



Physical Activity as a Moderator of the Relationship Between Stress and Limbic Grey Matter in Older Adults

Sophia Weiner-Light¹, Samantha Walters¹, Nina Djukic¹, Michelle You¹, Devyn Cotter¹, Marie Altendahl¹, Corrina Fonseca¹, Yann Cobigo¹, Fanny Elahi¹, Adam Staffaroni¹, Cutter Lindbergh¹, Joel Kramer¹, Kaitlin Casaletto¹

¹ Memory and Aging Center, Department of Neurology, University of California, San Francisco

UCSF Weill Institute for
Neurosciences

Memory and
Aging Center

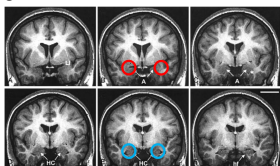
Background & Objectives

- Perceived stress is commonly associated with disrupted amygdalar and hippocampal networks
- Hippocampal and amygdalar atrophy commonly occurs in aging and may contribute to age-related changes in psychological health
- Physical activity may promote functioning of these brain regions and support psychological health
- Aim:** Explore the potential protective role of physical activity as a moderator of the relationship between perceived stress and grey matter volume in older adults

Methods

Study Design

• **Imaging:** Siemens Trio 3T MRI scanner



• **Grey Matter Regions of Interest (ROI):**

- Bilateral **amygdalar** volume
- Bilateral **hippocampal** volume
- Occipital volume (control region)

• *Analyses adjusted for total intracranial volume (TIV)*

• **Physical Activity:** Participants wore a Fitbit Flex 2 device for all waking hours (≥ 14 days), blinded to activity levels; total daily average steps and calories burned were calculated

- Total Daily Steps
- Total Daily Calories Burned

• **Perceived Stress Scale (PSS)**



Cohort Characteristics Mean (SD)

Participants	
N	34 typically-aging older adults (CDR = 0)
Age	74.8 (6.1)
Gender	59% female
Education	17.6 (1.8)
MMSE	29.1 (1.0)
BMI	25.2 (5.1)
Physical Activity	
Total daily steps	7,765.4 (4,233.2)
Total daily calories burned	1,847.2 (445.3)
Psychological Measures	
Perceived Stress Scale (PSS), Median (IQR)	8 (4, 14.25)

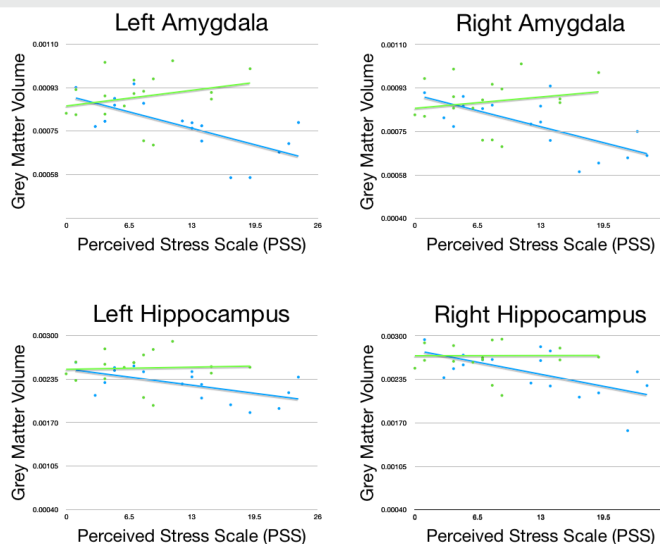
Correlation Results

Higher perceived stress was associated with smaller hippocampal and amygdalar volumes (β range= -0.28 to 0.36, $p < 0.03$)

Region of Interest	Perceived Stress Scale (β)
Left Amygdala	-0.29
Right Amygdala	-0.31
Left Hippocampus	-0.26
Right Hippocampus	-0.36

Perceived Stress x Calories Burned Interaction Results

- High PA
- Low PA



Results

- The relationship between perceived stress and grey matter volumes attenuated with increasing physical activity:
 - Average daily calories burned:
 - Left Amygdala ($\beta = 0.27, p = 0.04$)
 - Right Amygdala ($\beta = 0.33, p = 0.03$)
 - Left Hippocampus ($\beta = .16, p = 0.22$)
 - Right Hippocampus ($\beta = 0.29, p = 0.04$)
 - Average daily steps (β range= 0.15 to 0.23, $p > 0.26$)

Conclusions

- Our data provide early support for the protective role of physical activity on the relationship between perceived stress and limbic grey matter volume in typically aging adults
- Promoting higher intensity PA interventions aimed at burning more calories may support grey matter integrity among individuals reporting high stress, by way of weakening the relationship between stress and grey matter loss
- These results suggest a possible avenue by which to support psychological health, and thus brain health, in at-risk adults
- Future research should consider a longitudinal study design to examine within-person effects, to further corroborate the utilization of calorie-burning routines as protective against the negative effects of stress on cognition