

Differences in Neuroendocrine Responses to Psychosocial Stress Before and After the COVID-19 Pandemic in Female Adolescents

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Introduction

- The prevalence of depressive symptoms is at a **decade high** following the COVID-19 pandemic, particularly for adolescents assigned female sex at birth (AFAB) (CDC)
- The **pubertal transition** is a developmental window characterized by dramatic changes in brain maturation and the endocrine milieu, promoting increased risk of psychopathology
- The significant stress of COVID-19 may have impacted the neurophysiology and cortisol responses elicited during psychosocial stress

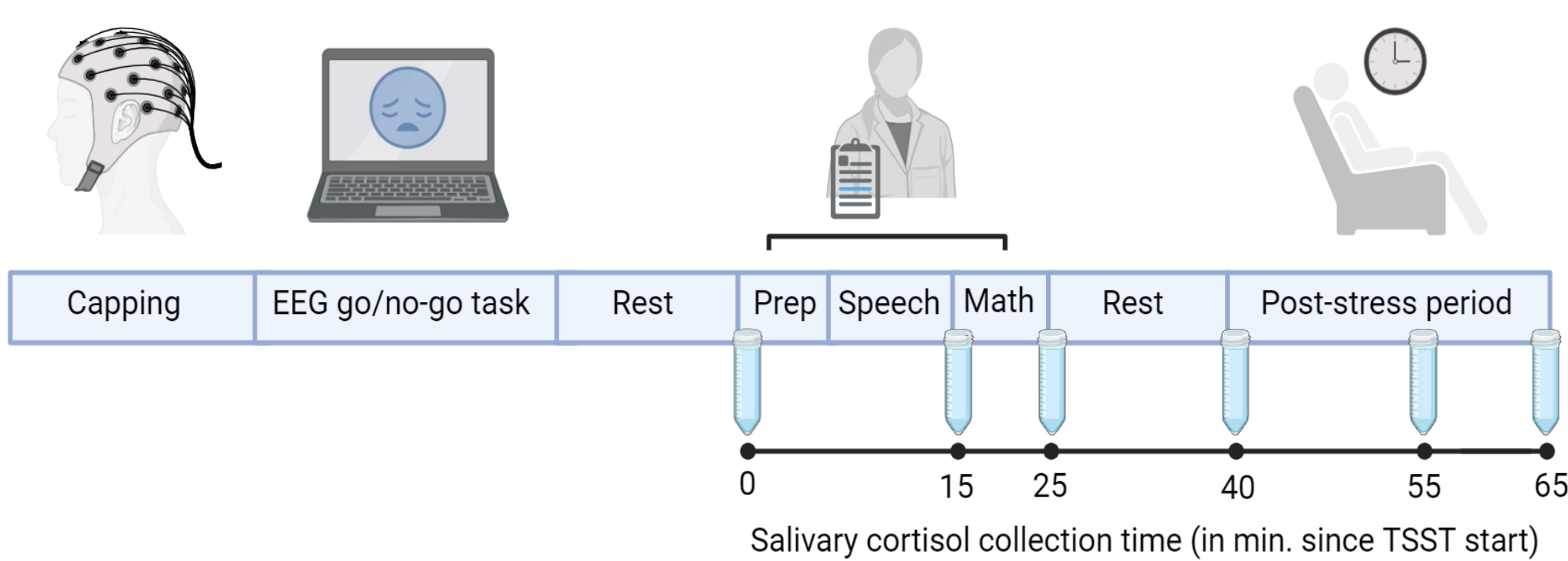
Objective

Characterize the influence of the **COVID-19** pandemic on **psychosocial stress** reactivity via **cortisol** and **neurophysiology (EEG)**.

