



# Hippocampal Activity During Fear Extinction Recall is Linked to PTSD Symptoms in Healthy Controls

Samantha O. Goldberg, Rachel A. John, Amanda Hicks, Kayla Smith, Sonalee A. Joshi, James Abelson, Israel Liberzon, and Elizabeth R. Duval

Department of Psychiatry, University of Michigan Health System

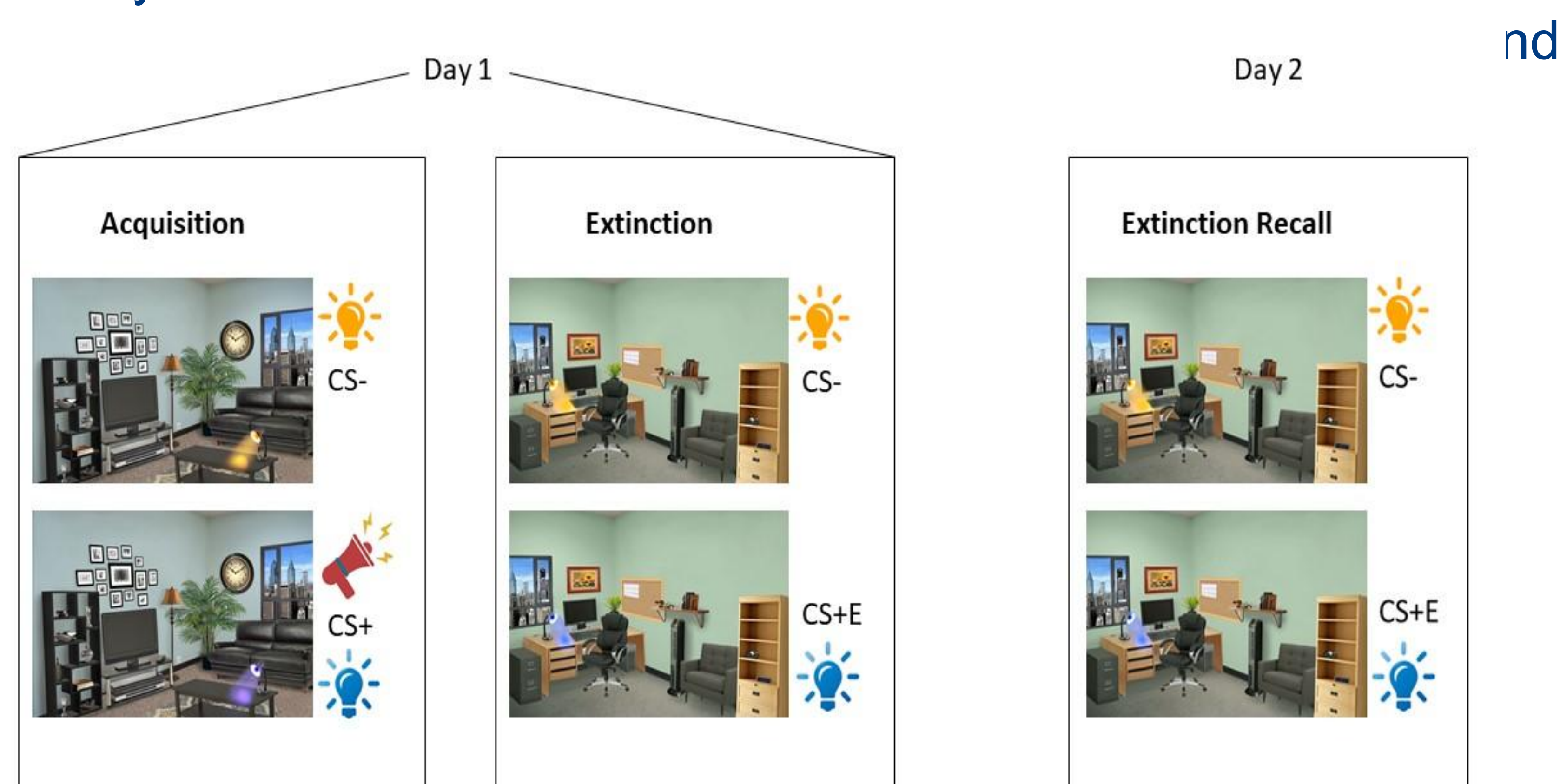
## Background

- Fear extinction recall (ER) is dependent on contextual memory, which allows modulation of fear to a potential threat, based on environmental information
  - Greater hippocampal activation is associated with better ER performance
  - Greater PTSD symptoms have been associated with lower hippocampal activation
- Healthy individuals who have experienced a traumatic event have displayed neural differences compared to those who have not experienced a traumatic event

