Changes in Cerebrovascular Pulsatility during Aerobic Exercise Are Unrelated to Brachial-Ankle Pulse Wave Velocity in Chronic Stroke

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Arterial stiffness contributes to increased cerebral hemodynamic pulsatility and independently predicts negative outcomes post-stroke. Exercise can contribute towards recovery after stroke, yet it is unclear whether arterial stiffness influences acute cerebrovascular responses to exercise. One study in healthy young men showed high-intensity resistance exercise increased stiffness and pressure pulsatility up to 30 minutes post-exercise without affecting cerebral hemodynamics (1). The influence during acute aerobic exercise, however, is unknown.

Objectives: To investigate the association of arterial stiffness with changes in pulse pressure (PP) and middle cerebral artery pulsatility index (PI) during aerobic exercise in chronic stroke adults. We hypothesized that resting brachial-ankle pulse wave velocity (baPWV) would be associated with greater exercise-related increases in PP and PI.

Methods: Participants were recruited 3 to 12 months post-stroke. BaPWV was quantified using applanation tonometry. A symptom-limited cardiopulmonary assessment determined peak aerobic fitness ($\dot{V}O_{2peak}$). In a subsequent session, participants cycled on a recumbent ergometer for 20 minutes at 60% heart rate reserve. Cerebral blood flow velocity was measured using transcranial ultrasound. Arterial blood pressure was measured using finger-cuff photoplethysmography.

Results: Preliminary results from 9 men and 2 women are reported (age: 68±9 years; $\dot{V}O_{2peak}$: 19±5 mL/kg/min; baPWV: 12.0±2.0 m/s). At rest, baPWV was not correlated with PP or PI (p>0.6). During exercise, PP and PI increased 22±11% and 44±21%, respectively (p≤0.001). A non-significant association was noted between ΔPI and ΔPP (r=0.68, p=0.096). Resting baPWV was unrelated to ΔPP (r=0.42, p=0.228) or ΔPI (r=-0.04, p=0.932).

Conclusions: BaPWV, an index of stiffness influenced by central and peripheral vasculature, was unrelated to blood pressure or cerebrovascular pulsatility in this small cohort. Change in cerebral blood flow pulsatility during moderate intensity exercise appears to be independent of systemic arterial stiffness, although a larger sample is still necessary.

References:

1. Lefferts WK *et al.* (2014) *Front. Physiol.* 5: 101.