

# Correlation Between Skin Temperature Over Myofascial Trigger Points in the Upper Trapezius Muscle and Range of Motion, Electromyographic Activity, and Pain in Chronic Neck Pain Patients

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## ABSTRACT

**Objective:** The purpose of this study was to assess the correlation between skin temperature over a myofascial trigger point in the upper trapezius muscle and range of motion of the cervical spine, electromyographic activity, and pain in patients with chronic neck pain.

**Methods:** This is a single-blind cross-sectional study. Forty participants of both sexes, aged 18 to 45 years, with chronic neck pain and myofascial trigger points in the upper trapezius muscle were included in the study. The participants were assessed using the Numeric Rating Scale, the Neck Disability Index, infrared thermography, algometry, fleximetry, and electromyographic activity.

**Results:** A positive association was observed between skin temperature to the right with the range of motion of cervical flexion ( $r = 0.322$ ,  $P = .043$ ), the median frequency of isometrics to the right ( $r = 0.341$ ,  $P = .032$ ), and the median frequency of rest to the left ( $r_s = 0.427$ ,  $P = .006$ ); as were a negative association between skin temperature to the right and the root mean square of rest to the right ( $r_s = -0.447$ ,  $P = .004$ ), and a positive association of skin temperature to the left with the median frequency of isometrics to the right ( $r = 0.365$ ,  $P = .020$ ), and the median frequency of rest to the left ( $r_s = 0.573$ ,  $P < .001$ ).

**Conclusion:** Patients with chronic neck pain who had reduction of skin temperature over myofascial trigger points in the upper trapezius muscle had reduced cervical range of motion for flexion, reduced median frequency at rest and during isometric contraction, and increased root mean square at rest. (J Manipulative Physiol Ther 2018;xx:1-8)

**Key Indexing Terms:** *Physical Therapy Modalities; Myofascial Pain Syndromes; Muscle, Skeletal; Thermography*

## INTRODUCTION

Neck pain is a prevalent musculoskeletal dysfunction that is related to new lifestyles and work activities.<sup>1,2</sup> Among the various anatomic structures involved in the pathologic process of neck pain, the myofascial component

stands out,<sup>1</sup> especially the trapezius muscle.<sup>3</sup> Studies show that individuals with chronic pain have metabolic,<sup>4</sup> vascular,<sup>5</sup> and electromyographic<sup>3</sup> alterations in this muscle. A common clinical sign in the trapezius muscle of individuals with neck pain is the presence of myofascial trigger points.<sup>6</sup>

Myofascial trigger points, which are defined as palpable nodules located in the taut band of a skeletal muscle, are related to sensory, motor, and autonomic changes. They also produce local and referred pain and may be active or latent.<sup>2,7</sup> It has been proposed that the etiologic process of myofascial trigger points is related to direct muscle trauma or overuse.<sup>2</sup>

Several studies have used criteria<sup>8</sup> based on muscle palpation for diagnosing myofascial trigger points. However, other methods<sup>9</sup> highlight that palpation requires a combination of skill, training, and critical clinical practice. Other instruments such as ultrasound,<sup>10</sup> sonoelastography,<sup>11</sup> and electromyography also have applicability in assessing patients with myofascial trigger points.<sup>12</sup>

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In this context and considering the autonomic and metabolic repercussions caused by the presence of myofascial trigger points,<sup>2</sup> we can also add infrared thermography as a possible method in the evaluation of individuals with myofascial pain.<sup>13,14</sup> It is a noninvasive, painless method that does not require contact with the region being evaluated. It is based on the emission of infrared radiation by bodies with a temperature above absolute zero, providing an image of the distribution of the body's skin temperature, which is conditioned by micro-circulatory activities.<sup>15</sup>

However, the possible correlation between skin temperature and the other clinical variables used in evaluating the trigger point has not yet been fully understood by the scientific literature. There is a need to establish the possible association between skin temperature and common medical complaints in patients with myofascial trigger points with chronic neck pain, such as pain, limitation in the range of cervical motion, and muscle tension. Given this context, the aim of this study was to correlate skin temperature at the myofascial trigger point in the upper trapezius muscle with the range of motion of the cervical spine, electromyographic activity, and pain in patients with chronic neck pain.

