

## **Peripheral Heating with Negative Pressure Increases Arterial Blood Flow**

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### **ABSTRACT**

Over half (53%) of adults in the United States have some form of diabetes. Traditional treatments have been inadequate in stopping this epidemic suggesting the need for novel therapies. Peripheral heating with negative pressure has previously been shown to reduce blood glucose. The mechanisms behind this effect are unknown but may be related to changes in blood flow to the treated extremity. **PURPOSE:** To examine changes in flow rate (time averaged mean velocity (TAMV)), vessel cross-sectional area (CSA), and blood flow in the popliteal artery before and during peripheral heating with negative pressure applied to the feet. **METHODS:** Measures of TAMV, CSA, and blood flow were obtained from the left and right popliteal artery of participants using an ultrasound doppler (Philips CX50, General Electric, USA) before and during peripheral heating with negative pressure. Heat (42°C) was applied to the sole of the feet and negative pressure (-75 mmHg) applied from the feet to the top of the calves while participants remained seated. Vessels were matched for pre and post measures using anatomical landmarks and vessel diameter. Blood flow was calculated as TAMV \* CSA. Data are presented as mean (SD) and were analyzed with paired two-sided t-tests. **RESULTS:** Participants' (N=8, 4 men and 4 women) demographics are as follows: age: 26.5 (6.1) years; height: 177.7 (9.0) cm; BMI: 25.5 (3.9) kg/m<sup>2</sup>; body fat: 18.9 (5.7) %. From baseline to during the intervention, TAMV increased 22.3% from 13.0 (13.4) to 16.0 (16.5) cm/sec, p=.059 and 24.7% from 10.5 (10.7) to 13.0 (13.3) cm/sec, p=.067; CSA increased 9.7% from 0.42 (0.34) to 0.46 (0.39) cm<sup>2</sup>, p=.247, and 10.4% from 0.65 (0.62) to 0.72 (0.70) cm<sup>2</sup>, p=.122; and blood flow increased 32.3% from 5.2 (3.1) to 7.0 (4.0) mL/sec, p=.115 and 29.5% from 7.2 (7.3) to 9.3 (7.4) mL/sec, p=.032, in the left and right popliteal arteries respectively. **CONCLUSION:** In this pilot study, applying heat and negative pressure to the feet increased arterial blood flow largely by increasing flow rate with lesser changes to vessel CSA. Without reader blinding and assurance that the same vessel and portion of said vessel were used for pre and post measures, these results should be considered exploratory and interpreted with caution.