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Reliability of pressure pain threshold on myofascial trigger points in the trapezius muscle of women with chronic neck pain

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SUMMARY

OBJECTIVE: The aim of this study was to evaluate the intra- and inter-rater reliability of pressure pain threshold measurement on myofascial trigger points in the trapezius muscle in women with chronic neck pain.

METHODS: This reliability study involved 30 volunteers with neck pain for more than 90 days. The assessment procedures were performed by blinded researchers. Two examiners, who were previously trained in the use of algometry, independently performed two assessments of the pressure pain threshold at two time intervals, one week apart.

RESULTS: The study sample consisted of 30 young adult women. Excellent intra- and inter-rater reliability were found for the pressure pain threshold on myofascial trigger points, with intraclass correlation coefficient values ranging between 0.752 and 0.874, standard error of measurement ranging between 0.18 and 0.22 kg/cm^2, and minimum detectable change ranging between 0.45 and 0.62 kg/cm^2.

CONCLUSION: The present study showed that the assessment of pressure pain threshold through algometry presents satisfactory intraclass correlation coefficient values, considering different time and examiners, contributing to the spread of the use of this tool as a quantitative method of pain evaluation in myofascial trigger points.

KEYWORDS: Neck pain. Reproducibility of results. Chronic pain.

INTRODUCTION

Cervicalgia is a prevalent musculoskeletal disorder, affecting about 30% of the world population[1], with emphasis on the involvement of the myofascial component of the trapezius muscle[2]. In Brazil, Genebra et al.[3] observed a prevalence of neck pain in approximately 20% of individuals in a sample composed of adults aged 20 years and above.

A common clinical sign in the trapezius muscle of patients with neck pain is the presence of myofascial trigger points[2]. They produce local and referred pain and may be active or latent[4]. In general, the most accepted method of diagnosis of myofascial trigger points in research and clinical practice are the criteria centered on palpation described by Simons et al.[5]

However, other instruments have been used to complement the assessment of these patients, mainly because of the complexity inherent in measuring pain[6]. Among other assessment methods, algometry has characteristics that allow the pressure pain threshold to be accurately measured in a given region such as muscle belly and tendons[7].

Some studies have been conducted to evaluate the reliability of the pressure pain threshold in different populations. Using the intraclass correlation coefficient (ICC), in a population of

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healthy young adults, Waller et al.[8] identified adequate reliability in assessing the pressure pain threshold on the wrist, leg, and cervical and lumbar spine. In patients with neck pain, algometry has consistent reliability on the upper trapezius muscle and the anterior tibial belly[9]. Specifically for myofascial pain, Park et al.[10] identified excellent reliability for the pressure pain threshold on the upper trapezius, infraspinatus, extensor carpi radialis, and extensor indicis proprius muscles. However, these authors used Cronbach's alpha to measure reliability, an incoherent statistical method compared with ICC.

In view of the above and considering the scientific gap still present in the use of algometry in myofascial pain, the objective of this study is to evaluate the intra- and inter-examiner reliability of measuring the pressure pain threshold on myofascial trigger points in the upper trapezius muscle in women with chronic neck pain.

METHODS

Ethical aspects

The research was carried out in a laboratory of the university, and the study procedures were approved by the Research Ethics Committee of the institution (number blinded). Once selected, the volunteers were instructed about all the procedures involved, clarified about the research project and its objectives and characteristics, and asked to sign the free and informed consent form.

Research design

This reliability study involved two examiners, previously trained and familiarized with the use of the algometer, who performed the pressure pain threshold measurements at two time intervals, one week apart[11], making it possible to determine the intra- and inter-rater reliability.

Sample

The sample calculation was performed considering a confidence coefficient of 0.95 and the amplitude of the confidence interval for the ICC of 0.30. In addition, the calculation was performed to detect moderate reliability (ICC=0.75), according to the study conducted by Fleiss[12]. Therefore, a sample size of 24 volunteers was estimated. Concerning possible sample losses, 30 volunteers were recruited in the present study. The processing of the sample calculation was performed based on the study conducted by Bonett[13].

