Presence of Latent Myofascial Trigger Points and Determination of Pressure Pain Thresholds of the Shoulder Girdle in Healthy Children and Young Adults: A Cross-sectional Study

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Abstract

Objective: The primary objective of this study was to compare the number of myofascial trigger points (MTPs) and the pressure pain thresholds (PPTs) in the shoulder girdle, on the dominant and nondominant sides, between healthy children and adults. The secondary aim was to assess the correlations between the number of MTPs and the PPTs in these populations.

Methods: A cross-sectional study was performed. Thirty-five children (aged 9.1 ± 1.7 years) and 35 adults (aged 23.4 ± 3.4 years) with no history of shoulder or cervical pathology were included. All participants were examined for MTPs in the shoulder muscles and assessed for PPTs in the neck, shoulder, and tibialis anterior. Parametric and nonparametric tests, effect sizes, and odds ratios were used to determine the differences between groups and sides. Spearman's σ test was used to assess correlations between latent MTPs (LTPs) and PPTs in each group.

Results: Children had fewer LTPs than adults did ($P = .03$). The upper trapezius was the muscle with the largest number of LTPs, affecting 13 adults on the dominant side. Children had lower PPTs compared with adults ($P < .05$). Correlations between the number of LTPs (on both sides and in total) and PPTs were observed only in adults.

Conclusions: Healthy children have fewer LTPs and lower PPTs in the shoulder girdle than healthy adults. A relationship was observed between sensitivity to pressure and the presence of LTPs in adults, in whom lower PPT was associated with more LTPs. This relationship was not detected in children. (J Manipulative Physiol Ther 2016;xx:0-10)

Key Indexing Terms: *Musculoskeletal Pain; Pain Threshold; Sensitivity; Trigger Points*

Introduction

Assessing pain in children is challenging because of the factors that can influence its interpretation, such as children's capacity to understand the concept of pain and previous painful experiences.[1] Furthermore, children who have undergone painful processes are at greater risk of developing somatic and psychiatric symptoms in adulthood.[2] High incidences of pain processes have been reported in children.[3,4] Musculoskeletal pain seems to be the most prevalent chronic idiopathic pain in adolescents (33.4%), whereas the neck/shoulder and paravertebral areas are the most common regions.[5] This fact indicates the relevance of assessing musculoskeletal pain in children.

Myofascial pain develops from myofascial trigger points (MTPs) and is described as a myalgic condition characterized by local and referred pain.[6-8] There is general consensus that direct trauma, such as contusions, sprains, and strains, or muscle overloading and overuse can lead to the development of MTPs.[6,9] A compression or nonbacterial inflammation of a nerve root in the spine,[10] endocrine and metabolic deficiencies, thyroid and estrogen insufficiencies,[8,11]

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nutritional deficiencies of vitamins (especially B-12 and folic acid) and minerals,[8,12] and infections[13] have been identified as possible factors precipitating or perpetuating MTPs. All of these processes could influence nociceptive mechanisms. An MTP is characterized as a hyperirritable nodule inside a taut band in the skeletal muscle. According to the degree of irritability, these MTPs are classified as active (ATPs) when symptomatic and latent (LTPs) when asymptomatic. Active MTPs may cause spontaneous referred pain with or without a pain stimulus and reproduce a familiar pain, whereas LTPs may generate nonspontaneous referred pain that requires a stimulus to trigger it and produce unfamiliar pain. Myofascial trigger points can generate autonomic, efferent, and afferent alterations.[8] Specifically, LTPs can cause changes in muscle activity,[14-16] fatigue,[17] and sensitization of the nervous system[18] through biochemical changes[19] and limitations to the range of motion.[20] In addition, LTPs may develop into ATPs[21] with spontaneous pain. The origin and consequences of MTPs in children remain unknown, but some studies have associated MTPs with chronic tension-type headaches,[22] temporomandibular disorders,[23] or back injuries[24] in this population, indicating the relevance of their assessment during the early stages of life.

The age of the patient for the clinical interpretation of pain is important as the relationship between sensitivity and age has already been reported. Children from 5 to 16 years of age exhibited low pressure pain thresholds (PPTs), regardless of the region assessed, with the younger ones being more sensitive.[25] In healthy adults, Larivière et al. observed an increase in pain threshold with age that was related to the decline in central inhibitory mechanisms that begins in middle age.[26]

Finally, two studies have addressed the relationship between PPTs and the existence of MTPs in children. Kao et al detected lower PPTs in children under the age of 1 and the absence of MTPs in the brachioradialis muscle in comparison with adults. They concluded that these MTPs might be absent at birth and that they are acquired over time.[27] Han et al supported the view that children may develop ATPs and LTPs in the brachioradialis muscle at 4 years of age and that PPTs increase gradually with age, becoming more stable up to 11 years of age.[28] To the best of our knowledge, scarce evidence is available concerning the presence of MTPs in the shoulder girdle muscles in healthy children in comparison with healthy adults. There is also a lack of studies that have attempted to check whether the relationship between MTPs and PPTs assessed in the same body region depends on age.

Thus, the primary objective of the present study was to compare the number of MTPs and the PPTs in the shoulder girdle, on the dominant and nondominant sides, between healthy children and adults. The secondary aim was to assess the correlations between the number of MTPs and the PPTs in these populations. The hypotheses were that children exhibit fewer MTPs than adults and that the correlations between the number of MTPs and PPT are higher in adults than in children (ie, that these correlations increase with age).

Methods

Subjects

A cross-sectional design with nonprobabilistic sampling of consecutive subjects was applied. One hundred eleven volunteers were recruited through advertisement at the university and social services of the city and assessed for eligibility (Fig 1). Finally, the children's group (mean age ± standard deviation [SD], 9.1 ± 1.6 years) comprised 35 individuals, and the adult group (mean age ± SD, 23.4 ± 3.4 years) was made up of 35 individuals.

The study included healthy children between the ages of 7 and 12 years and healthy adults between the ages of 18 and 34 years. On the basis of a pilot study, the age range for the children's group was chosen to allow a better understanding of the procedures of data collection. We excluded children with a body mass index (BMI) above normal (>1 SD) according to the curve on the *z*-score graph for each gender[29] and adults with a BMI >25.0 kg/m^2. In the children's group, girls who had reached menarche were excluded to avoid the influence of hormones in the process of sensitivity to pain.[30,31] For both groups, the exclusion criteria were as follows: presence of orthopedic pathology; any neurologic, musculoskeletal, systemic, or cognitive disease that might affect the understanding of verbal commands; use of medication for pain or inflammation (analgesics; steroids; nonsteroidal, anti-inflammatory drugs) at least 48 hours before the assessment, and presence of ATPs.

All participants and the children's legal guardians were given written and verbal explanations of the aims and methodology of the study and signed an informed consent form. This study was submitted to and approved by the Research Ethics Committee of the Federal University of São Carlos (Protocol 196.260), in accordance with the standards for conducting human experiments (National Health Council Resolution 196/96).

Assessment of LTPs

In a standardized sequence, MTPs were assessed first, followed by the assessment of PPTs. The diagnosis of MTPs was determined by a physical therapist with 2 years of experience in myofascial pain assessment, according to the protocol proposed by Simons et al[8]: (1) presence of a palpable taut band in a skeletal muscle; (2) presence of a palpable nodule and hypersensitivity in the taut band; (3) a local twitch response elicited by palpation with pressure on the taut band; (4) reproduction of referred pain in response to compression of the MTPs.[8] These criteria have previously obtained good interexaminer reliability, with *k*