

The Mechanism Underlying the Hypotensive Effect of Isometric Handgrip Training: Is it Cardiac Output Mediated?

Sarah-Anne E. Hanik¹, Yasina B. Somani¹, Anthony W. Baross², Ian L. Swaine³, Kevin J. Milne¹, Cheri L. McGowan¹

¹Department of Kinesiology, Faculty of Human Kinetics, University of Windsor,
Windsor, ON, Canada, N9B 3P4

²Department of Sport and Exercise Physiology, University of Northampton,
Northampton, United Kingdom, NN2 7AL

³Department of Sports and Exercise Science, Canterbury Christ Church University,
Canterbury, Kent, United Kingdom, CT1 1QU

Isometric handgrip (IHG) training lowers blood pressure (BP) in normotensive individuals yet the mechanisms remain equivocal, and some evidence suggests that men and women respond differently to training. To date, non-sex specific mechanisms influencing total peripheral resistance, either in response to a single IHG bout or with training, have been a primary research focus, and the effects of acute and chronic IHG on cardiac output (Q) in either sex are under-explored. The purpose of the current study was two-fold: 1) to investigate the effects of IHG training (4, 2-minute sustained bilateral isometric contractions at 30% of maximal contraction, 1-minute rest between, 3X/week for 10 weeks) on resting Q, and 2) to examine the Q response to an IHG bout, and the effects of training on this response. Resting BP (Dinamap Carescape v100, Critikon) was measured after 10 minutes of seated rest in twenty-two normotensive participants (10 women; mean age= 24 ± 5.0 years). To assess Q, aortic root diameter (ARD; 3S-RS probe; Vivid I, GE Healthcare), velocity-timed integral (VTI; P2D probe; Vivid I), and HR (Dinamap) were measured pre- and post- an IHG bout. Both variables were re-assessed post-training. Reductions in resting systolic BP of a similar magnitude ($p > 0.05$) were observed in both men (2.4 ± 6.2 mmHg) and women (2.9 ± 4.6 mmHg) following 10 weeks of training ($p = 0.04$). This was accompanied by reductions in resting Q ($p = 0.007$) in both men (6.6 ± 2.2 to 6.3 ± 1.8 L/min) and women (5.8 ± 0.7 to 5.1 ± 0.8 L/min) and reductions in HR ($p = 0.036$), both of which were similar between sexes (all $p > 0.05$). In both groups, no changes in Q were observed in response to an IHG bout, and this response was similar pre- and post- training (all $p > 0.05$). In conclusion, resting Q is reduced with training, potentially implicating it as a mechanism of post-training BP reductions. The acute response to an IHG bout remains unchanged with training.