

No Gender Effect on Cerebral Blood Flow Hemodynamics During Post-Exercise Hyperthermia

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ABSTRACT

Females have greater orthostatic intolerance and increased adrenergic sensitivity to passive heat stress compared to males. It is unknown how cerebral blood flow is affected during post-exercise recovery from exercise heat stress. **PURPOSE:** We tested the hypothesis that females would have lower middle cerebral artery blood flow velocity ($MCAv^{mean}$) during recovery from exercise hyperthermia. **METHODS:** Twenty-two healthy active adult (7 day activity: 8620 ± 3008 steps/day; VO_{2max} : 49 ± 10 mL/kg/min) subjects (11M/11F, 22.4 ± 4.9 y, 169 ± 7.55 cm, 68.3 ± 13 kg) exercised at a similar metabolic heat production (M: 7.1 ± 1.5 W/kg and F: 6.9 ± 1.4 W/kg; $P=0.32$) for 60 minutes (cycle ergometer) in cool (24 ± 0.0 °C; 14.4 ± 3.6 %Rh) and hot (42.3 ± 0.2 °C; 27.9 ± 5.5 %Rh) conditions in random order with a 7 day washout. During 1-hour recovery post-exercise, Transcranial Doppler examined $MCAv^{mean}$, pulsatility index (PI) and intracranial pressure (ICP). Systemic vascular responses for mean arterial pressure (MAP), augmentation index (Alx), pulse wave velocity (PWV), systemic vascular resistance (SVR), and changes in intestinal temperature (ΔT_{in}) and heart rate (ΔHR) were measured during 1-hour recovery. Area under the curve (AUC) for each variable were analyzed using a mixed model 2-way repeated-measures analysis of variance for interaction (I) and main effects (ME) for Condition x Sex. Data are reported in means \pm SD and Alpha priori was set at $P < 0.05$. **RESULTS:** Exercise thermal (ΔT_{in} , Cool: $\Delta 0.5 \pm 0.1$ °C, Hot: $\Delta 1.5 \pm 0.6$ °C; ME: Condition; $P < 0.0001$) and cardiovascular strain (ΔHR Cool: 58 ± 15 b/min, Hot: 71 ± 15 b/min; ME: Condition; $P < 0.01$) was similar between groups that increased in hot compared to cool condition. During recovery both sexes had a similar AUC $MCAv^{mean}$, that was lower in hot compared to cool (ME: Condition; $P < 0.03$). Females showed reduced stiffness (AUC PWV and Alx) compared to males (ME: Condition; $P < 0.0001$; ME: Sex, $P < 0.0008$). Females had greater AUC SVR compared to males in both conditions (ME: sex; $P < 0.01$). There were no differences for MAP, PI, or ICP between the Condition or Sex. **CONCLUSION:** These data suggest that no sex difference exists for $MCAv^{mean}$ during recovery from exercise hyperthermia; however, both sexes had lower $MCAv^{mean}$ in hot compared to cool conditions. Nonetheless, the peripheral vascular mechanisms for this attenuation may differ as females have lower arterial stiffness and higher SVR.