Thirty volunteers with neck pain for more than 90 days aged between 18 and 45 years were recruited. To identify the neck pain, the following diagnostic criteria were used: score on the Neck Disability Index (NDI) ≥5 points and score on the Numerical Pain Scale (NPS) ≥3 at rest. In addition, all volunteers had an active myofascial trigger point, centrally located in the descending trapezius muscle, diagnosed according to the criteria established by Simons et al.[5], and the diagnosis was done by a physiotherapist with eight years of experience in myofascial pain.

The exclusion criteria were: a history of cervical trauma, degenerative diseases of the spine, systemic diseases, medical diagnosis of fibromyalgia and depression, and use of painkillers, anti-inflammatories, or muscle relaxants in the previous week.

Evaluation procedures

The assessment procedures were carried out by blinded researchers, according to the following description: a researcher with the previous knowledge of measuring the painful experience applied the assessment instruments for neck pain and diagnosed the myofascial trigger points at an initial moment. Then, two other examiners independently performed two assessments of the pressure pain threshold at two time intervals, one week apart, thus making it possible to measure intra- and inter-examiner reliability.

Initially, the data such as personal data, mass, height, body mass index, past illnesses, use of medications were collected, and then inspection and palpation of the evaluated region were performed.

The NPS was used to assess pain intensity. It is a scale validated for the Portuguese language, simple, and easy to measure, consisting of a sequence of numbers from 0–10, in which 0 represents "no pain" and 10 stands for "the worst pain one could ever imagine."[14] In this regard, the volunteers graduated their pain based on these parameters. Pain intensity was assessed at rest.

NDI was used to assess neck disability through the presence of pain. It consists of an instrument adapted and validated for the Brazilian population[15], and it is composed of 10 items, generating a score ranging from 0–50, the higher the score, the greater the disability.

An algometer (PTR-300 model, Instrutherm, São Paulo, SP, Brazil) was used to measure the pressure pain threshold. For this, the volunteers were placed in a chair, with the torso erect, back supported, feet resting on the ground, and hands resting on the thighs. The algometer with a rubber disk measuring 1 cm^2 at the edge was positioned and the examiner exerted a gradual compression with a constant speed of approximately 0.5 $kg/cm^2/s$, controlled by the sound feedback of a digital metronome[7], perpendicularly to the fibers of the upper trapezius muscle, bilaterally, exactly over the myofascial trigger points. These points were pressed until the pain was reported, and the value displayed on

the equipment's display was recorded in kg/cm^2. The pressure pain threshold measurement was performed three times for each muscle to obtain the mean value, with the order of collection (right or left myofascial trigger point) defined by drawing.

Statistical analysis

For the analysis of reliability, the $ICC_{2,3}$ was used to determine the intra- and inter-rater reliability of measuring the pressure pain threshold, with its respective 95%CI, standard error of measurement (SEM), and minimum detectable change (MDC)[16].

The interpretation of the ICC value was based on the study by Fleiss: low, values below 0.40; moderate, between 0.40–0.75; substantial, between 0.75–0.90; excellent, values greater than 0.90[12].

All statistical processing was performed using the Statistical Package for the Social Sciences (SPSS) software, version 17.0 (Chicago, IL, USA).

RESULTS

The study sample consisted of 30 women, 29 right-handed, at a mean age of 23.30 years (standard deviation [SD] 2.79), mean body mass index of 22.17 kg/m² (SD 3.78), mean pain intensity at rest of 3.80 (SD 1.15), mean disability of 12.03 (SD 4.49), and mean chronic pain of 39.70 months (SD 31.34).

Table 1 shows the mean values of the pressure pain threshold according to each examiner. Tables 2 and 3 show excellent intra- and inter-rater reliability, respectively, with ICC values varying between 0.752–0.874, SEM ranging between 0.18 and 0.22 kg/cm^2, and MDC varying between 0.45 and 0.62 kg/cm^2.

DISCUSSION

The results of the present study demonstrated adequate values of reliability in measuring the pressure pain threshold on the trigger point of the upper trapezius muscle of women with chronic neck pain using the algometry technique. These results presented are similar to those suggested by Koo et al.[17] who demonstrated that the evaluation of the pressure pain threshold using a manual algometer showed excellent reliability (ICC=0.914) in healthy subjects. Persson et al.[18] reported ICC between 0.70–0.90 for the evaluation of the descending trapezius muscle of 27 healthy women.

