



Buffering the long-term effects of prenatal drug exposure (PDE): Early caregiving emotional environment is associated with memory performance & hippocampal volume in adolescents with a history of PDE

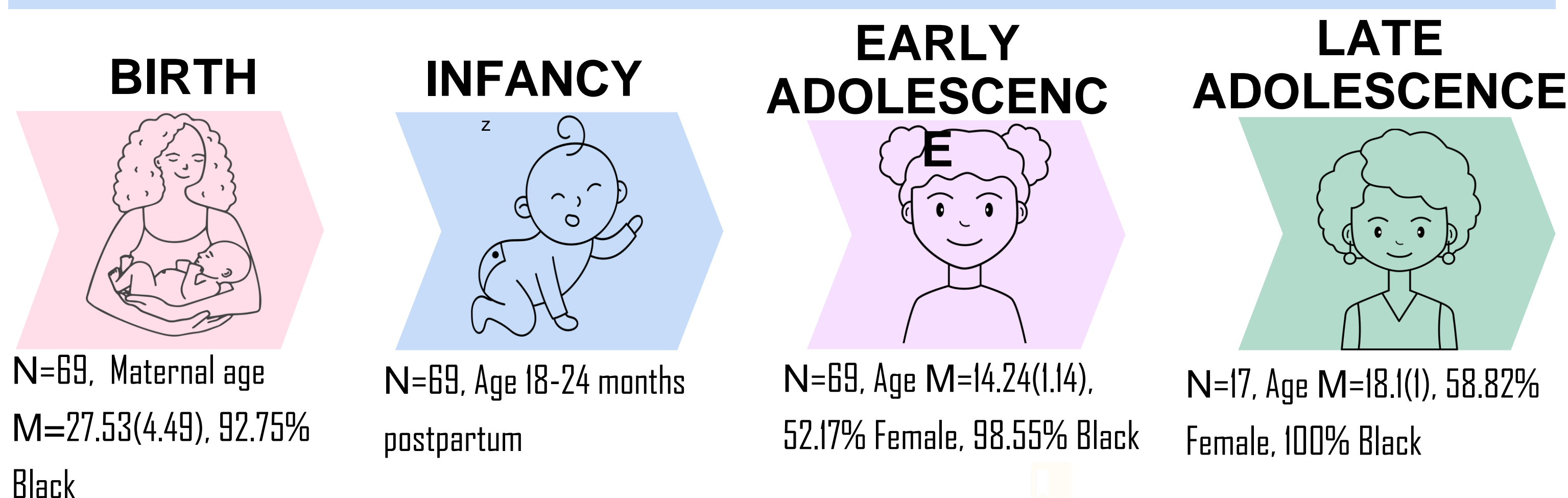
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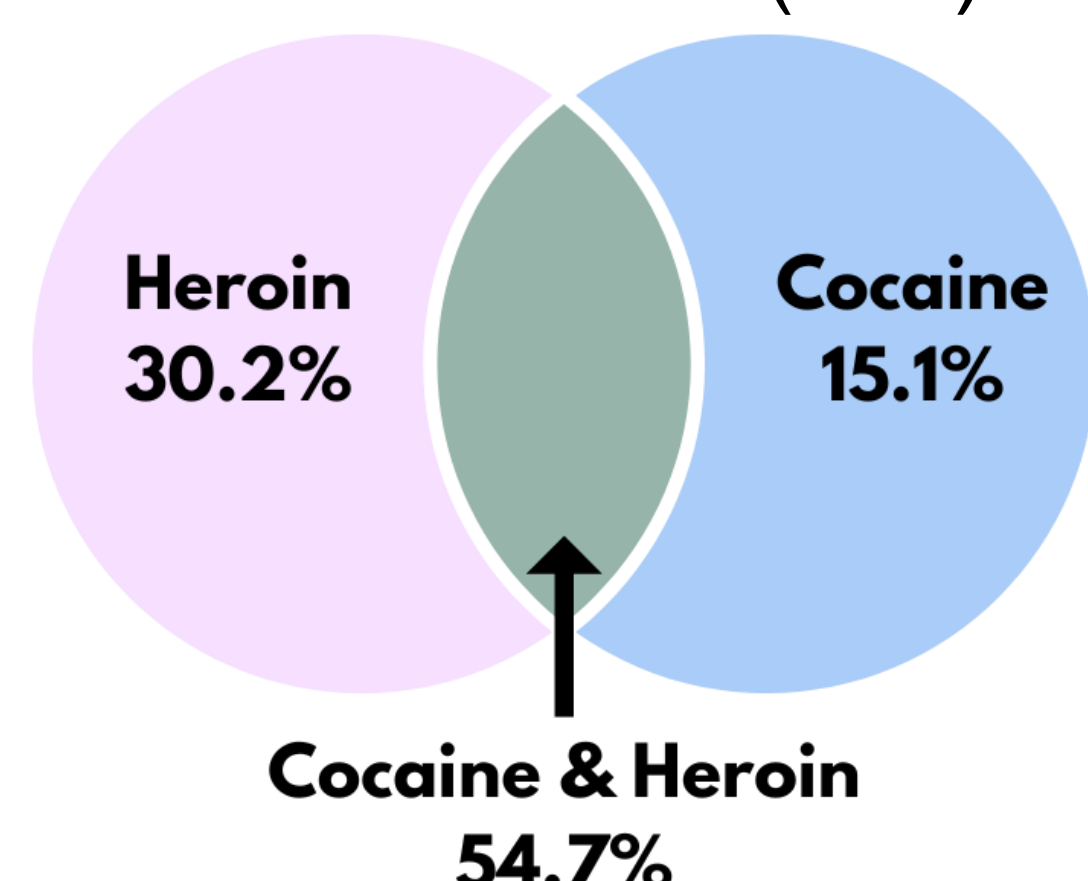
INTRODUCTION

