

A comparison of two formulations of Biofreeze on blood flow and vascular responses to exercise

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Our previous studies have demonstrated that a topical gel containing 3.5% menthol (Biofreeze®) can have a significant effect on reducing arterial blood flow^{1,2} similar to ice therapy³ even following an acute bout of muscular contraction.⁴ Since the formulary of this topical application of menthol was recently modified by the manufacture the purpose of this study is to compare blood flow and vascular responses to exercise following an application Biofreeze®, with the new formulary, Biofreeze II®.

18 (9 males and 9 females) healthy adults, 22.44 (SD + 1.95) years of age with an average BMI of 23.97 (SD+ 3.88) were recruited. After providing informed consent subjects were scheduled for two data collection appointments each separated by at least 5 days. The data collection protocol was the same at each data collection appointment except that the ordering of Biofreeze® and Biofreeze II® was randomized between the two appointments. At each appointment the subject's heart rate, brachial artery blood flow (ml/min) and brachial artery diameter were measured on the right side using a General Electric 3 Ultrasound Doppler and perceptions of intensity were measured a total of five times. These data were collected at baseline (T1) and 5 minutes after one of the two treatments were applied (T2) to the subject's right upper arm. Immediately following this second data collection the subject completed 5 maximum hand grips on the right side using a

handgrip dynamometer (Lafayette Instrument, Lafayette, IN). Immediately following this exercise (T3) and then at 2 (T4) and 4 (T5) minutes following the exercise data were again collected.

Results: Comparisons over time and between the treatment conditions were conducted at three different points in the protocol. When comparing baseline (T1) with 5 minutes post intervention (T2) there were no changes in heart rate or vessel diameter under either treatment condition. Only Biofreeze II® exhibited a significant decline in blood flow (-22.6%) which was not different than declines in flow under Biofreeze® (-21.8%). Flow and vessel diameter significantly increased with the Biofreeze® condition (492% and 3.4% respectively) between T2 and T3 as a result of the exercise but not to a level greater than the nonsignificant increases in flow and diameter measured under the influence of Biofreeze II® (356% and 2.0% respectively). When comparing data collected at the three post exercise points (T3, T4, T5) no significant differences in were detected in flow or diameter between the Biofreeze® and Biofreeze II® conditions.

Conclusions: The Biofreeze® and Biofreezell® conditions resulted in similar reductions in blood flow and vascular responses to exercise. Although the statistical interpretation indicated that Biofreezell® resulted in significant declines in blood flow and a dampened vascular response to exercise. These results must be interpreted cautiously due to the low statistical power resulting from a small heterogeneous sample.