

Background

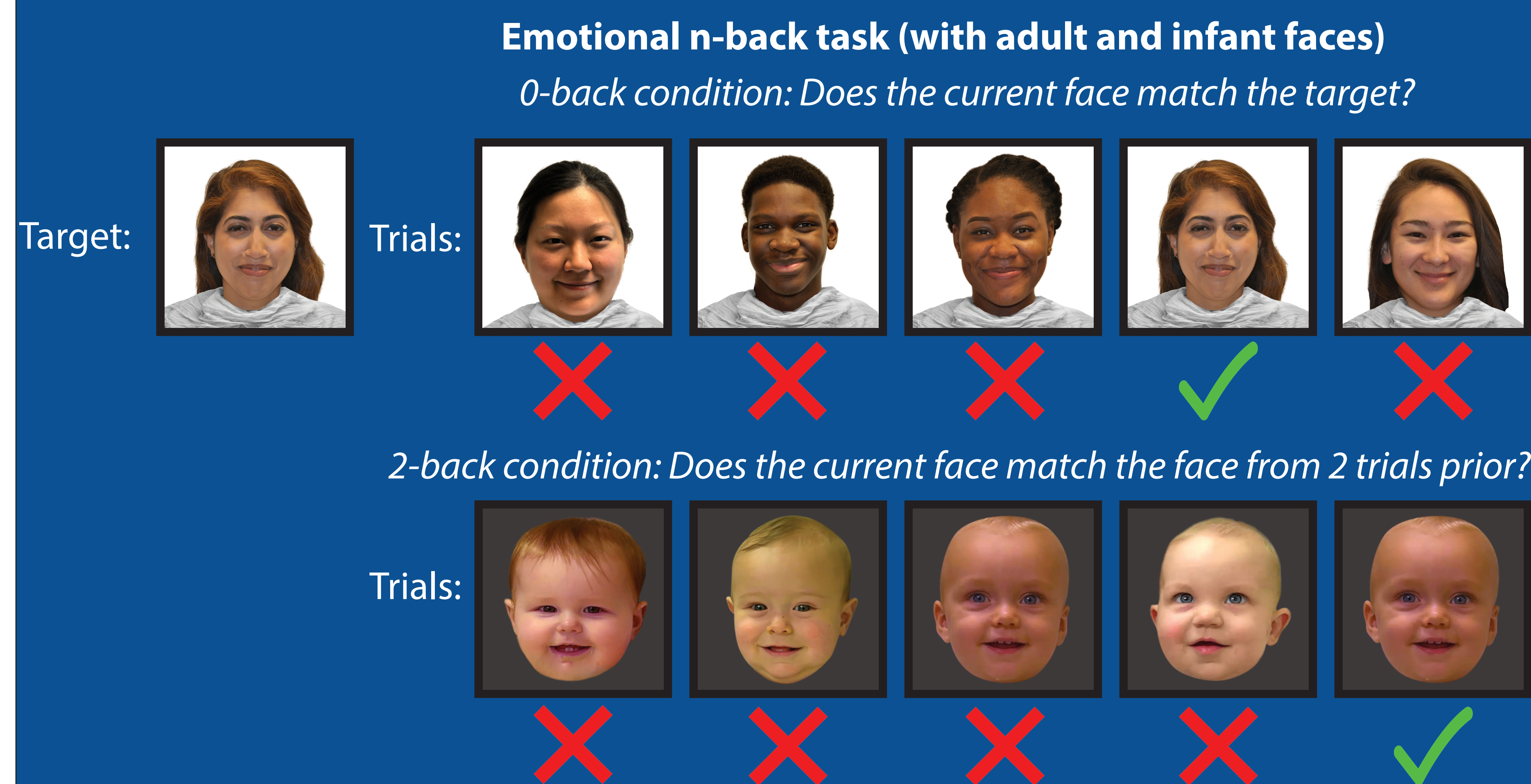
- Postpartum depression (PND) is common and disabling for mothers and their developing infants (Slomian et al., 2019)
- Emotional processing of infant faces is disrupted in PND (Bjertrup et al., 2019)
- This phenotype may reflect a continuum of abnormal function, even in patients with subclinical levels of depression
- In previous work, patients with major depressive disorder showed symptom-specific variation that linked anxiety with altered connectivity in emotion regulation circuitry (Drysdale et al., 2017)
- We hypothesize that emotion regulation is a quantifiable trait with direct correlation to PND symptoms
- We use an emotional regulation task to examine how specific facial expressions in adult and infant stimuli affect behavior and underlying neural circuitry