- PDE (exposure to cocaine and/or heroin) is associated with adverse developmental outcomes across multiple domains.¹
- Potential sources of longitudinal variability include age, biological sex, and caregiving context.^{2,3,4}
- Postnatal and **family factors may account for 50% of differences** children's outcomes.^{5,6}
- Female sex may be protective** against adverse cognitive and behavioral outcomes.⁷
- Memory and its underlying neural correlates are particularly susceptible to pre- and postnatal stressors due to their **protracted development**.^{8,9,10}
- OBJECTIVE:** Leverage the longitudinal study of memory and hippocampal development to explore whether the caregiving emotional environment (CEE) and biological sex may modulate the impact of PDE.

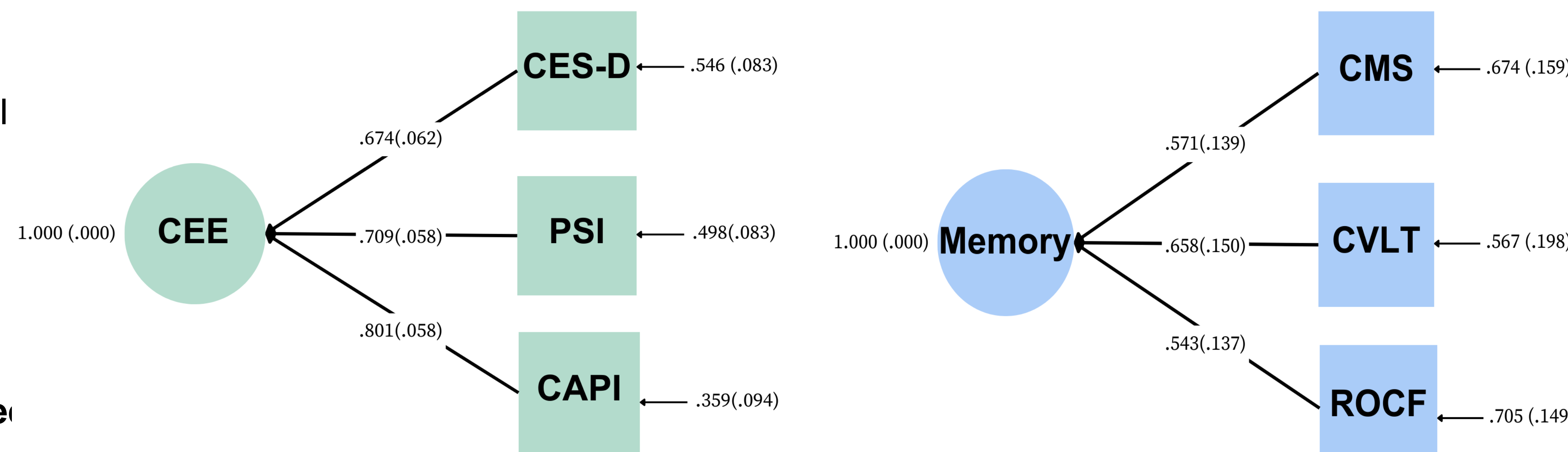
METHOD



