, of which the majority (47%) reported a decrease in the improvement obtained after the immediate end of the intervention, but with some improvement being maintained. 29.4% reported little improvement and 17.7% reported a lot of improvement. There was no maintenance of total improvement, reduction of improvement to the level that was before the intervention or worsening. 1 student was not affected in the aspects of life when he was not in crisis. Table 3 shows the headache relationship and its aspects with the university, as well as the total time of the

students' headache. More than half of the students (54%) started to present headache associated with muscle tension after entering university, but with no significant result ($p = 0.83$). In the other students (46%), who had headache even before entering university, a lower frequency of crises was observed (in 82% of these students) and a lower intensity of crises pain (in 64%) comparing the same frequency variables and pain after entering university.

DISCUSSION

The initial objective of this study was to analyze the effect of a physical therapy protocol for non-specific headache associated with muscle tension, however, to determine the sample, it was necessary to carry out a small epidemiological analysis. The prevalence of females in the result of this research is explained by Silva *et al.* (2015) as a result of the association of headaches with the levels of female sex hormones, highlighting, among others, changes in estradiol levels. In addition, it suggests the involvement of emotional factors. It was observed that most of the students analyzed began to present headache after entering university, and those who already had it, worsened symptoms after admission. Although the result was not statistically significant, it appears that there is a relationship between admission to university and headache. This relationship gains consistency with the findings by Almeida *et al.* (2015) who found a prevalence of 93.58% of headache among medical students at a public university. In another study with medical students, more than half of the students in the third and fourth year of the course had headache (53.78%), with the tension type being the most frequent. There was a higher prevalence in students in more advanced years, explained by the academic stress increased by the end of graduation and the demand to enter professional life (Almesned, 2018). The stress factor may be closely involved with the present study, explaining the fact that most individuals in the sample develop headache after entering university, as well as the worsening of the symptoms of other students with pre-existing headache. Tension-type headache is closely related to physical, emotional, psychosocial stress and poor sleep quality (Muñiz; Laso, 2018). In this sense, the treatment based on muscle relaxation has solid bases to be prescribed. The use of thermotherapy is able to promote muscle relaxation from its effects of vasodilation and increased local blood flow (Ansari *et al.*, 2014; Ferreira *et al.*, 2017). The application of an intervention protocol based on manual therapy techniques and application of superficial heat by infrared light significantly decreased the intensity of aspects of pain. The reduction in the therapeutic effect one month after the application of the protocol was due, among others, to the fact that the individuals studied remained in physical stress, stressing the importance of the association of treatment with changes in habits and lifestyle as the practice of activity physical and leisure moments, improvement in the quality of sleep and food (Feio, 2017). According to the study by Jiang *et al.* (2019), manual therapy techniques involving the suboccipital region, which were also part of the protocol of this study, showed a decrease in pain intensity in patients with tension headache in several articles, being explained by the restoration of the normal function of the occipital muscles, in addition to the improved blood circulation at the site and increased proprioception. Although the present study has not shown statistically significant results in the duration and frequency of headache crises, there is evidence in the literature on stretching, mobilization and other physiotherapy techniques, which affect by decreasing these aspects in cases of tensional headache with significant relevance in 26 studies analyzed by Muñiz *et al.* (2018). Systematic reviews have also found that the manual therapy in headache is equally effective compared to the use of prophylactic medications with antidepressants, or Propranolol or Topiramato in the three aspects

mentioned: duration, frequency and intensity of the headache crisis (Odell *et al.*, 2019). It was observed that headache negatively influences the aspects of daily life of 90% of the sample, even outside the crisis period, which showed a considerable decrease with physical therapy intervention, inferring an improvement in the quality of life. This data is corroborated in several studies that analyzed various aspects of the quality of life of individuals with headache, as follows below. In a study with female students with an average age of 21.17 ± 2.2 years, similar to that found in this study, 85.1% reported that headache limited aspects of their daily life, such as: studying or enjoying life (Desouky *et al.*, 2019). Torres-Ferrus *et al.* (2018) applied the Strengths and Difficulties Questionnaire (SDQ) to adolescents who had headache and adolescents who did not have headache, and the first group demonstrated abnormal values in several aspects, including emotional, conduct and relationship problems ($p < 0.001$). And in a group of 116 young adults, evaluated through an online diary for three weeks, it was noted that on days with headache crises, individuals feel less satisfaction in their basic life needs and in the pursuit of their goals, which it is essential for the global well-being of human beings (Greene *et al.*, 2018). Georgoudis *et al.* (2018) evaluated the effect of physiotherapy on quality of life and other aspects of patients with tension-type headache through several questionnaires, such as: (1) Migraine Disability Assessment Questionnaire (MIDAS) and (2) the short version of the Health Survey 12 SF-12. He compared the performance of using acupuncture + stretching (control group) and acupuncture + stretching + physiotherapy (experimental group) in 10 sessions. At the end of the intervention, improvement was found in all values in both groups, with (1) and (2) $p < 0.001$, with more expressive results in the experimental group. The limitations of this study were the impossibility of quantitative statistical analysis of data related to aspects of daily life due to the form covered in the questionnaire, restricted period for data collection, reduced sample, absence of a control group, limited time for researchers and respondents for the treatment.

Conclusion

The study showed that the physical therapy protocol composed of superficial heat and manual therapy techniques employed significantly improved the intensity aspect of headache associated with muscle tension in students, in addition to suggesting an improvement in the frequency and duration of crises, including reducing the weekly amount to no headache crises in 29.16% of those involved by the end of the study. It was also confirmed that physical therapy positively interfered in aspects of daily life affected by headache, suggesting an improvement in quality of life. It was also suggested that admission to the university was related to the onset of headache in students, as well as the worsening of the symptoms of those previously affected by this pathology. Finally, it is concluded that the improvement of the condition was evidenced, however, one month after the treatment this effect was attenuated, demonstrating that the factors that trigger headache with muscle tension are possibly still present. Therefore, it is suggested that in addition to physical therapy treatment, changes in lifestyle should be adopted. The present research served as a statistically significant proof that the physical therapy protocol composed of manual therapy and thermotherapy is capable of reducing aspects of headache. Because it is a conservative treatment strategy, physical therapy and the population affected by headache benefit.

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