Methods

- Participants recruited from Fair Start, a largely minority, Spanish-speaking, local Washington Heights birth cohort
- To date, 45 postpartum participants completed a modified Emotional n-back fMRI task (Cohen et al., 2016), with infant stimuli in addition to the standard adult faces
 - Counter-balanced conditions:
 - Complexity: 0-back versus 2-back
 - Face-Type: Infant versus Adult
 - Face Emotion: Happy versus Sad
 - 2 blocks of each condition, 20 total trials per condition
- Depression measured by Edinburgh Postnatal Depression Scale (EPDS)
- Used Linear Mixed Effects model to estimate how complexity, face-type, face-emotion, and depression affected accuracy
- Examined whole-brain effects of selected contrasts using surface-based, functional parcellation (Gordon et al., 2016)
- Collection ongoing

References

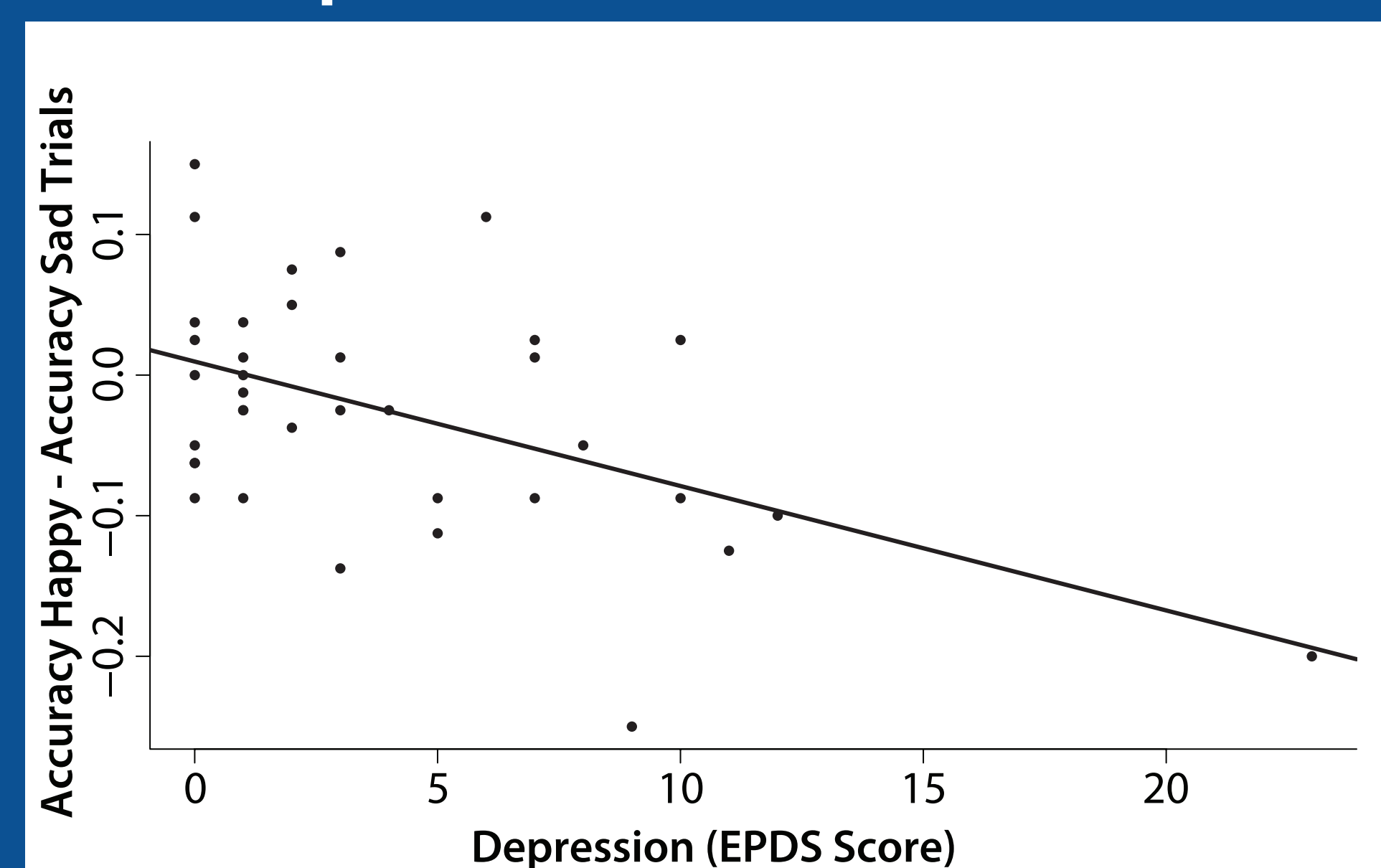
- Slomian J, Honvo G, Emonts P, et al. Women's Health. 2019. 15: 1-55.
- Bjertrup AJ, Friis NK, Miskowiak KW. Neurosci Biobehav Rev. 2019. 107:196-207
- Drysdale AT, Grosenick L, Downar J, et al. Nat Med. 2017. 23:28-38;
- Cohen AO, et al. Proceedings of the Society for Neuroscience. San Diego, CA. 2016.
- Gordon EM, Laumann TO, Adeyemo B, et al. Cereb Cortex. 2016. 26:288-303



