

Hemodynamic and Mechanical Responses in the Brachial, Common Carotid, and Internal Carotid Arteries to a Maximal Strength Test in Males and Females

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ABSTRACT

Maximal voluntary contraction during an exercise test elicits robust sympathetic output in response to the physiological stress that is associated with maximal strength testing. The one-repetition maximum test (1RM) is a validated method to assess muscular strength, with varying responses between males and females. However, the vascular response of such testing in males and females is not clear. **PURPOSE:** To determine the hemodynamic and mechanical responses of the brachial (BA), common carotid (CCA), and internal carotid (ICA) arteries following a 1RM in males and females. **METHODS:** College-aged (22.5 ± 3.1 yrs) males ($n=13$) and females ($n=16$) who were free from cardiovascular risk factors performed a leg 1RM via seated leg press. CCA 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 leg strength than females ($p<0.001$). Males showed higher BA Ep ($p=0.001$), BA DIAM ($p<0.001$), and CCA PS ($p=0.023$) when compared with females. Higher BA PI ($p=0.021$), ICA ED ($p=0.025$), ICA TAMAX ($p=0.006$), and TAMEAN ($p=0.001$) were evident in females when compared with males. Following 1RM, males increased BA ED ($p=0.022$), TAMAX ($p=0.042$), and TAMEAN ($p=0.043$). Females also increased BA ED ($p=0.014$), TAMAX ($p=0.034$), and TAMEAN ($p=0.031$). Increased in CCA β ($p=0.008$), CCA Ep ($p=0.038$) and reductions in CCA AC ($p=0.037$) were observed in males, with no change in any stiffness parameters evident in females across all arteries ($p>0.05$ for all). No interactions were observed for any hemodynamic ($p>0.05$ for all) or stiffness measure ($p>0.05$ for all). **CONCLUSION:** Comparable hemodynamic responses between males and females are evident in peripheral and cerebral arteries following 1RM. Changes in CCA stiffness parameters were evident in males but not females which may be reflected in the higher 1RM values observed.