

Peripheral and Cerebral Arterial Hemodynamic and Mechanical Responses to a Maximal Oxygen Consumption Exercise Test in Males and Females

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ABSTRACT

Variations in physiological responses to exercise between males and females have been identified by previous investigations. Maximal oxygen consumption tests (VO_{2max}) are widely used for exercise prescription within the professional and recreational capacity, in addition to providing insight of overall cardiovascular and pulmonary health. However, the specific response of multiple components of the arterial network have yet to be established and compared within males and females. **PURPOSE:** To determine the hemodynamic and mechanical responses of the brachial artery (BA), the common carotid artery (CCA), and the internal carotid artery (ICA) to VO_{2max} . **METHODS:** College-aged (22.5 ± 3.1 yrs) males ($n=13$) and females ($n=16$) who were free from cardiovascular risk factors performed a VO_{2max} . BA, CCA and ICA peak systolic velocity (PS), end-diastolic velocity (ED), time-averaged maximal velocity (TAMAX), time-averaged mean velocity (TAMEAN), pulsatility index (PI), and average diameter (DIAM) were captured in the supine position by Doppler ultrasound before and within 10 minutes of the cessation of exercise. Arterial stiffness index (β), Peterson's Elastic Modulus (Ep), distensibility (DISTEN), and compliance (AC) were also calculated. **RESULTS:** Males demonstrated higher VO_{2max} than females ($p=0.03$). Males presented higher BR DIAM ($p<0.001$), BR β ($p=0.047$), CCA PS ($p=0.004$), CCA ED ($p=0.003$), CCA β ($p=0.013$), and ICA PI ($p=0.024$) when compared with females at baseline. Males showed increased BA ED, ($p<0.001$), BA TAMAX ($p=0.01$), BA TAMEAN ($p=0.01$), BA Ep ($p=0.007$) CCA PS ($p=0.031$). These changes were also observed in females ($p<0.05$ for all), with the addition of increased BA PS ($p=0.007$), CCA ED ($p=0.024$), CCA TAMAX ($p=0.001$), CCA TAMEAN ($p=0.012$), CCA PI ($p=0.014$), ICA PI ($p=0.01$), and reduced BA PI ($p=0.044$). No interactions between sex and arterial response were evident in any hemodynamic and stiffness measure ($p>0.05$ for all). **CONCLUSION:** Hemodynamic changes are evident in peripheral and cerebral arteries following VO_{2max} in males and females, with no apparent sex difference in response. BA Ep increased in both groups following exercise which indicate the peripheral vessels are susceptible to varying stiffness magnitudes which are not evident in the CCA or ICA. PI reduced in the BA and increase in CCA and ICA within the female group, suggesting increased resistance within the cerebral network following VO_{2max} .