- Infancy:** Mothers completed: Center for Epidemiological Studies Depression Scale (CES-D), Parenting Stress Index (PSI), and Child Abuse Potential Inventory (CAPI). Higher scores indicate greater depression, stress, and distress. Confirmatory factor analysis (CFA) was used to create a latent construct of Caregiver Emotional Environment (CEE), from these three measures.
- Early Adolescence:** Children completed the Wechsler Abbreviated Scale of Intelligence (WASI-II), the California Verbal Learning Test –Child Version (CVLT-C), the Child Memory Scales (CMS), and the Rey–Osterrieth Complex Figure (ROCF). Higher scores indicate better performance. CFA was used to create a latent construct of episodic memory from three memory measures.
- Early and Late Adolescence:** T1-weighted structural scan was acquired & processed in FreeSurfer v5.2. Volumes were adjusted for age, sex, and intracranial volume (ICV).

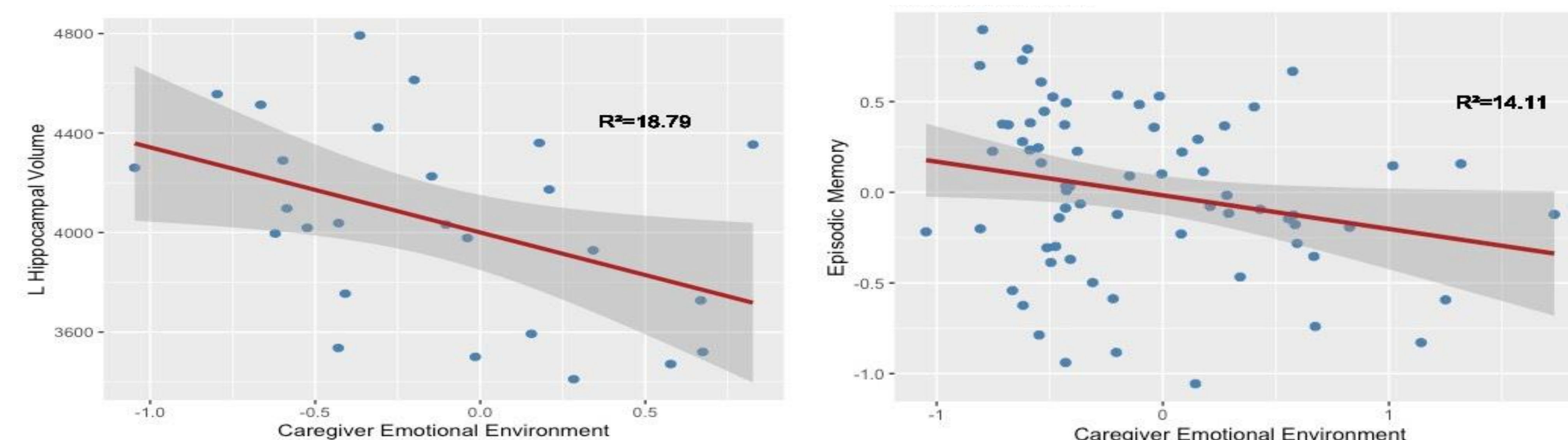


RESULTS



The measurement models were saturated. Standardized factor loadings were above .51 ($p < .001$).