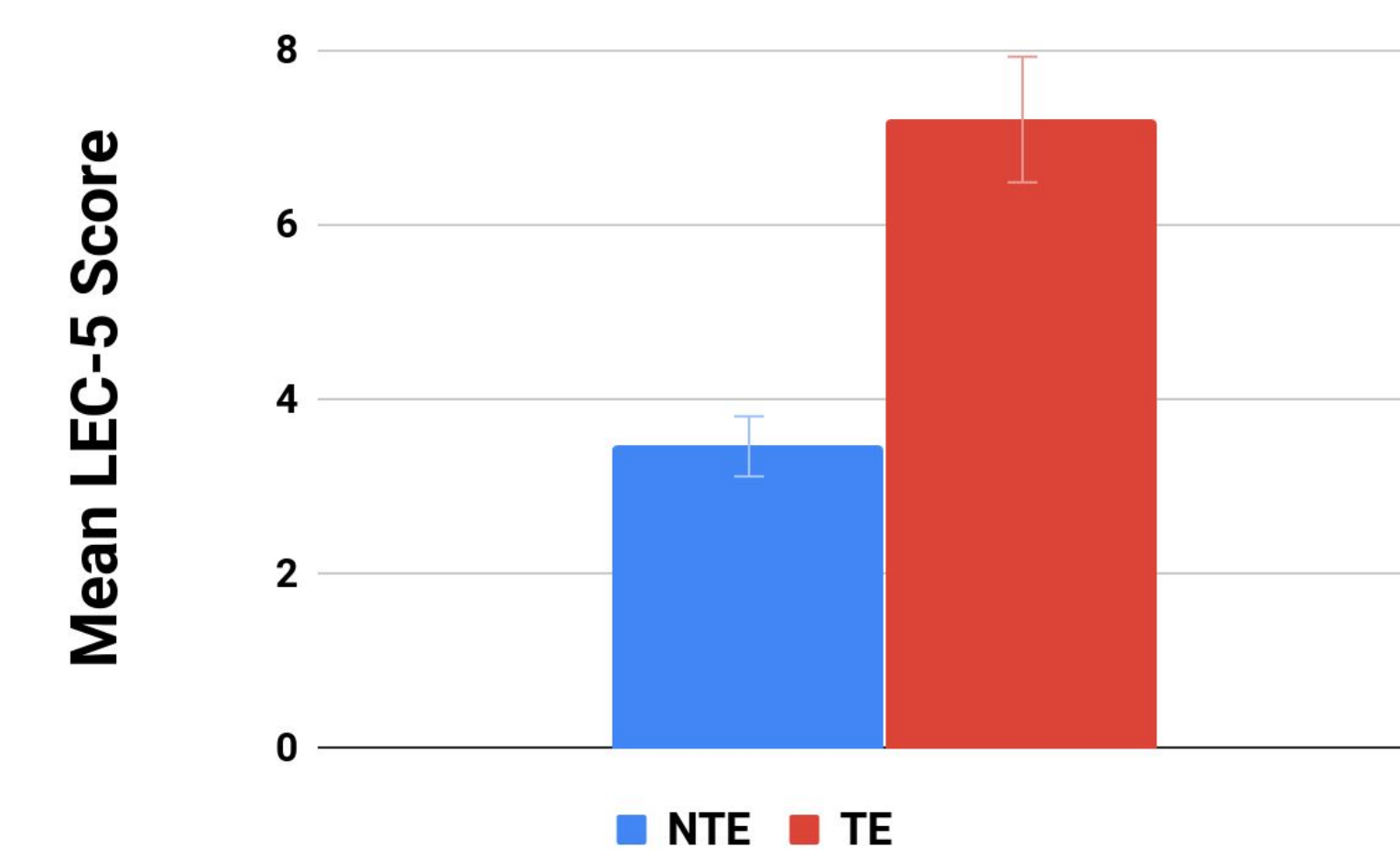
- **Purpose:** Examine relationships between hippocampal function and (1) performance during ER, (2) PTSD symptoms, and (3) differences related to trauma exposure in healthy individuals

