FOCAL KNEE JOINT COOLING FACILITATES QUADRICEPS ACTIVATION IN HEALTHY SUBJECTS
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**Context:** Focal knee joint cooling has been reported to facilitate the motor neuron pool excitability of inhibited quadriceps. Research has not determined if joint cooling will increase the ability to activate motor neurons as assessed by area under the EMG spectral curve ($f$EMG) during dynamic activities, such as a knee extension task.

**Objective:** Our objective was to compare vastus lateralis (VL) and rectus femoris (RF) $f$EMG during maximal voluntary isometric contraction (MVIC) of knee extension before and after 20-minutes of focal knee joint cooling in healthy subjects.

**Design:** A cross-over design was used.

**Setting:** The study was conducted in the university laboratory setting.

**Participants:** Eleven healthy volunteers (6m/5f, age=25±5yrs; ht=171±10cm, mass=77±21kg) were included in the analysis.

**Interventions:** Subjects participated in 2 counterbalanced sessions, which were completed 3 - 14 days apart, and consisted of 20-minutes of knee joint cooling or no intervention (control session). The joint cooling intervention consisted of two 1.5L ice bags applied to the anterior and posterior aspects of the knee joint for 20-minutes. During the control session, subjects sat quietly between the baseline and 20-minute measurements.

**Main Outcome Measures:** The outcome measure was $f$EMG (Baseline, 20, 30 and 45 minutes post initial intervention application), determined by extracting a 15ms epoch of EMG signal during a MVIC. The EMG time domain data were transformed into the frequency domain using a Fast Fourier Transformation. The area under the spectral frequency curve was used to estimate motor neuron activation.

**Results:** There were significant main effects for time ($F_{2,20}= 7.27, p=.004$), and condition ($F_{1,10} = 8.75, P=.014$) for the VL muscle only. Post hoc t-tests revealed that change scores for VL $f$EMG were significantly greater in the joint cooling session than the control session at 20-minutes (10.69±13.2 vs. -16.00 ±24.00; $t_{10} = 2.609, P=.026$) and 45-minutes post cryotherapy (2.76±19.28 vs. -24.06±27.88; $t_{10} = 3.234, P=.009$) and trended towards being higher at 30 – minutes post intervention (7.39±18.46 vs. -9.26±20.41; $t_{10} = 1.976, P=.076$).

**Conclusions:** The measure of $f$EMG represents the individual motor neurons that are active, therefore we interpret the increase in the $f$EMG as an increase in the amount of motor neurons involved in performing the task increases. We conclude that a 20-minute knee joint cooling intervention facilitates the VL motor neuron pool at 20 and 45 minutes post initial intervention application, and possibly at 30 – minutes, in a healthy population.

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