## METHODS

### Ethics

The study was approved by the Research Ethics Committee of the Clinics Hospital of the Medical School of Ribeirão Preto of the University of São Paulo, under opinion number 030643/2013. The recruitment of the participants took place in the city of Ribeirão Preto (São Paulo, Brazil), using posters, radio, and the internet. The invitation to participate was done verbally. All participants consented to partake.

### Study Design

This is a single-blind cross-sectional study in which 1 physiotherapist (A.V.D.-F.) was responsible for recruiting, diagnosing, and assessing pain, electromyographic activity, and the cervical range of motion. A second physiotherapist (A.K.d.O.) was responsible for thermal evaluation, and a third (C.E.G.) conducted the processing and analysis of the data collected.

### Sample

The processing of the sample size calculation was performed using Ene software, version 3.0 (Autonomous University of Barcelona, Barcelona, Spain). The sample size was calculated based on the study carried out by Haddad et al,<sup>14</sup> which found a correlation between skin temperature at the myofascial trigger points and pain. The calculation was based on the detection of a moderate

association ( $r = 0.50$ ) between the variables. Thus, a number of 34 participants was estimated to reach a statistical power of 90% and an  $\alpha$  of 0.05. Anticipating a possible sample loss, 40 participants were recruited for this study.

Participants were both sexes between the ages of 18 to 45 years, and they had chronic neck pain (>90 days), which was identified in accordance with the following criteria: score on the Neck Disability Index (NDI)  $\geq 5$  points and score on the Numeric Rating Scale (NRS)  $\geq 3$  at rest or during active movement of the cervical. Furthermore, the participants had an active and central myofascial trigger point in the upper trapezius muscle, diagnosed according to the criteria established by Simons et al<sup>8</sup> and Gerwin et al<sup>16</sup>: the presence of a taut band in the skeletal muscle, the presence of a hypersensitive point within the taut band, local contraction in response to the palpation of the taut band, and reproduction of the referred pain due to compression of up to 2.5 kg/cm<sup>2</sup> on the trigger point.<sup>17</sup> It should be pointed out that these diagnostic criteria of the myofascial trigger point have acceptable levels of reliability, with  $\kappa$  values ranging between 0.36 and 0.88<sup>16</sup> and having been carried out by a physiotherapist with 8 years of experience with myofascial pain.

Excluded from the study were participants who had a history of trauma in the neck; undergone head, face, or neck surgery; had a cervical hernia or degenerative diseases of the spine; had been subjected to physical therapy treatment in the previous 3 months; had used an analgesic, anti-inflammatory, or muscle relaxant in the previous week; had systemic diseases; had a medical diagnosis of fibromyalgia; or a had body mass index (BMI) greater than 28 kg/m<sup>2</sup>, according to Albuquerque-Sendin et al.<sup>18</sup> Also excluded from the study were participants with symptoms of depression, as evaluated by the Beck Depression Inventory.<sup>18,19</sup>

### Anamnesis and Physical Examination

The following data were collected by the evaluator: personal data, weight (kg), height (m), BMI (kg/m<sup>2</sup>), previous diseases, use of medication, and history of surgery or physical therapy. Furthermore, as described in the exclusion criteria, the Beck Depression Inventory (Gorenstein and Andrade<sup>19</sup>) was used to identify symptoms of depression in the participants (score >9 points).

### Neck Disability Index

The NDI is an instrument adapted and validated for the Brazilian population<sup>20</sup>; it has 10 questions that investigate disability and neck pain. For each question, it is possible to mark 1 of 6 answers, corresponding to scores of 0 to 5. Therefore, the score for classification of disability due to pain varies from 0 to 50 points, as follows: 0 to 4 points, no disability; 5 to 14 points, mild disability; 15 to 24 points,

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