TACSM Abstract

The Relation Between Cognitive Function and Cerebral Vasodilatory Reactivity in Young Adults with Major Depressive Disorder

SALWA SHOAIB[1], RAUCHELLE E. RICHEY[1], SHERRI M. PHAM[1], JOHN D. AKINS[1], DAHLIA MUKHERJEE[2], ERIKA F.H. SAUNDERS[2], R. MATTHEW BROTHERS[1], and JODY L. GREANEY[1]

[1]Department of Kinesiology, The University of Texas at Arlington; Arlington, TX; [2]Department of Psychiatry, Penn State College of Medicine; Hershey, PA

Category: Undergraduate

Advisor / Mentor: Greaney, Jody (jody.greaney@uta.edu)

ABSTRACT

Major depressive disorder (MDD) has been associated with an elevated risk of developing neurocognitive diseases (e.g., dementia). Although the precise neurobiological mechanisms remain incompletely understood, cerebrovascular dysfunction is thought to directly contribute, at least in part, to impairments in cognitive function. Cerebral vasodilatory reactivity to a hypercapnic stimulus is blunted in older adults with MDD compared to age-matched non-depressed adults. Further, impaired cerebral vasodilation has been linked to reduced cognitive activity in older adults with depression. However, to date, limited studies have examined the relation between cognitive function and cerebrovascular function in otherwise healthy young adults with MDD. **PURPOSE**: We tested the hypothesis that greater hypercapnia-induced cerebral vasodilation would be related to greater fluid cognitive ability (i.e., the capacity to process and integrate new information) in young adults with MDD. **METHODS**: Ten adults with MDD (non-medicated; age: 22±2 yrs: body mass index: 22.8±4.5 kg/m^2; education level: all enrolled in a four-year university) participated. Cognitive function was assessed via the NIH Toolbox Cognitive Function Battery (iPad). A composite fluid cognitive ability score was derived from the specific tests within the battery that measure fluid ability [e.g., Flanker, Dimensional Change Cart Sort (DCCS)]; an age-correct standard T-score of 100 indicates ability that is average compared with national data. Beat-to-beat mean arterial pressure (MAP; finger photoplethysmography), middle cerebral artery blood velocity (MCAv; transcranial Doppler ultrasound), and end-tidal carbon dioxide concentration ($PETCO_2$; capnograph) were continuously measured during normocapnic baseline and during rebreathing-induced hypercapnia. The hypercapnia-induced ($\Delta PETCO_2$=9 mmHg) increase in cerebral vascular conductance index (ΔCVCi=MCAv/MAP) was used as an index of cerebral vasodilatory reactivity. **RESULTS**: Hypercapnia elicited an increase in CVCi in all subjects (mean: 30±12%; range: 18-60%). The age-corrected composite fluid cognitive ability standard score was 100±15 (range: 79-119). The increase in CVCi was not related to fluid cognitive ability (slope=-0.12±0.3; r^2=0.02, p=0.67). In addition, the increase in CVCi was not related to either the age-corrected standard score for the Flanker task (slope=-0.38±0.4; r^2=0.12, p=0.32) or for the DCCS task (slope=0.09±0.3; r^2=0.02, p=0.72), both of which specifically measure executive function. **CONCLUSION**: These preliminary data suggest that cerebral vasodilatory reactivity to a hypercapnic stimulus is not related to fluid cognitive function in otherwise healthy college-aged adults with MDD.