Pain assessment involves possible limitations resulting from the subjectivity inherent in the painful condition and the human capacity for physiological adaptation to painful stimuli, which are already reported in the literature[19,20]. Thus, the use of

Table 1. Mean and standard deviation of the pressure pain threshold according to the measurements of two evaluators (n=30).

PPT (kg/cm^2)	Examiner 1		Examiner 2	
	Test	Retest	Test	Retest
Right upper trapezius	1.75 (0.56)	1.71 (0.54)	1.60 (0.47)	1.53 (0.42)
Left upper trapezius	1.76 (0.53)	1.71 (0.50)	1.55 (0.46)	1.44 (0.42)

PPT: the pressure pain threshold.

Table 2. Intra-rater reliability of measuring pressure pain threshold in participants with neck pain (n=30).

PPT	ICC	95%CI	SEM (kg/cm^2)	SEM (%)	MDC (kg/cm^2)	MDC (%)
Right upper trapezius	0.752	0.480–0.882	0.22	14.22	0.62	39.41
Left upper trapezius	0.781	0.609–0.877	0.21	13.80	0.57	38.26

PPT: the pressure pain threshold; ICC: intraclass correlation coefficient; CI: confidence interval; SEM: standard error of measurement; MDC: minimum detectable change.

Table 3. Inter-rater reliability of measuring pressure pain threshold (PPT) in participants with neck pain (n=30).

PPT	ICC	95%CI	SEM (kg/cm^2)	SEM (%)	MDC (kg/cm^2)	MDC (%)
Right upper trapezius	0.858	0.778–0.914	0.18	11.17	0.50	30.95
Left upper trapezius	0.874	0.803–0.923	0.16	10.37	0.45	28.74

PPT: the pressure pain threshold; ICC: intraclass correlation coefficient; CI: confidence interval; SEM: standard error of measurement; MDC: minimum detectable change.

algometry as a tool for measuring pain threshold has supported the development of studies that evaluate the properties of this method in painful conditions; given the above, we discussed the results found in this study.

Mutlu and Ozdincler[21] concluded that algometry can be used to assess the pressure pain threshold in patients with knee osteoarthritis; after finding adequate ICC values, these authors emphasized the importance of having this tool available to rehabilitation professionals in assessing the patients' pain. Walton et al.[9] assessed pressure pain threshold using algometry in women with and without acute neck pain and found values of excellent reliability for the intra-examiner (ICC=0.96) and substantial for inter-examiner (ICC=0.81), and although the values found in our study are slightly lower (0.752–0.874), they are considered substantial.

Walton et al.[22] evaluated the reliability of algometry in individuals of both sexes with neck pain without a specific cause. The ICC values were similar to the present study (ICC is equal to 0.89 for inter-examiner and 0.83 for intra-examiner) and, despite those values corresponded to good levels of reliability, the authors pointed out a limitation that may influence the result factors linked to the level of concentration/distraction of the volunteer at the time of the assessment since it is a test that depends directly on the volunteer's perception of their pain. In the present study, the evaluators received instructions to guide the volunteers on the importance of both being concentrated at the time of the evaluation; however, we agree that such factors mentioned by the authors above may interfere with the final result of the evaluation.

CONCLUSION

In the present study, the pressure pain threshold assessment using algometry shows satisfactory ICC values, considering different times and examiners, contributing to the spread of the use of this tool as a quantitative method of pain assessment on myofascial trigger points of women with chronic neck pain.

AUTHORS' CONTRIBUTIONS

AKO: Conceptualization, Data curation, Formal Analysis, Methodology, Writing – original draft. **AVDF:** Conceptualization, Data curation, Methodology, Writing – review & editing. **GS:** Conceptualization, Data curation, Investigation, Methodology, Writing – original draft. **ACFM:** Conceptualization, Data curation, Formal Analysis, Methodology, Writing – original draft. **RRJG:** Conceptualization, Data curation, Formal Analysis, Methodology, Writing – review & editing.

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