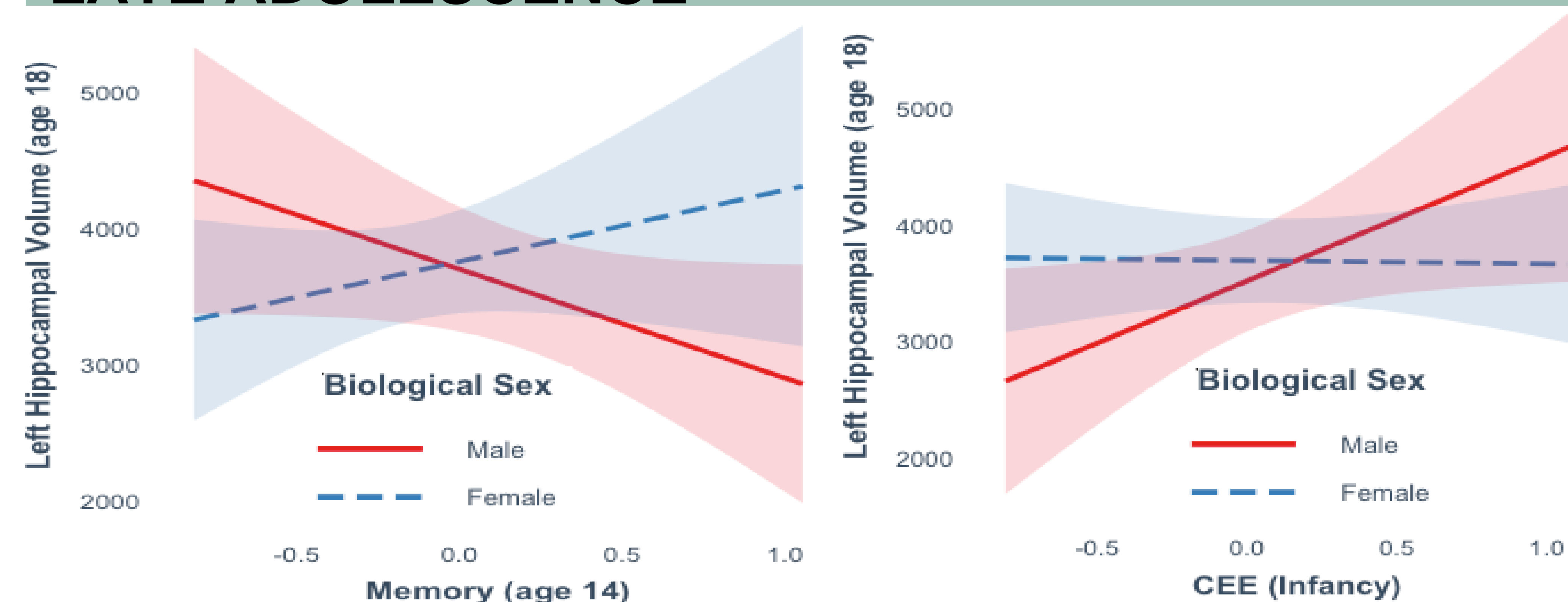
EARLY ADOLESCENCE



A CEE marked by distress was associated with smaller adjusted left hippocampal volume, $\beta = -342.17$, $t(24) = -2.36$, $p = .03$

A CEE marked by distress was associated with low memory scores when controlling for IQ, $\beta = -.18$, $t(64) = -.18$, $p = .04$

LATE ADOLESCENCE



Better memory was marginally associated with smaller hippocampal volumes in males ($\beta = 800.12$, $p = .07$), but not females ($\beta = 526.23$, $p = .25$)

A CEE marked by distress was associated with larger left hippocampal volumes in males ($\beta = 1068.34$, $p = .04$), but not in females ($\beta = -28.35$, $p = .92$)

DISCUSSION

- Findings demonstrate the association between quality of the early CEE on memory and hippocampal volume in adolescence and that these effects vary between 14 and 18 years, likely due to prolonged plasticity.
- Sex-dependent effects in late (but not early) adolescence add to the limited literature examining the interaction between PDE and sex through adolescence and into early adulthood.
- CEE represents a modifiable construct that may, in turn, influence the developmental consequences of PDE
- Future research should explore sources of resilience and more positive indicators of CEE.

TAKE HOME

A caregiver emotional environment marked by distress may **accentuate** the effects of prenatal drug exposure on neurocognitive development.

The impact of interactions between pre- and postnatal environments may be age and sex dependent.



References

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