Mid Atlantic Regional Chapter
of the
American College of Sports Medicine

Annual Scientific Meeting, November 5th- 6th, 2021
Conference Proceedings
International Journal of Exercise Science, Issue 9, Volume 10

Relation between middle cerebral artery pulsatility index and hippocampal tissue integrity in healthy adults

Faria Sanjana, Peyton L. Delgorio, Theodore M. DeConne, Curtis L. Johnson, Christopher R. Martens. University of Delaware, Newark, DE

Increasing evidence suggests that peripheral vascular dysfunction, including stiffening of large elastic arteries, contributes to age-related cognitive decline. Transmission of highly pulsatile pressure waves from the peripheral vasculature to the low-resistance cerebrovasculature is hypothesized to promote structural damage to the brain. In this regard, changes to neuronal tissue microstructural integrity of the hippocampus (HC), a brain structure essential for memory encoding, may reflect the impact of increased pulsatile blood flow through the middle cerebral artery (MCA). **PURPOSE:** To examine whether increased pulsatile blood flow within the MCA, assessed using Gosling's pulsatility index (PI) is associated with HC tissue integrity in adults across the lifespan. **METHODS:** Transcranial doppler ultrasound was used to measure basal MCA blood flow velocity (MCAv) in 25 healthy participants (16M/9F, mean age: 44±16 y; age range: 22-69 y; mean BMI: 27±5 kg/m^2; mean BP: 115±11/71±10 mmHg). PI was calculated as the difference between maximum MCAv and minimum MCAv (MCAv pulse amplitude) normalized to the mean MCAv. Tissue integrity was determined through the viscoelastic properties of the HC measured using magnetic resonance elastography (MRE). MRE data were acquired using a Siemens 3T Prisma MRI scanner to image shear waves generated via a pneumatic actuator (Resoundant, Rochester, MN) at 50 Hz. Bilateral HC stiffness (μ) was estimated from MRE displacement data using a nonlinear inversion algorithm. Associations between HC μ and cerebrovascular parameters, including PI and MCAv (mean and pulse amplitude), were assessed using linear regression correcting for age. **RESULTS:** PI was negatively associated with HC μ (R^2=0.31, P=0.004). There was no association between MCAv pulse amplitude and HC μ (R^2=0.002, P=0.84), though there was a trend towards a positive association of HC μ with mean MCAv (R^2=0.10, P=0.10). **CONCLUSION:** Greater pulsatility of cerebral blood flow is associated with lower HC tissue integrity, possibly reflecting damage to tissue that has to withstand pulsatile blood flow in the cerebrovasculature, which may result in late-life loss of cognitive function.

Supported by NIH Grants P20GM103653, P20GM113125, K01AG054731, R01AG058853