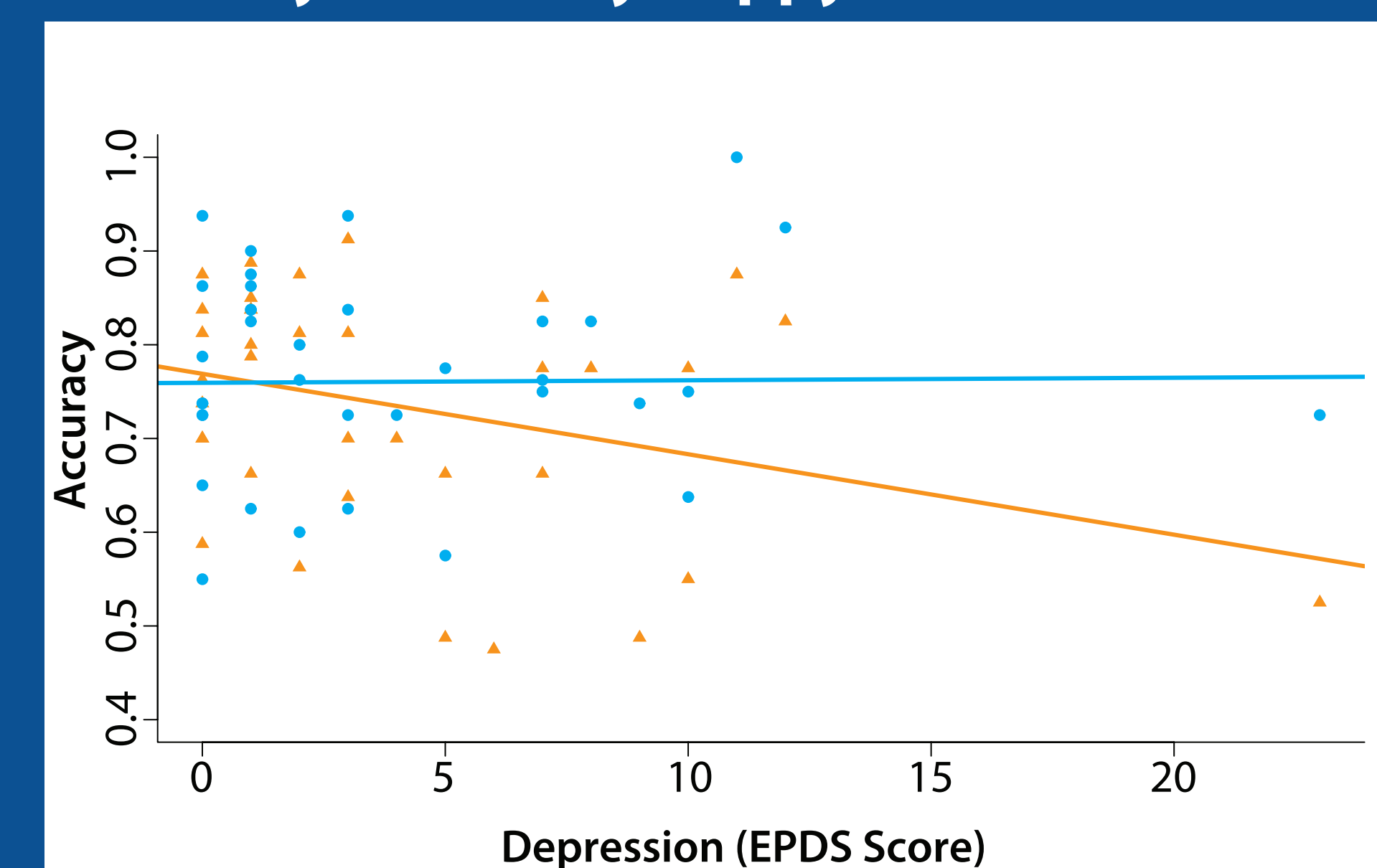
Results

Effects of face-emotion on behavior and brain activation

Depression and face-emotion interactively affect accuracy, driven by happy-face trials

