Central Artery Stiffness, Baroreflex Sensitivity, and Brain White Matter Integrity in Older Adults

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Central artery stiffness is associated with greater risk of white matter (WM) lesions and cognitive impairment in older adults, yet the pathophysiological mechanisms remain unclear. Stiffening of central elastic arteries impairs cardiovagal baroreflex, a neurogenic mechanism of short-term blood pressure regulation, and may increase the risk of cerebral hypoperfusion in deep and periventricular WM areas. **Objective**: To determine the associations among central artery stiffness, cardiovagal baroreflex sensitivity (BRS), and cerebral WM microstructural integrity in older adults. **Methods**: Fifty-four older adults (65±6 years) with normal cognitive function (n=18) or mild cognitive impairment (MCI, n=36) were tested. Carotid-femoral pulse wave velocity (cfPWV) via applanation tonometry, cardiovagal BRS via the Modified Oxford technique, and deep and periventricular WM tract integrity via diffusion tensor imaging were measured. Voxelwise and region of interest analyses were performed on fractional anisotropy (FA) and radial diffusivity (RD), indices of axonal integrity and demyelination respectively. **Results**: Participants with MCI showed lower memory and executive function performance whereas cfPWV, cardiovagal BRS, and WM tract integrity were not different from normal subjects. In the pooled data combining all subjects, cfPWV and cardiovagal BRS were inversely correlated (r=-0.34, P=0.01). Across WM, lower FA and higher RD were associated with increasing cfPWV and decreasing BRS with many of the regions showing overlap (Figure 1). Multiple linear regression analysis of FA and RD, including age, sex, and cognitive status as covariates, demonstrated independent contributions of cfPWV and cardiovagal BRS to posterior corona radiata, external capsule, and retrolenticular part of internal capsule. Furthermore, FA and RD measured from these regions were associated with executive function performance (Figure 2). **Conclusion**: Central arterial stiffness and lower cardiovagal BRS are independently associated with deep and periventricular WM microstructural integrity and contribute to executive function performance in older adults.

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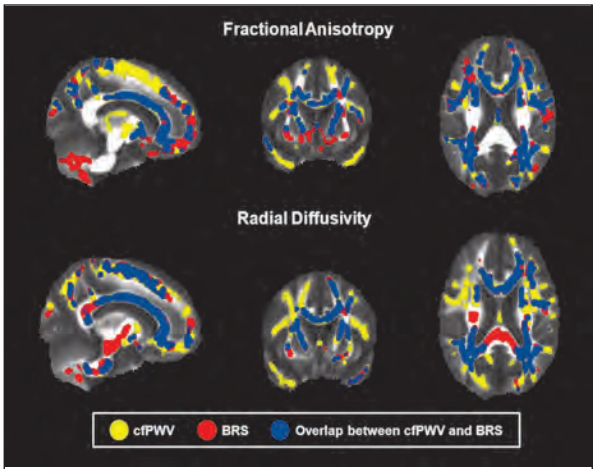

Figure 1: Tract-based spatial statistics maps displaying the regions of fractional anisotropy (FA) and radial diffusivity (RD) which showed associations with carotid-femoral pulse wave velocity (cfPWV) and cardiovagal baroreflex sensitivity (BRS). Lower FA and higher RD were associated with increasing cfPWV (yellow) and decreasing cardiovagal BRS (red). The blue areas represent the overlap where both cfPWV and cardiovagal BRS associated with FA and RD.

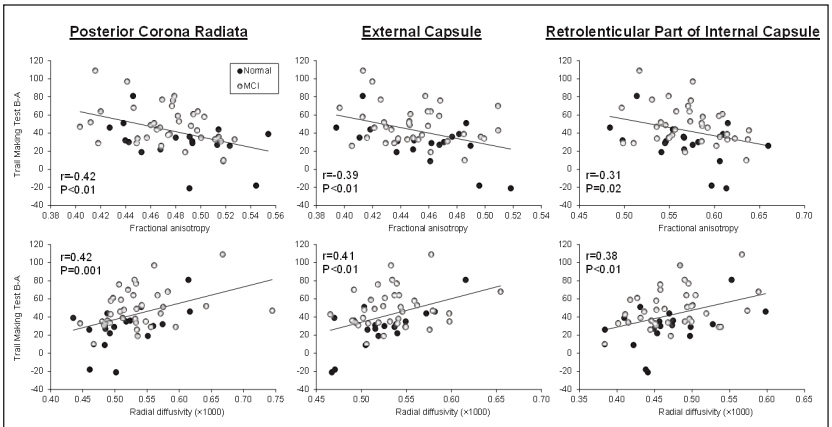

Figure 2: Pearson's product-moment correlation analysis of fractional anisotropy and radial diffusivity with executive function performance assessed by Trail Making Test part B minus A.