

ORIGINAL RESEARCH

Vastus Medialis Hoffmann Reflex Excitability Is Associated With Pain Level, Self-Reported Function, and Chronicity in Women With Patellofemoral Pain

Danilo de Oliveira Silva, MSc,^a Fernando Henrique Magalhães, PhD,^b
Nathálie Clara Faria, MSc,^a Deisi Ferrari, MSc,^c Marcella Ferraz Pazzinato, MSc,^a
Evangelos Pappas, PhD,^d Fábio Mícolis de Azevedo, PhD^a

From the ^aPhysical Therapy Department, School of Science and Technology, University of São Paulo State, Presidente Prudente, São Paulo, Brazil; ^bSchool of Arts, Sciences, and Humanities, University of São Paulo, São Paulo, Brazil; ^cPost-Graduation Program Interunits Bioengineering, University of São Paulo, São Carlos, Brazil; and ^dDiscipline of Physiotherapy, Faculty of Health Sciences, University of Sydney, Sydney, NSW, Australia.

Abstract

Objective: To determine the association between the amplitude of vastus medialis (VM) Hoffmann reflex (H-reflex) and pain level, self-reported physical function, and chronicity of pain in women with patellofemoral pain (PFP).

Design: Cross-sectional study.

Setting: Laboratory of biomechanics and motor control.

Participants: Women diagnosed with PFP (N = 15) aged 18 to 35 years.

Interventions: Not applicable.

Main Outcome Measures: Data on worst pain level during the previous month, self-reported physical function, and symptom duration (chronicity) were collected from the participants. Maximum evoked responses were obtained by electrical stimulation applied to the femoral nerve and peak-to-peak amplitudes of normalized maximal H-reflexes (maximal Hoffmann reflex/maximal motor wave ratios) of the VM were calculated. A Pearson product-moment correlation matrix (r) was used to explore the relations between the amplitude of VM H-reflex and worst pain during the previous month, self-reported function, and chronicity of pain.

Results: Strong negative correlations were found between the amplitude of VM H-reflex and worst pain in the previous month ($r = -.71$; $P = .003$) and chronicity ($r = -.74$; $P = .001$). A strong positive correlation was found between the amplitude of VM H-reflex and self-reported physical function ($r = .62$; $P = .012$).

Conclusions: The strong and significant relations reported in this study suggest that women with PFP showing greater VM H-reflex excitability tend to have lower pain, better physical function, and more recent symptoms. Therefore, rehabilitation strategies designed to increase the excitability of the monosynaptic stretch reflex should be considered in the treatment of women with PFP if their effectiveness is demonstrated in future studies. Archives of Physical Medicine and Rehabilitation 2016; ■: ■ ■ ■ ■ - ■ ■ ■ ■

© 2016 by the American Congress of Rehabilitation Medicine

Patellofemoral pain (PFP) is the second most common diagnosis of the lower extremity observed in sports and orthopedic centers, accounting for ~25% to 40% of all knee disorders.^{1,2} PFP is more frequent in women than in men, with a prevalence of 13% in women

aged 18 to 35 years.³ Clinically, women with PFP often report physical functional limitations due to pain during dynamic activities.^{4,5} Despite the high incidence and functional limitations, prospective studies have highlighted a poor long-term prognosis with only one third of people with PFP being pain-free 1-year after treatment⁶ and less than a half after 5 to 8 years.⁷

The etiology of PFP is multifactorial; various biomechanical, anatomical, and strength factors have been

Supported by the São Paulo Research Foundation (grant no. 2014/24939-7 and scholarship no. 2013/10755-9). The financial sponsor played no role in the design, execution, analysis and interpretation of data, or writing of the study.

Disclosures: none.

associated with PFP.⁸ Consequently, evidence-based treatments have focused on protocols designed to restore normal biomechanical patterns in the population with PFP. Such an approach has been reported as successful for the short term, whereas long-term outcomes have been considered much less promising.^{6,7} This lack of long-term efficacy indicates that the mechanisms behind PFP are not fully understood and/or are not being properly addressed.

More recently, the investigation of neurophysiological alterations associated with PFP have provided novel information to understand its pathophysiology.⁹ More specifically, de Oliveira Silva et al⁹ reported that the amplitude of vastus medialis (VM) Hoffmann reflex (H-reflex) is lower in women with PFP than in pain-free controls, thereby indicating an impaired efficacy on the transmission between Ia afferent inputs and VM motoneurons in women with PFP. However, there is wide variability in the H-reflex excitability in women with PFP, which may be associated with pain and impaired physical function in this population. Such an impaired reflex excitability may play a role in the pain-induced inhibitory effects that have been observed during involuntary and voluntary muscle activation.¹⁰ Therefore, it is reasonable to speculate that the decreased excitability of neuronal pathways may be associated with the lack of long-term efficacy on biomechanically based treatments targeting this population (eg, exercises for hip and knee muscles¹¹).

