Reduced knee-extensor torque steadiness and higher motor unit discharge rate variability in individuals with patellofemoral pain

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It has been hypothesized that one of the main causes for patellofemoral pain is higher activation of the vastus lateralis (VL) compared to the vastus medialis (VM) muscle.

This difference in activation, likely induces a lateral shift of the patella (Powers 2017).

However, this observation is not consistent across all studies, possibly due to the limitations of conventional electromyographic (EMG) methods (Martinez-Valdes 2018).

**AIM**

To assess muscle activation and motor unit behaviour during isometric knee extensions in individuals with PFP and asymptomatic control subjects (CONT) using high-density surface electromyography (HDEMG).
Introduction

- 10 control (CONT) participants: 6 m/4 w, age: 26.3±5.5 y
- 10 individuals with PFP: 6 m/4 w, age: 23.1±5.0 y
- KUJALA score: 80.7±9.1/100

Methods

Visual torque-matching targets

<table>
<thead>
<tr>
<th>MVC Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>10% MVC</td>
<td>30°</td>
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<tr>
<td>30% MVC</td>
<td>50°</td>
</tr>
<tr>
<td>50% MVC</td>
<td>300°</td>
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<tr>
<td>70% MVC</td>
<td>500°</td>
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HDEMG motor unit decomposition

Outcome measures:

Pain intensity (NRS), torque steadiness, mean discharge rate and discharge rate variability (coefficient of variation for the inter-spike interval, CoVisi).
CONTROL

Torque (10% MVC, CoV FORCE: 3.2%)

CoV discharge rate: 3.2%

PFP

Torque (10% MVC, CoV FORCE: 5.0%)

CoV discharge rate: 5.0%
• Despite previous reports showing that individuals with PFP have higher activation of the VL muscle compared to the VM, we did not observe notable differences in motor unit behaviour between groups.

• The decreased torque steadiness in conjunction with higher motor unit discharge rate variability (CoVisi), suggests that PFP is associated with a reduced ability to control muscle torque.

• This suggests that the rehabilitation of people with PFP should aim to improve control of exerted knee-extension force/torque rather than focusing on facilitation of a specific muscle (e.g. higher activation of VM).
THANK YOU!

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