

## The Effects of Combined Topical Menthol and Ice on Distal Blood Flow

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The purpose of this study is to compare radial artery blood flow at 1, 5, 10, 15 and 20 minutes during the application the right forearm of one of four conditions 1) 3.5 ml menthol (3.5 %), 2) .5 Kg of ice, 3) 3.5 ml of menthol (3.5%) and .5 Kg of ice, 4) control of no treatment. 18 healthy young (mean age = 25.70±3.98years height = 68.67±3.7inches, weight=175.50±45.70) adults (male 61%, female 39%) volunteered to participate in trial which involved four data collection sessions separated by at least 48 hours. Prior to undergoing any data collection session all subjects completed a written informed consent and a familiarization trial in order to acquaint them with the data collection protocols. Data collection consisted of measuring the right radial artery diameter (cm), blood flow (ml/min) through the right radial artery, and heart rate (b/min) prior to the application of any treatment (baseline) and again at 1, 5, 10 15 & 20 minutes following treatment application. A subjective measure of intensity of the treatment (0=none, 10=worst possible) was also assessed at 1, 5, 10 15 & 20 minutes following the application of the three treatments. Radial artery diameter and blood flow was assessed using a Doppler ultra sound. Heart rate was assessed by palpating the contralateral radial artery for one minute. Each data collection session involved application of one of four randomly applied treatments to the subject's right forearm. Repeated measures ANOVA with treatment, time and interaction of treatment and time was used to determine any within, between or interaction effects of the treatments on the outcome measures. Significant main or interaction effects were addressed further through calculating Fischer's Least Significant Differences to detect differences between the treatment/time means ( $p < .05$ ). This analysis indicated that

heart rate and radial artery diameter did not significantly change within or between groups from their pretreatment baseline measures over the course of data collection. Blood flow indicated a significant treatment, time and interaction effect. The control condition did not change blood flow over the duration of the trial. All three treatments resulted in significant declines in blood flow at 1, 5, 10 and 15 minutes following application of the respective therapy with peaks in blood flow reductions being 26% in the menthol treatment, 28% in the ice treatment and 40% in the combined menthol and ice treatment. At the 20 minute data collection point both the ice and combination treatment demonstrated reduced blood flow compared to baseline while the blood flow under the menthol treatment was not different between baseline and the 20 minute data collection points. At the 5, 10, 15 and 20 minute data collection points the blood flow of the combination treatment was also significantly lower than the menthol treatment. Intensity of the treatment also indicated a significant treatment, time and interaction effect. The menthol and ice treatments produced similar patterns in reducing blood flow at all data collection points. The intensity of the menthol treatment was significantly less than the ice and the combination treatment at 1 minute following application. The ice remained of a higher intensity than the menthol at the 5 minute data collection point only while the intensity of combination treatment was not different in intensity than the menthol at the 10, 15 or 20 minutes data collection points. These findings indicate that menthol has a significant effect at reducing peripheral blood flow distal to application similar to that of ice and that combining ice with menthol may have a potentiating effect on reducing blood flow over using menthol alone. The perceived intensity of menthol alone was significantly less than ice or menthol combined with ice during the initial phases of treatment.