

## Research Abstract

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**Research Article:** A Menthol Counterirritant Does Not Facilitate The Quadriceps Motoneuron Pool In Healthy Subjects

A Menthol Counterirritant Does Not Facilitate The Quadriceps Motoneuron Pool In Healthy Subjects

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Context: Cryotherapy has been reported to facilitate motoneuron pool excitability in inhibited and healthy subjects. Cryotherapy induced motoneuron pool facilitation has been theorized to be due to stimulation of thermoreceptors surrounding a joint. It is unknown whether menthol counterirritants, which also stimulate thermoreceptors, have the same effect on motoneuron pool excitability. Objective: To compare quadriceps motoneuron pool excitability following a menthol counterirritant application to the anterior knee, a sham counterirritant application, and a control treatment in healthy subjects. Design: A blinded, randomized controlled trial. Setting: A controlled laboratory. Participants: Thirty healthy, subjects (16 males, 14 females; age=  $24.1 \pm 3.9$ ; height =  $170.6 \pm 11.4$  cm; mass =  $72.1 \pm 15.6$  kg) with no history of lower extremity surgery volunteered for this study. Intervention: The independent variables included treatment group and time. Subjects were randomly assigned to 1 of 3 groups including menthol application, sham menthol application, or control. The sham product, manufactured specifically for this study, was of similar texture and smell but did not contain menthol. Approximately 2 mL of the menthol or sham counterirritant was lightly massaged into the skin of the anterior knee for approximately 1 minute by a certified athletic trainer, while subjects in the control group sat quietly for 1 minute. A towel was then applied to the top of the knee to blind the investigator to the treatment. Measurements were taken at 5 separate times including baseline, 5, 15, 25 and 35 minutes post initial treatment application. A 3x5 repeated measures, mixed model ANOVA was used to determine group differences over time, with an a priori level of  $P < .05$ . Main Outcome Measures: The Hmax:Mmax ratios of the vastus medialis were used to estimate motoneuron pool excitability of the quadriceps at baseline, 5, 15, 25 and 35 minutes post initial application. Results: Hmax:Mmax ratios for all groups significantly decreased over time ( $F_{4,108} = 10.52$ ,  $P < .001$ ) (menthol: baseline =  $.32 \pm .20$ , 5min=.29  $\pm .18$ , 15min=.27  $\pm .18$ , 25min=.28  $\pm .19$ , 35min=.27  $\pm .18$ ; sham: baseline =  $.46 \pm .26$ , 5min=.36  $\pm .20$ , 15min=.35  $\pm .19$ , 25min=.35  $\pm .20$ , 35min=.34  $\pm .18$ ; control:baseline= $48 \pm .32$ , 5min=.37  $\pm .27$ , 15min=.37  $\pm .27$ , 25min=.37  $\pm .29$ , 35min=.35  $\pm .28$ ). There were no significant differences ( $F_{2, 27} = 0.62$ ,  $P = .55$ ) in Hmax:Mmax ratios between groups or a significant group x time interaction ( $F_{8,108} = .65$ ,  $p = .74$ ,  $1-\hat{\alpha} = .29$ ). Conclusions: Menthol did not have a facilitory effect on the quadriceps motoneuron pool excitability of healthy subjects over time. It is possible that increased motoneuron pool excitability reported following cryotherapy is not only caused by stimulated thermoreceptors, but also by mechanoreceptor stimulation not associated with menthol application.

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