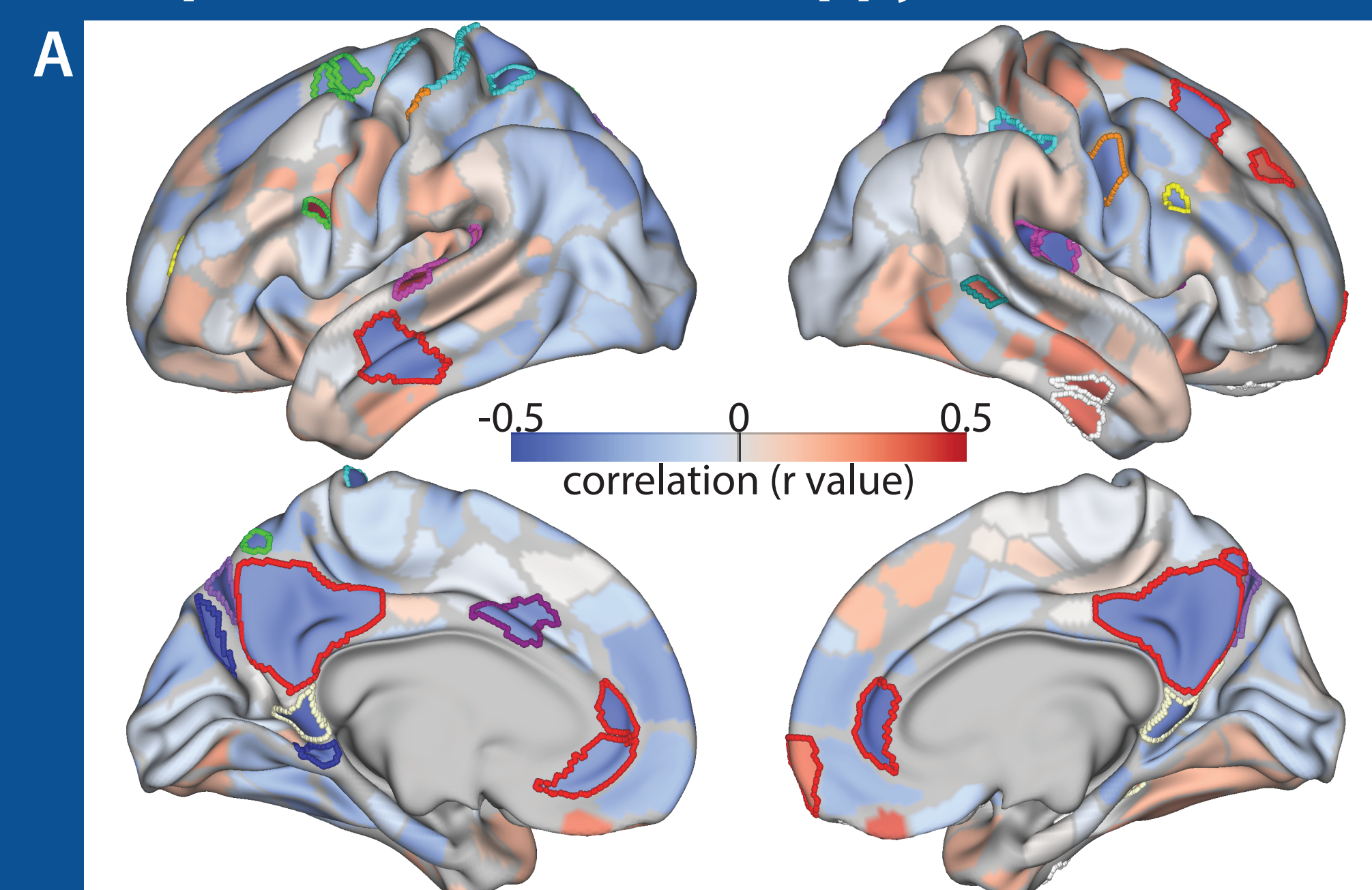


Omnibus linear mixed effects model identified a significant interaction between face-emotion and depression score ($F(1,245) = 8.68, p < 0.0036$). Performance differences between happy- and sad-face trials are correlated with individual depression scores (depicted above; $r(35) = -0.505, p < 0.0015$).

