

Relative Contribution of Cardiac and Peripheral Blood Flow to Blood Pressure in Humans: The Role of Metaboreceptors

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ABSTRACT

The autonomic nervous system plays an essential role during exercise by adjusting cardiac output (CO) and redistribution of peripheral blood flows. One primary mechanism responsible for such alterations is the exercise pressor reflex (EPR), a feedback mechanism from contracting muscles via mechano- and metaboreceptor activation. The EPR adjusts the circulation by evoking reflex increases in sympathetic outflow to the heart and the vasculature, eventually increasing blood pressure (BP) during exercise. Previous studies suggested that relative contribution of cardiac and peripheral blood flow to regulate BP may depend on various factors (e.g., sex, health status). Thus, we thought to investigate if one of such factors, such as sex, influences CO, blood flow, and BP responses mediated by metaboreceptor activation. **PURPOSE:** To determine the role of sex on central and peripheral mechanisms how metaboreceptor-mediated pressor responses are different. **METHODS:** A total of 16 young adults completed the study. HR from ECG, beat to beat arterial BP from Finapres, and stroke volume (SV) from Modelflow, were continuously measured during baseline, 2 minutes of handgrip exercise at 35% of maximal contraction, 2 minutes of occlusion on exercising arm (postexercise ischemia; PEI), and recovery. Diameter, velocity, and flow of the femoral artery (FBF) were measured using Doppler ultrasound throughout the experiment. CO and TVC were calculated as $CO=HR \times SV$ and $TVC=CO/Mean\ BP$, respectively. **RESULTS:** While both sexes increased mean BP from rest to exercise, men had augmented pressor response ($\Delta 11.1 \pm 1.4$ men vs. $\Delta 6.1 \pm 1.3$ women, $p < 0.05$, mmHg). Mean BP stayed elevated during PEI compared to exercise in both groups ($\Delta -1.9 \pm 0.9$ men vs. $\Delta 0.9 \pm 1.2$ women, mmHg). HR and CO decreased significantly to PEI from exercise in men ($\Delta -7.2 \pm 0.9$ bpm, $\Delta -0.43 \pm 0.13$ L/min); however, HR and CO stayed similar from exercise to PEI in women ($\Delta -2.4 \pm 1.9$ bpm, $\Delta -0.07 \pm 0.20$ L/min). FBF did not change from rest to PEI in men ($\Delta 22.5 \pm 40.1$ mL/min); however, there was a tendency to increase in FBF in women ($\Delta 98.1 \pm 63.7$ mL/min). **CONCLUSION:** The augmented pressor response mediated by metaboreceptors in men appears to be due to less cardiac and more peripheral contributions. No changes in blood flow to the non-contracting limb during PEI and higher peripheral resistance could be why BP stayed elevated in men.

This work is supported by National Institute of Health, National Institute of General Medical Sciences Grant (SC2GM144165 to A.K. Jensen)