## Method

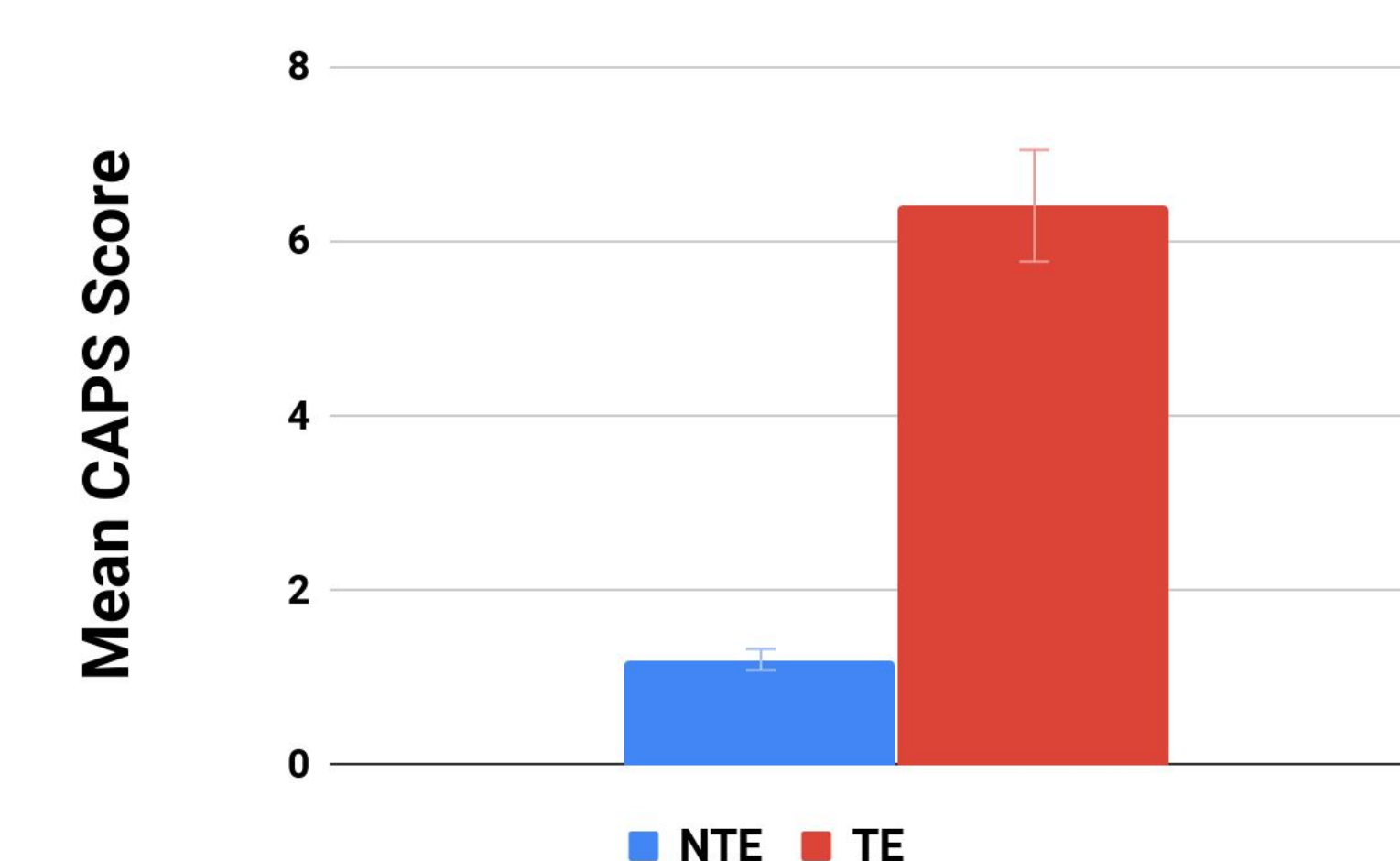
- 22 healthy individuals ( $M$  age = 29.14 ), 73% female
- 10 trauma exposed participants, 11 non-trauma exposed
- Stressful Event Assessment: Life Events Checklist for DSM-5 (LEC-5)
- PTSD Symptom Assessment: Clinician Administered PTSD Scale for DSM-5 (CAPS)
- fMRI to assess for hippocampal function during ER
- Expectancy ratings during extinction recall to assess extinction memory



