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Effect of Aerobic Exercise on Artery Stiffness and Cerebrovascular Pulsatility in Hypertensive and Non-Hypertensive Adults

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Large elastic arteries (i.e. aorta, carotid) buffer pulsatile hemodynamics by dampening changes in pressure and flow. Stiffer central arteries, as seen in hypertension, transmit greater pulsatile hemodynamics into fragile cerebral vessels. Aerobic exercise is recommended for hypertensives (HTN), but its effects on artery stiffness and pulsatility in this group are unclear. **PURPOSE**: Investigate the effect of acute aerobic exercise on artery stiffness and cerebrovascular pulsatility in HTN and non-HTN adults. **METHODS**: 30 medicated HTN and 30 age, sex, and body mass index (BMI)-matched non-HTN adults (56±6 yrs, BMI 28.2±2.9 kg/m^2; 32 men) underwent hemodynamic measures pre and 10 min post a 30-min cycling bout (55% peak oxygen consumption). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cf PWV) and carotid artery (CA) stiffness was assessed with PWV-β via Ultrasound. Aortic mean (MP) and pulse pressure (PP; via radial generalized transfer function), and CA PP were measured by tonometry. CA and middle cerebral artery (MCA) blood velocity pulsatility index (PI) were measured using Doppler. **RESULTS**: cf PWV, MCA PI and CA PI increased post exercise compared to pre in both groups ($p<0.05$), while aortic MP, PP, and CA PP, PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other significant group or interaction effects were detected. **CONCLUSIONS**: Acute aerobic exercise increases aortic stiffness and cerebrovascular hemodynamic pulsatility in both non-HTN and HTN individuals. These data suggest medicated-HTN have similar vascular responses to early recovery from acute aerobic exercise as non-HTN.

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Table 1: Arterial stiffness and hemodynamic pulsatility pre/post acute exercise in non-HTN and HTN subjects.

	non-HTN		HTN		Effects		
Measure	Pre	Post	Pre	Post	G	T	GxT
Aorta							
Mean pressure, mmHg	91±8	92±7	96±10	95±9	0.047	0.531	0.136
Pulse pressure, mmHg	33±9	32±7	33±7	30±7	0.175	0.005	0.595
cf PWV, m/s	7.9±1.1	8.1±0.9	8.2±1.3	8.7±1.5	0.081	0.001	0.221
Carotid artery							
Pulse pressure, mmHg	37±10	36±8	37±8	35±8	0.816	0.070	0.888
Blood velocity PI	1.43±0.34	1.49±0.34	1.34±0.26	1.42±0.26	0.356	0.001	0.530
PWV-β, m/s	6.3±1	6.3±0.9	6.6±1.3	6.8±1.5	0.209	0.204	0.602
Middle cerebral artery							
Blood velocity PI	0.78±0.12	0.82±0.12	0.76±0.11	0.78±0.11	0.314	0.003	0.513

HTN, hypertensive; cf, carotid-femoral; PWV, pulse wave velocity; PI, pulsatility index; G, group; T, time; GxT, group-by-time interaction.