Methods

- Cohort 1**
- Pre-pandemic cohort (n=50)
 - 09/2018 – 03/2020

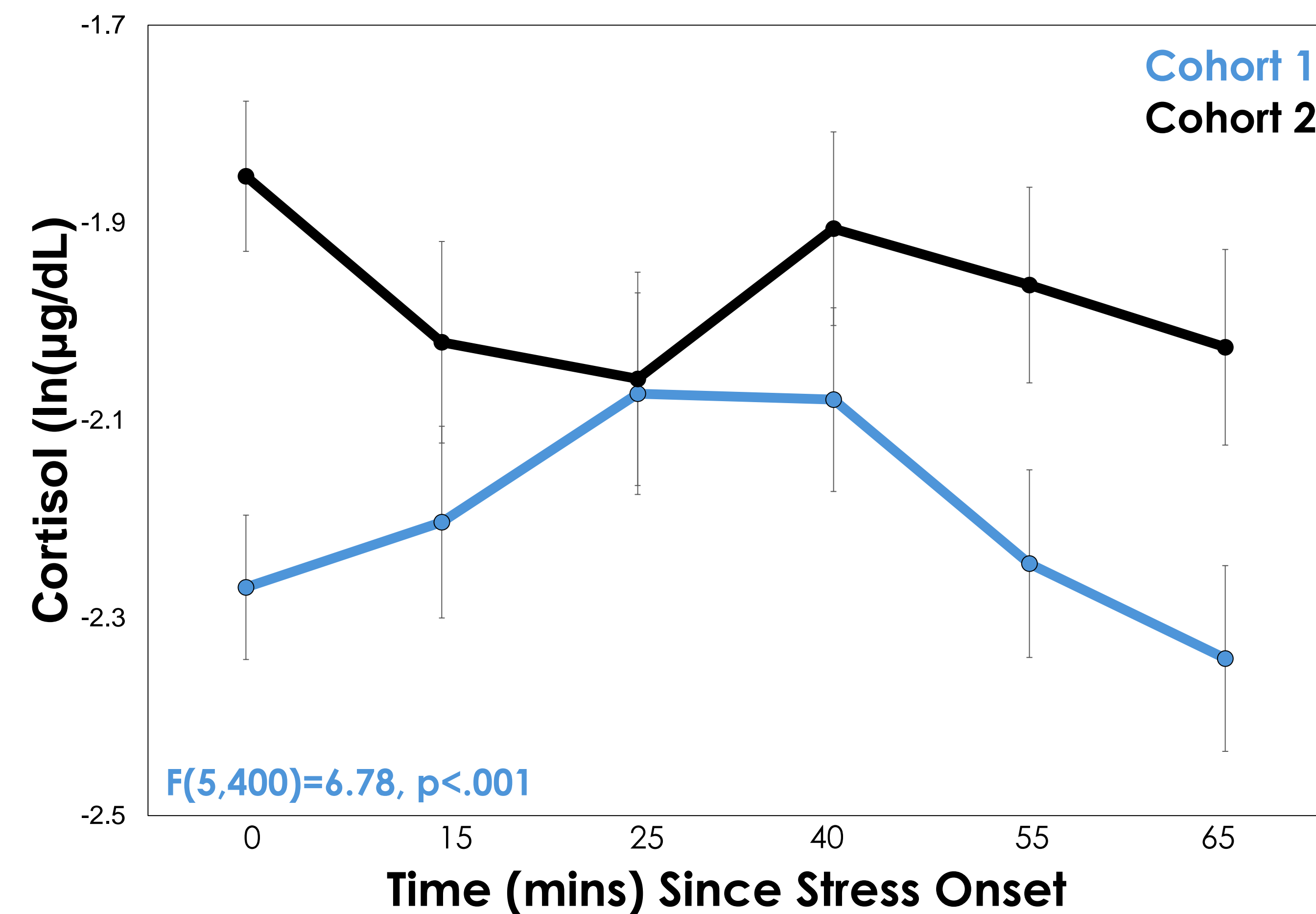
- Cohort 2**
- Post-pandemic cohort (n=42)
 - 12/2021 – 07/2023



