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Correspondence: Ashni S. Persad, Fuller Theological Seminary, ashnipersad@fuller.edu

29 Vascular Burden Mediates the Relationship Between ADHD and Cognition in Older Adults

Brandy L. Callahan[1,2], Sara Becker[1,2], Joel Ramirez[3], Rebecca Taylor[3], Prathiba Shammi[3], Sandra E. Black[3,4]
[1]University of Calgary, Calgary, AB, Canada. [2]Hotchkiss Brain Institute, Calgary, AB, Canada. [3]Sunnybrook Health Sciences Centre, Toronto, ON, Canada. [4]University of Toronto, Toronto, ON, Canada

Objective: Accumulating evidence from case-control and population studies suggests attention-deficit/hyperactivity disorder (ADHD) confers a 2- to 5-fold risk of all-cause dementia later in life. Here, we investigate vascular burden as a potential mediator of this relationship, because vascular integrity is well known to be compromised in ADHD (due to chronic obesity, diabetes, and hypertension) and is also a robust risk factor for neurodegeneration (due to reduced cerebral blood flow). We use brain white matter hyperintensities (WMH) as a measure of vascular burden.
Participants and Methods: Thirty-nine adults aged 48-81 years with clinical ADHD, and 37 matched controls, completed neuropsychological testing and 1.5 T structural neuroimaging. None had stroke. Cognitive tests were demographically-adjusted to *Z* scores using regression-based norms generated from the control group, and averaged across tests within domains of short- and long-term verbal memory (forward digit span, California Verbal Learning Test, Logical Memory), visual memory (Visual Recognition, Rey Complex Figure), processing speed (coding, trails A, Stroop word-reading and color-naming), language (Boston Naming Test, semantic fluency), visuoconstruction (clock drawing, Rey Complex Figure copy), and executive function (backward digit span, trails B, phonemic fluency, Stroop inhibition, Wisconsin Card Sorting Test). Total WMH volumes (i.e., combined periventricular and deep) within subcortical, temporal, frontal, parietal, and occipital regions were individually divided by regional volumes to produce a proportion of each region representing WMH, then log-transformed to correct for skew. Age-corrected linear regression quantified total effects of ADHD on cognition; when these were significant, mediation models quantified the direct effects of ADHD on WMH volumes and the direct effect of WMH volumes on cognition. Sobel's test estimated indirect effects of ADHD on cognition via WMH.
Results: Group had a significant total effect on Processing Speed (β=-1.154, *p*<.001) and on Executive Functioning (β=-0.587, *p*=.004), where ADHD participants had lower composite scores (*M*=-1.10, *SD*=1.76 and *M*=-0.54, *SD*=1.14 respectively) than controls (*M*=0.02, *SD*=0.74; *M*=0.00, *SD*=0.49). Only frontal-lobe WMH had direct effects on Processing Speed (β=-0.315, *p*=.012) and Executive Functioning (β=-0.273, *p*<.001). The direct effect of ADHD on frontal WMH was significant (β=-0.734, *p*=.016), and Sobel's tests supported an indirect effect of ADHD on Executive Functioning

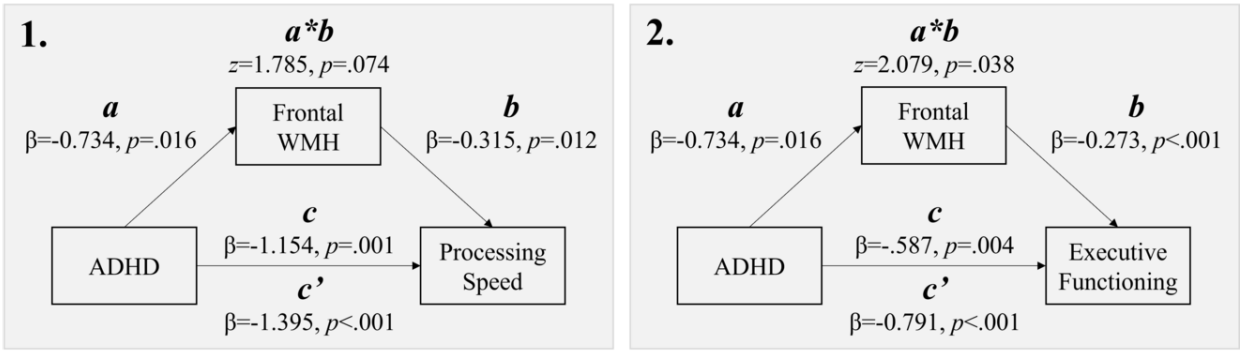

Figure 1. Mediation model depicting the role of frontal WMH volumes in the association between ADHD and processing speed (1) and executive functioning (2). The indirect effect of ADHD on cognition via WMH refers to path (a*b), and the direct effect (c') represents the effect of ADHD on cognition after controlling for WMH. The total effect (c) is the sum of the indirect (a*b) and direct (c') effects.

