

**Buffering of Carotid Artery Pressure and Flow Pulsatility during Cognitive Engagement in Healthy Adults**

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The matching of vascular supply to neuronal metabolic demand during cognitive engagement is known as neurovascular coupling (NVC). Excessive hemodynamic pulsatility may have a detrimental effect on neural function and affect NVC. Arterial stiffness is a prominent determinant of pulsatility in the brain.<sup>1,2</sup>

**OBJECTIVES:** We explored changes in arterial stiffness and cerebrovascular hemodynamic pulsatility during cognitive engagement in healthy adults.

**METHODS:** Twenty-seven adults (age 39 ± 3 yrs, BMI 24±1 kg/m<sup>2</sup>) underwent Doppler ultrasonography and applanation tonometry of the common carotid artery (CCA) to derive 1) CCA elastic modulus (Ep) and β-stiffness index; 2) CCA flow pulsatility index (PI); 3) CCA pulse pressure (PP), and 3) CCA augmentation index (AIx). Transcranial Doppler was used to assess cerebral PI at the middle cerebral artery (MCA). All measures were made simultaneously at rest and during a 4-minute Stroop task.

**RESULTS:** CCA PI was reduced (p<0.05) while MCA PI was unchanged (p>0.05) during Stroop. Brachial PP increased during Stroop (p<0.05) while CCA PP was unchanged (p>0.05). Similarly, CCA Ep (p>0.05) and β-stiffness (p>0.05) were unchanged. CCA AIx increased (p<0.05).

**CONCLUSION:** Carotid pressure pulsatility and cerebral flow pulsatility is unaltered while carotid flow pulsatility is reduced during cognitive engagement. Carotid stiffness does not change suggesting that factors other than the elastic properties of the vessel moderate cerebrovascular pulsatility during cognitive engagement.

**TABLE 1.** Hemodynamic and vascular parameters at rest and during Stroop task

Variable	Baseline	Stroop	p- value
Brachial Pulse Pressure, mmHg	43 ± 1	46 ± 1	0.002
Carotid Pulse Pressure, mmHg	36 ± 1	35 ± 1	0.324
Carotid β-Stiffness, aU	4.4 ± 0.4	4.2 ± 0.3	0.224
Carotid Ep, kPa	54.5 ± 5.5	53.8 ± 4.9	0.670
Carotid Pressure AIx, %	1 ± 4	13 ± 4	0.001
Carotid Distension AIx, %	4 ± 2	8 ± 2	0.001
Carotid Mean Diameter, mm	5.62 ± 0.13	5.74 ± 0.13	0.010
Carotid Pulsatility Index	1.75 ± 0.06	1.57 ± 0.06	0.016
Cerebral Pulsatility Index	0.75 ± 0.02	0.75 ± 0.01	0.841

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