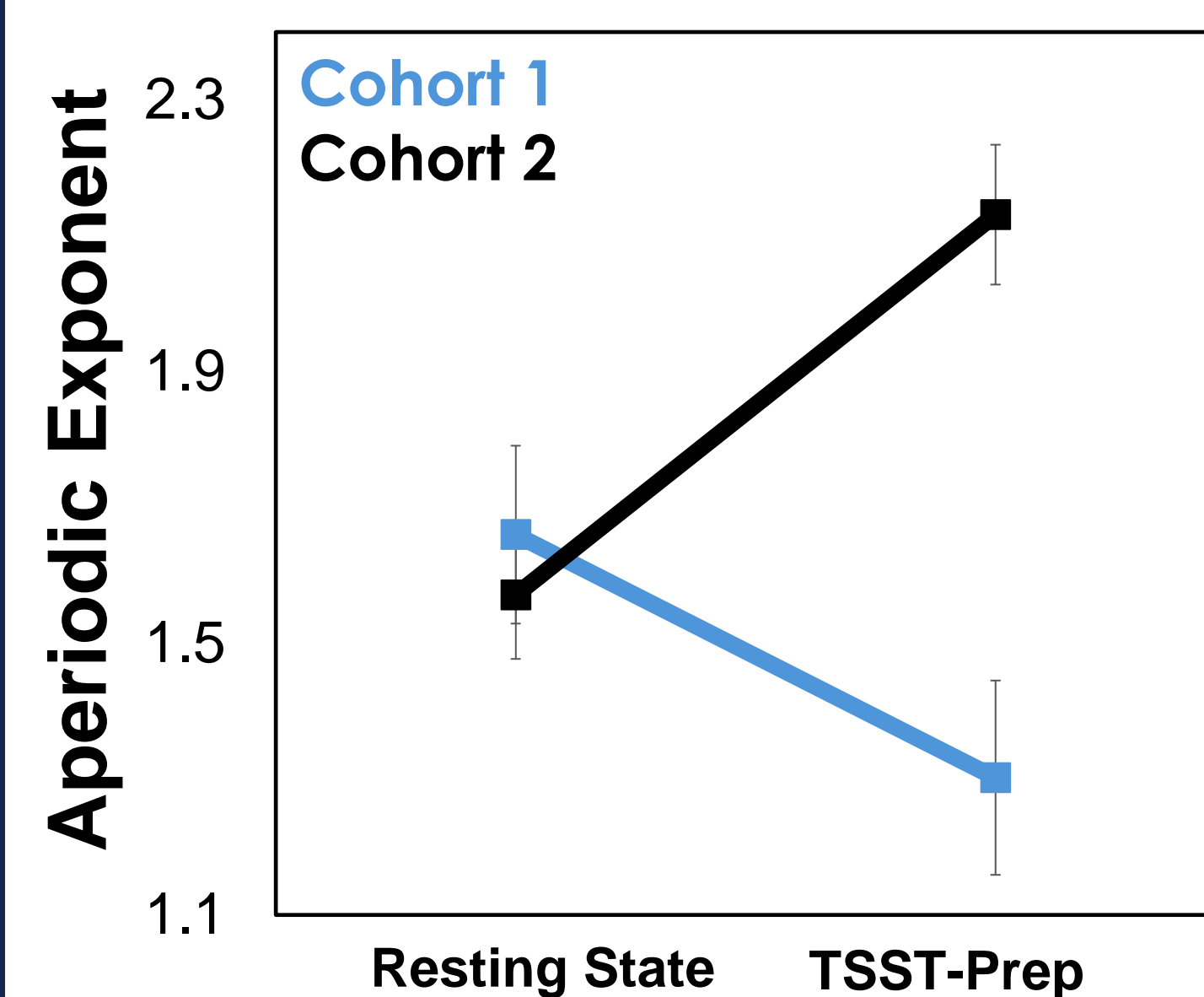
Measures:

- Trier Social Stress Test (TSST)**¹: Modified for children; psychosocial stress test with speech and math tasks to elicit robust stress response
- Area Under the Curve with respect to Increase (AUC_i) cortisol**: measure of cortisol reactivity used to quantify change in cortisol over the six collection points
- Area Under the Curve with respect to Ground (AUC_g) cortisol**: measure of cortisol output used to quantify total output over the collection period
- Parenting Styles and Dimensions Questionnaire (PSDQ)**²: measure of authoritarian, authoritative, & permissive parenting styles
- Behavioral Approach/Avoidance – Children Questionnaire (BAS/BAS)**³: measure to reflect sensitivity to aversive and rewarding motivations
- Aperiodic exponent (i.e., slope)**⁴: indexing excitatory-inhibitory balance of cortical circuits during rest (prior to stress onset) and during anticipation of stress.