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(z=2.079, p=.038) but not Processing Speed (z=1.785, p=.074) via WMH. Because the effect of ADHD on WMH was negative (i.e., *fewer* WMH in ADHD) despite worse cognition than controls, we tested the a posteriori hypothesis that WMH burden may be relatively more deleterious for ADHD than controls. We found considerably stronger negative correlations between total WMH volumes and Processing Speed (r=-.423, p=.009) and Executive Functioning (r=-.528, p<.001) in the ADHD group than in controls (r=-.231, p=.175 and r=-.162, p=.346, respectively), even though total whole-brain proportion of WMH (M=0.15%, SD=0.27; Mann-Whitney U=430.0, p=.002) and frontal-lobe proportion of WMH volumes (M=0.33%, SD=0.51; Mann-Whitney U=464.0, p=.007) were lower in ADHD than in controls (M=0.29%, SD=0.42 and M=0.66%, SD=0.88, respectively).
Conclusions: WMH burden contributes significantly to the relationship between ADHD and cognition, but ADHD remains an independent contributor to worse processing speed and executive functioning in older adults. Vascular burden may have relatively more deleterious effects on cognition in ADHD, potentially due to decades of accumulated allostatic load, whereas healthy controls can accumulate greater amounts of WMH before cognition is impacted.

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Correspondence: Brandy L. Callahan, Department of Psychology, University of Calgary, Calgary (Alberta), Canada. brandy.callahan@ucalgary.ca

30 Examining the Bilingual Advantage in Executive Functioning in ADHD: A Retrospective Study

Collin Lee, Christy Hom
UC Irvine School of Medicine, Department of Psychiatry & Human Behavior, Orange, CA, USA

Objective: Several studies have found a bilingualism advantage on executive functioning tasks like cognitive flexibility, inhibitory control, switching, and working memory in typically developing populations. (Grote et al., 2015, Foy & Mann, 2014). However, some studies have found deficits in inhibitory control and switching for bilingual individuals with Attention Deficit/Hyperactivity Disorder (ADHD) compared to monolingual individuals and control groups (Bialystok et al., 2017, Mor et al., 2015). They suggest that this disadvantage is due to the burden of managing two language systems which perpetuates the executive dysfunction seen in ADHD. The current study aims to examine if there is a bilingualism advantage in other aspects of executive function, including inhibitory control, planning, problem solving, switching, and working memory among children and adults diagnosed with ADHD.
Participants and Methods: The medical records of 170 patients evaluated in an outpatient neuropsychology clinic from 2018-2022 were reviewed. Sixty participants diagnosed with ADHD, between the ages of 6 and 46 (61.67% male), comprised the final sample. Forty-one were monolingual and 19 were bilingual or multilingual. Language status was based upon patient or parental report. Outcomes on various direct and indirect measures of executive function were examined.
Results: Linear regression models, adjusting for age and sex, revealed a significant bilingual advantage on the following measures: Wechsler Intelligence Scale for Children- Fifth Edition (WISC-V) and Wechsler Adult Intelligence Scale - Fourth Edition (WAIS-IV) Digit Span Backwards and Digit Span Sequencing, WISC-V Picture Span, and Behavior Rating Inventory of Executive Function, 2nd Edition (BRIEF-2) Parent-Report Emotion Regulation Index (ERI). There were no significant differences in scores between monolinguals and bilinguals on the following measures: Delis-Kaplan Executive Function System (D-KEFS) Color-Word Interference Inhibition versus Combined Naming Contrast Score and Inhibition/Switching versus Inhibition Contrast Score, D-KEFS Trail Making Number-Letter Switching versus Combined Number Sequencing and Letter Sequencing Contrast Score, A Developmental Neuropsychological Assessment, 2nd Edition (NEPSY-2) Naming versus Inhibition Contrast Score and Switching versus Inhibition Contrast Score, Wisconsin Card Sort Task Learning to Learn Index, BRIEF-2 Parent-rated Behavioral Regulation Index (BRI), Cognitive Regulation Index(CRI), and Global Executive Composite(GEC), BRIEF-2 Self-rated BRI, ERI,

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