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Sex Differences in Aortic Stiffness, 24-hour Aortic Blood Pressure, and Cardiac Deformation in Marathon Runners

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Endurance exercise reduces risk for cardiovascular disease. Excessive endurance exercise may be detrimental to cardiovascular health. Interestingly, these detrimental cardiac adaptations may be more prevalent in male marathoners. Sex differences in the effect of marathons on cardiac function may be related to differences in aortic stiffness. **PURPOSE:** 1) Examine sex differences in cardiovascular function; 2) Explore associations between aortic stiffness and cardiac function in marathoners. **METHODS:** Sixteen experienced marathoners had peak aerobic capacity, aortic stiffness, and cardiac function measured on 3 separate days. Aortic stiffness was measured as carotid-femoral Pulse-Wave Velocity (cfPWV) obtained using applanation tonometry. An ambulatory oscillometric blood pressure cuff was used to measure 24-hr systolic blood pressure (BP). Cardiac function was measured using 3-dimensional deformation echocardiography (3DE). Left ventricular (LV), longitudinal, circumferential, area, and radial strain were used as indices of cardiac function. **RESULTS:** cfPWV and 24-hr systolic BP were higher and 3DE longitudinal and area strain were lower in males compared to females ($p < 0.05$). cfPWV was associated with longitudinal ($r = 0.58$, $p = 0.04$), circumferential ($r = 0.71$, $p = 0.01$), area ($r = 0.66$, $p = 0.01$), and radial strain ($r = -0.66$, $p = 0.02$). **CONCLUSIONS:** Among marathoners, males have higher aortic stiffness and lower cardiac function when compared to females. Higher aortic stiffness may be associated with lower cardiac function in experienced marathoners.

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Table 1	Males (n=7)	Females (n=9)	p-value
Age (years)	45±4	43±3	0.53
VO ₂ max (ml/kg/min)	52.8±11.8	47±6.2	0.27
Resting Heart Rate (bpm)	52±7	56±9	0.31
Body Mass Index (kg/m ²)	29±5	22±3	0.00
Body Fat (%)	20.7±10	23±6	0.59
cfPWV (m/s)	8.1±1.0	6.5±1.2	0.02
Brachial 24-hr Systolic BP (mmHg)	124±4	112±7	0.01
Aortic 24-hr Systolic BP (mmHg)	113±4	104±8	0.05
3DE Longitudinal Strain (%)	-10±5	-16±4	0.04
3DE Circumferential Strain (%)	-11.3±4.2	-15.6±4.3	0.10
3DE Area Strain (%)	-18.8±7.1	-26.9±6.3	0.05
3DE Radial Strain (%)	29.2±12.2	46.0±17.1	0.07

Significance level, $p < 0.05$. cfPWV, Carotid-femoral Pulse Wave Velocity; BP, Blood Pressure; 3DE, 3-dimensional Echocardiography