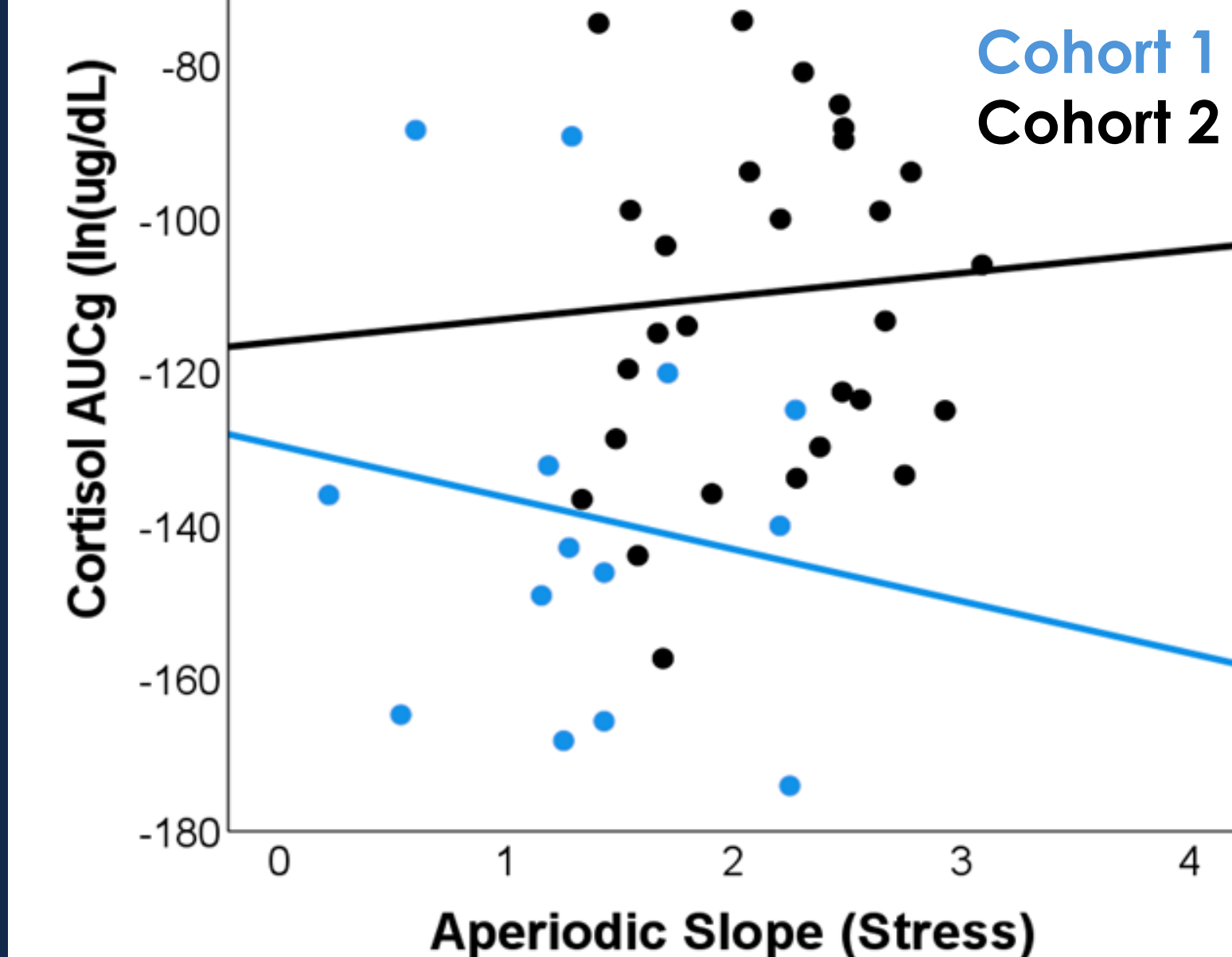
Results



Atypical cortisol response and increased aperiodic EEG exponents during stress exposure in post-pandemic peripubertal female adolescents



Cohort 2 showed an increase in the aperiodic slope from resting state to stress onset $F(1,42)=16.1, p<.001, \eta_p^2=.28$