In this direction, an important question to answer is whether the decreased VM H-reflex excitability is associated with pain intensity, self-reported physical function, and chronicity of PFP. Addressing the specific relations among these variables would assist in the development of optimal rehabilitation strategies for women with PFP. For instance, it may provide evidence toward a need to change the current treatment focus from a biomechanically based perspective¹² to include components designed to increase excitability of the monosynaptic stretch reflex pathway (eg, sensory stimulation,¹³ corticomotor facilitation via attention-oriented tasks,¹⁴ or reflex operant conditioning¹⁵).

In this context, the aim of this study was to determine the association between VM H-reflex amplitude and pain, self-reported physical function, and chronicity of pain in women with PFP. It was hypothesized that lower amplitude of VM H-reflex would be associated with higher pain level, lower self-reported physical function, and greater chronicity of pain.

Methods

Reporting of this cross-sectional study is in accordance with Strengthening the Reporting of Observational Studies in Epidemiology guideline recommendations. Participants were contacted through advertisements and flyers, distributed in fitness centers, public places for physical activity, and universities. The study was approved by the local ethics committee, and each participant provided written informed consent before participation.

List of abbreviations:

AKPS	Anterior Knee Pain Scale
Hmax	maximal Hoffmann reflex
H-reflex	Hoffmann reflex
ICC	intraclass correlation coefficient
Mmax	maximal motor wave
PFP	patellofemoral pain
VM	vastus medialis

Participants

Fifteen women with unilateral PFP aged 18 to 35 years were recruited. The characteristics of the sample are presented in table 1. Diagnosis of PFP was completed after consensus from 2 experienced clinicians (>5y experience) and on the basis of definitions used in previous studies.¹⁶⁻¹⁸ Participants needed to fulfill all the following criteria: (1) report unilateral symptoms of insidious onset and duration of at least 1 month; (2) peri- or retropatellar pain during at least 2 of the following activities: squatting, prolonged sitting, kneeling, running, jumping, and climbing stairs; and (3) worst pain level in the previous month: ≥ 3 cm on a 10-cm visual analog scale. Exclusion criteria were as follows: events of patellar subluxation or dislocation, lower limb inflammatory process, previous lower limb surgery, patellar tendon or meniscus tears, bursitis, ligament tears, or the presence of neurological diseases. Those who had received oral steroids, opiate treatment, acupuncture, physiotherapy, or any other treatment for pain during the preceding 6 months were also excluded from this study.

The Anterior Knee Pain Scale (AKPS) was completed by all participants.¹⁹ The AKPS is a 13-item questionnaire that evaluates subjective symptoms and functional limitations associated with PFP. The questionnaire score ranges from 0 to 100, with the maximum total score of 100 indicating no disability. This tool has been validated for individuals with PFP and has been reported to demonstrate high test-retest reliability.²⁰ Next, all participants were asked to report their PFP symptom duration in months to evaluate the chronicity of pain in each participant.

H-reflex stimulation and recording

Electromyograms were recorded using round-shaped adhesive surface electrodes (Ag/AgCl electrodes [Medi-Trace],^a 0.8cm in diameter, with an interelectrode distance of 2cm) applied in the bipolar configuration over the VM muscle. The electrodes were placed distally at the longitudinal axis of the femur in line with orientation of the VM fibers, 2cm distally to the motor point in the direction of the muscle belly.⁹ The electromyographic signals were amplified (final gain of 1000 \times) and filtered (fourth-order Butterworth filter with cutoff frequencies set at 5 and 2000Hz) using the MSC 1000 V3 system,^b with a common rejection mode ratio of >130dB, an input impedance of 10G Ω , and a signal-to-noise ratio of <3 μ V RMS. Signals were sent to an analog to digital interface^c with a 5-kHz sampling rate, and data were stored in hard disk for later off-line processing.

Table 1 Characteristics of the participants

Variable	Value
Age (y)	22.07 \pm 3.17
Body mass (kg)	55.73 \pm 4.48
Height (m)	1.64 \pm 0.06
Hmax/Mmax ratio	0.12 \pm 0.06
Worst pain level in the previous month (scored by the VAS)	4.80 \pm 0.40
Self-reported functional status (scored by the AKPS)	77.00 \pm 5.69
Average duration of the symptoms (mo)	66.20 \pm 12.51

NOTE. Values are mean \pm SD.

Abbreviation: VAS, visual analog scale.

Download English Version:

<https://daneshyari.com/en/article/5677589>

Download Persian Version:

<https://daneshyari.com/article/5677589>

[Daneshyari.com](https://daneshyari.com)