BREWING TROUBLE:

EXPLORING THE EFFECTS OF PRENATAL CAFFEINE EXPOSURE ON FRONTOLIMBIC WHITE MATTER MICROSTRUCTURE IN ADOLESCENTS

Julia M. Evanski, Clara G. Zundel, Hilary A. Marusak

Department of Psychiatry and Behavioral Neurosciences, Wayne State University School of Medicine, Detroit, Michigan, USA

WAYNE STATE UNIVERSITY

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INTRODUCTION

- Caffeine is the most widely used stimulant in the world and often consumed by pregnant people.
- However, research has shown that prenatal caffeine exposure can negatively impact offspring neurodevelopment by inhibiting fetal growth and increasing risk of both premature birth externalizing problems during childhood.
- Prenatal caffeine exposure may also alter brain structure in offspring, including the development of frontolimbic pathways associated with cognitive and emotion-related functioning.
- In this study we investigated the relationship between prenatal caffeine exposure and integrity of frontolimbic white matter pathways during childhood.

METHODS

- We used data from the nationwide, multisite Adolescent Brain Cognitive Development (ABCD) Study (Data Release 3.0), n=11,869 children (*M*±*SD* age=9.91±0.62 years; 47.8% female).
- Prenatal caffeine exposure was measured via parent retrospective report (yes/no).
- Using tabulated DTI data, fractional anisotropy (FA) was estimated from ten frontolimbic white matter tracts, with five tracts in each hemisphere.
- The tracts we examined are: the cingulum bundle, fornix, parahippocampal cingulum, inferior fronto-occipital fasciculus, and the uncinate fasciculus (**Figure 1.**)
- Linear mixed effect models were used to examine associations between frontolimbic white matter microstructure and prenatal caffeine exposure.
- We adjusted for potential confounders, including: age, sex, race/ethnicity, maternal depression, parent education, family income, planned pregnancy, premature birth, prenatal alcohol, tobacco exposure, cannabis exposure, and other drug exposure.

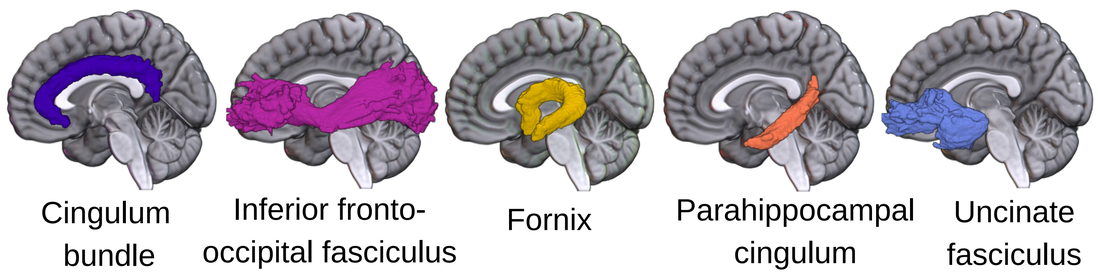

Figure 1. Frontolimbic white matter tracts

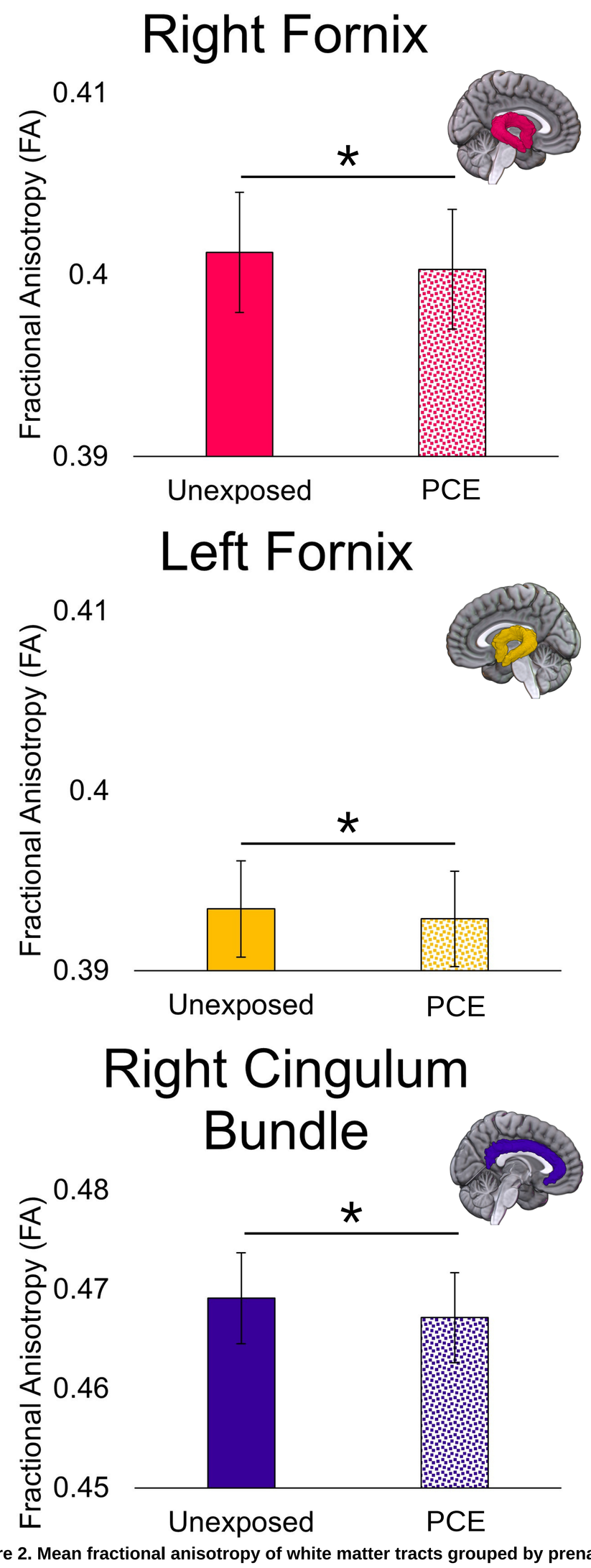

Figure 2. Mean fractional anisotropy of white matter tracts grouped by prenatal caffeine exposure (PCE). Means shown are unadjusted for covariates.

RESULTS

- In this sample, 63.3% of caregivers reported using caffeine during pregnancy.
- Results indicate that prenatal caffeine exposure was associated with lower FA in the right fornix (β=-0.00121,*CI*=[-0.00238,-0.0005],*p*=0.041), left fornix (β=-0.0013,*CI*=[-0.00242,-0.0001], *p*=0.024), and right cingulum bundle (β=-0.002,*CI*=-0.0039,-0.0001],*p*=0.039).

CONCLUSION

- These findings suggest that prenatal caffeine exposure may lead to microstructural alterations in the fornix and cingulum bundle.
- This may contribute to neurobehavioral problems being reported in exposed offspring.
- Future studies should consider amount of caffeine intake, as well as what stage of pregnancy the caffeine is being consumed.
- It is recommended that individuals limit caffeine consumption while they are pregnant.

CONTACT ME!

@julia_evanski

julia.evanski@wayne.edu

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