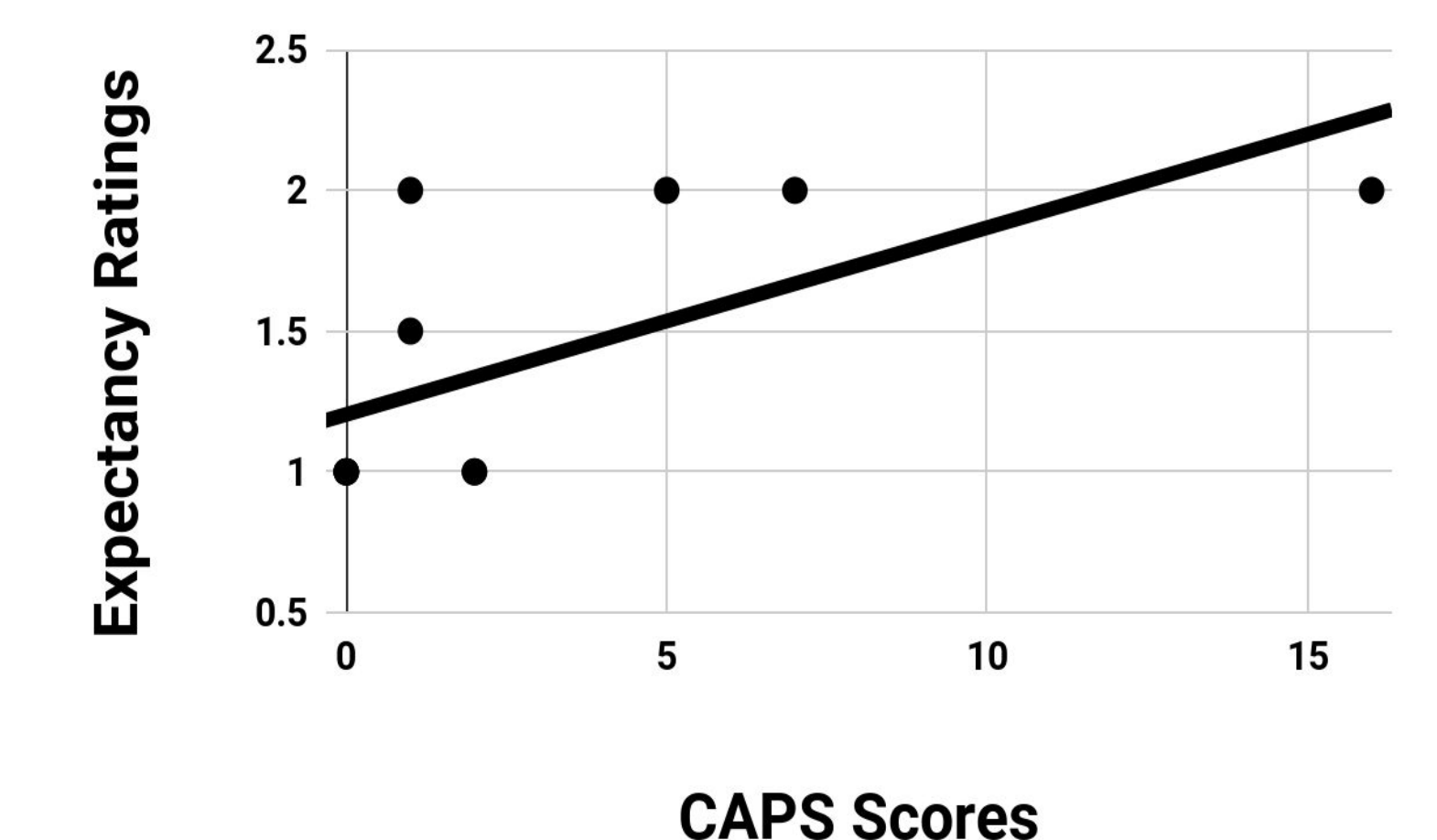
## Results



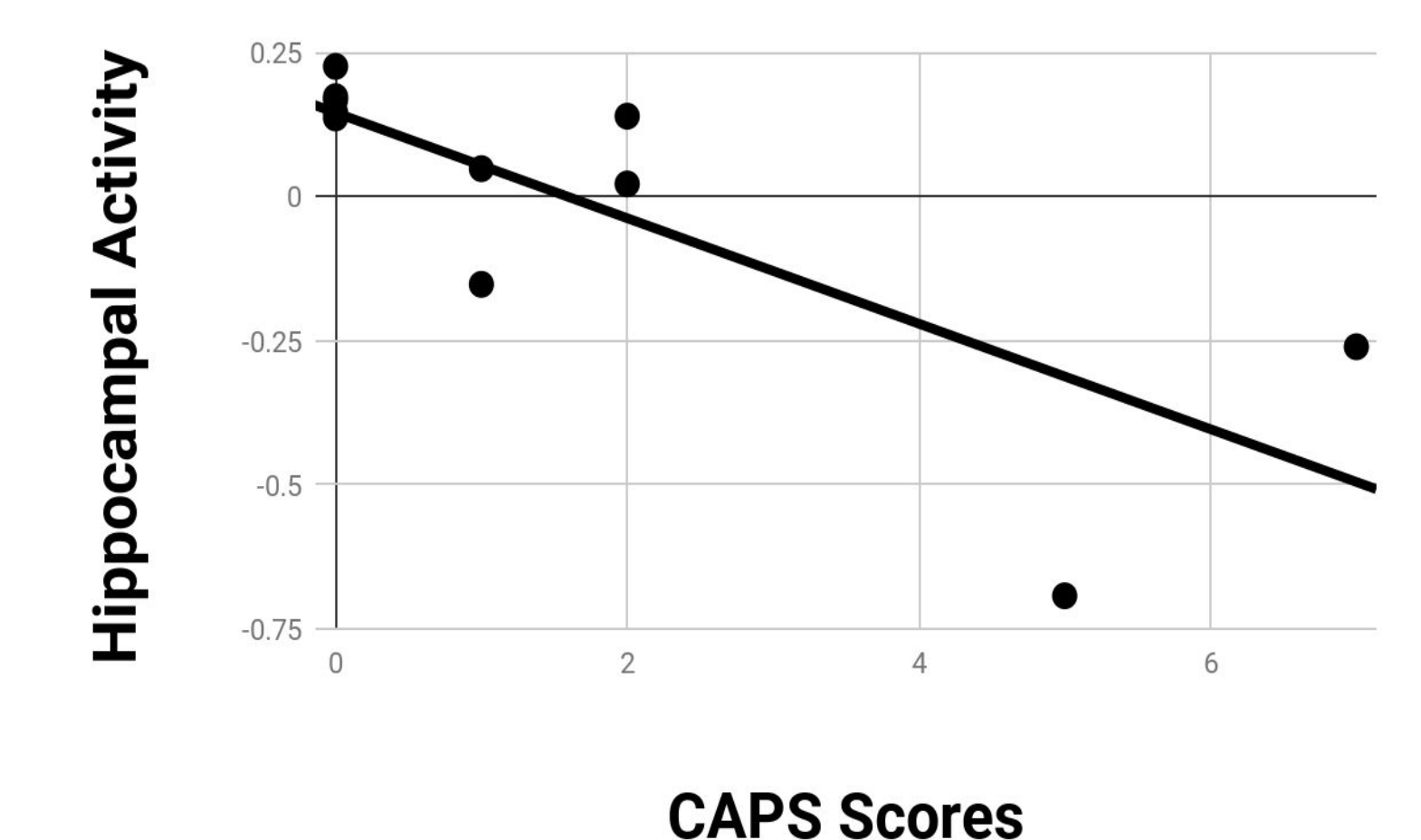
LEC-5 scores were higher in the TE group ( $M = 7.20$ ,  $SD = 4.42$ ) than the NTE group ( $M = 3.46$ ,  $SD = 1.64$ ),  $t(11.22) = -2.53$ ,  $p = 0.014$



CAPS scores were higher in the TE group ( $M = 6.40$ ,  $SD = 6.10$ ) than the NTE group ( $M = 1.09$ ,  $SD = 1.81$ );  $t(10.45) = -2.65$ ,  $p = 0.012$ .



CAPS scores were positively related to expectancy ratings  $r(9) = 0.31$ ,  $p < 0.028$



CAPS scores were negatively related to hippocampal activation  $r(9) = 0.178$ ,  $p < 0.004$ . There was a non-significant trend towards a group difference in hippocampal

## Summary

- TE healthy individuals reported both being exposed to more types of stressful events, and had higher PTSD scores than NTE participants, even though both groups were healthy
- Healthy individuals, even without ER deficits (all expectancy ratings were low), still exhibited relationships between ER and subclinical PTSD symptoms
- Ongoing data collection will examine relationships between ER and hippocampal function in PTSD
- Differentiating the brain effects of cumulative trauma exposure from the neurobiology of PTSD (and understanding their linkages) remains a central ongoing challenge of this

## Acknowledgments

- We thank Mike Angstadt for assistance with data processing and analysis, the National Institute of Mental Health (Duval: K23MH109762), and our research participants.