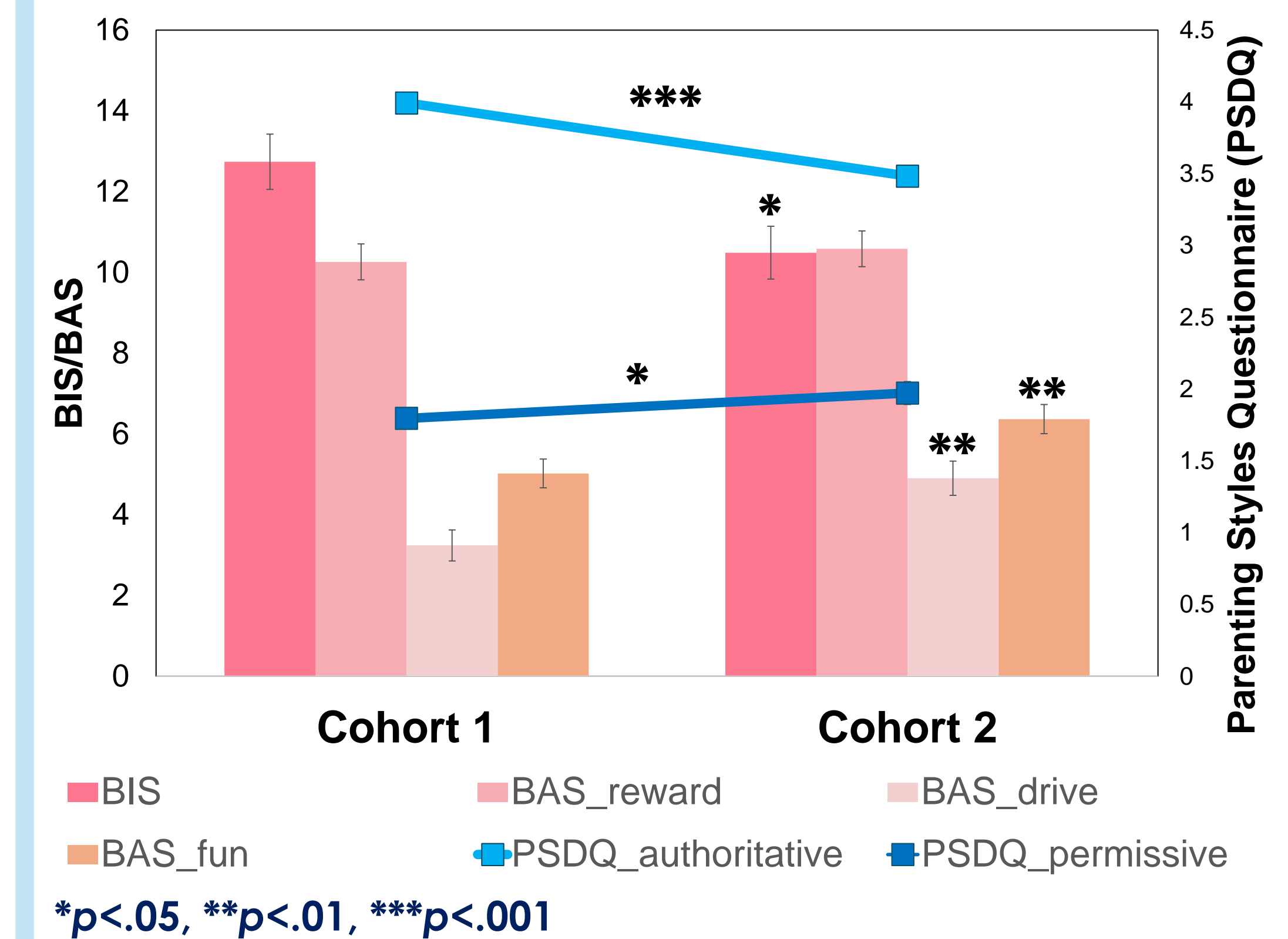


Cohort 2 had increased cortisol AUCg $F(1,81)=19.1, p<.001$ and steeper aperiodic slopes during stress $F(1,43)=21.9, p<.001$

Increased cortisol output associated with steeper aperiodic slope

$r_s=.32, p=.04$

Potential Predictors of Cortisol Responses



Reduced behavioral inhibition ($\beta=-16.1, t(84)=-3.3, p=.002$) and reduced authoritative parenting ($\beta=-9.5, t(81)=-2.2, p=.03$) predicted cortisol AUCg ($R^2=.23, F(6,72)=3.5, p=.004$)

Discussion

- Results suggest that the COVID-19 pandemic contributed to **dysregulated cortisol stress responses** and **greater cortical inhibition (E<I)** during acute psychosocial stress
- Dysregulated cortisol responses have been associated with **mood sensitivity to sex hormones** during puberty,⁵ and amongst individuals that have experienced **repeated life stressors**⁶
- Disruptions in cortisol responsivity and the balance of cortical excitation/inhibition are potential mechanisms promoting susceptibility to psychopathology in adolescence
- Reduced authoritative **parenting styles** and **self-reported behavioral inhibition (BIS)** may influence the cortisol stress response

Acknowledgments

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References: 1. Yim et al., 2015 2. Robinson et al., 1995, 3. Carver & White, 1994, 4. Karalunas et al., 2022, 5. Andersen et al., 2023., 6. Pfeffer et al., 2007.