

Cerebrovascular Deficits And Cognitive Impairment In Elderly Patients With Long Covid

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Introduction

- Older adults with Long COVID commonly exhibit persistent cognitive deficits in attention, working memory, and processing speed¹
- Cognitive profiles overlap with vascular cognitive impairment and prodromal dementia syndromes
- Emerging evidence implicates cerebrovascular dysfunction (CBF/CVR) as a key pathophysiologic mechanism^{2,3}
- The network-level convergence of CBF and CVR abnormalities and their relationship to cognitive decline in aging populations remain poorly characterized⁴

Methods

Participants

- Cross-sectional study of adults aged ≥ 50 years with Long COVID (met criteria with persistent symptoms ≥ 3 months post-confirmed infection) and healthy controls
- Mean time since SARS-CoV-2 infection: 2.7 years
- CBF cohort:**
 - Long COVID (n = 60; mean age 60.1 ± 7.1 years; 90% female)
 - Controls (n = 79; mean age 62.0 ± 6.6 years; 78% female)
- CVR cohort:**
 - Long COVID (n = 72; mean age 60.9 ± 7.7 years; 79% female)
 - Controls (n = 61; mean age 62.1 ± 7.4 years; 66% female)

Measurement Techniques

- Arterial spin labeling MRI (CBF)
- Breath-hold fMRI (CVR)
- Voxel-wise and network-level analyses
- Standardized neuropsychological assessments

Key Findings

- Long COVID participants demonstrated **significantly lower global and regional CBF and CVR**
- Convergent deficits seen primarily within the **default mode network** and **dorsal attention system**
- Focal regional increases in CVR suggested compensatory vascular responses
- Long COVID participants showed **significant impairments in attention and working memory**
- Brain-behavior relationships remained significant after controlling for age, sex, and education level

Objectives

- Examine Cerebral Blood Flow and Cerebrovascular Reactivity in older Long-COVID patients and healthy controls via neuroimaging
- Analyze the relationship between cerebral perfusion and attention and memory

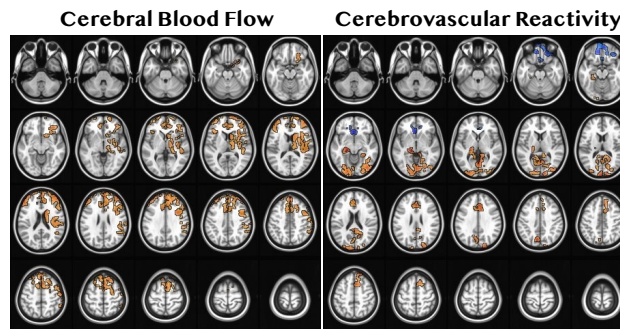


Figure 1. Reduced Cerebral Blood Flow and Cerebrovascular Reactivity in Older Adults with Long COVID. $p < 0.05$, corrected

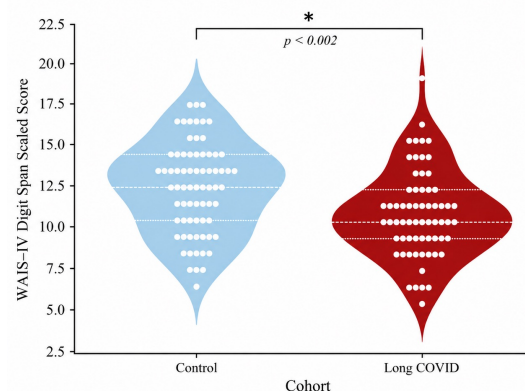


Figure 2. Reduced Attention and Working Memory Performance Among Older Adults With Long COVID. $p < 0.002$

CBF and Clinical Correlations

	Immediate Recall	Delayed Recall	Delayed Recognition	Physical Function	Pain
Dorsal Attention	0.32*	0.33*	0.33*	0.29	-0.29*
Ventral Attention	0.33*	0.34*	0.34*	0.35*	-0.37*
Limbic	0.32*	0.33*	0.33*	0.32*	-0.34*

Figure 3. Cross-correlation matrix showing associations between cerebral blood flow and clinical symptom severity. * $p < 0.05$

Conclusions

- Consistent with previous research, we found that CBF and CVR are lower in Long COVID compared to controls
- Affected cognitive domains map to executive control and attention-related brain networks
- Results support persistent microvascular abnormalities following mild COVID-19
- Given the global prevalence of mild COVID infections, population-level cognitive consequences are a major public health concern
- Future directions** include a longitudinal study using blood biomarkers to assess Long COVID imaging findings and potential increased Alzheimer's disease risk

References

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