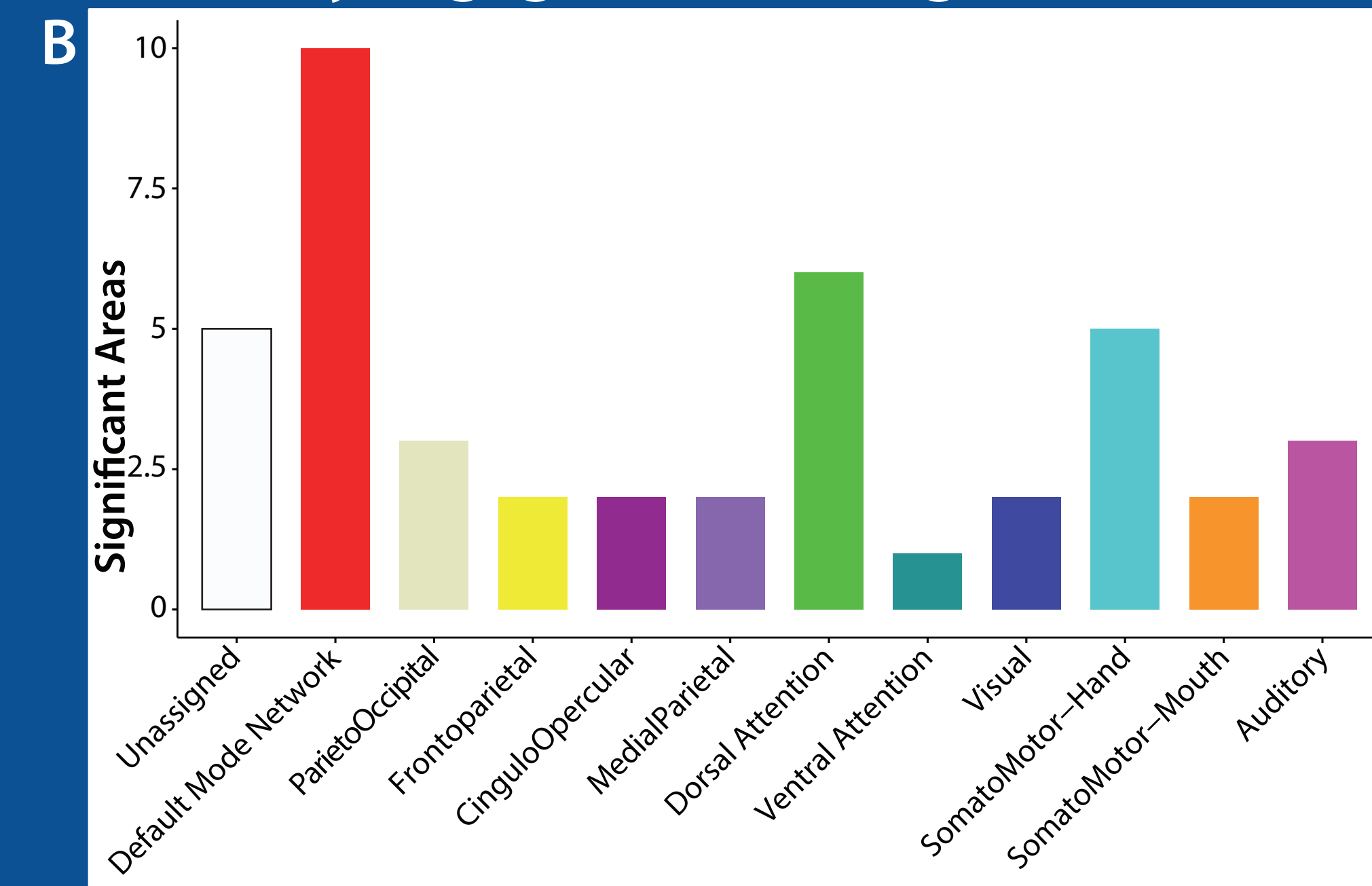


When examined separately by face-emotion, performance on happy-face trials shows an inverse correlation with depression score (orange triangles; $r(35) = -0.332, p < 0.045$) while performance on sad-face trials is uncorrelated with depression score (cyan circles; $r(35) = 0.01, p < 0.952$).

As depression increases, happy- and sad-face stimuli differentially engage emotion regulation circuitry

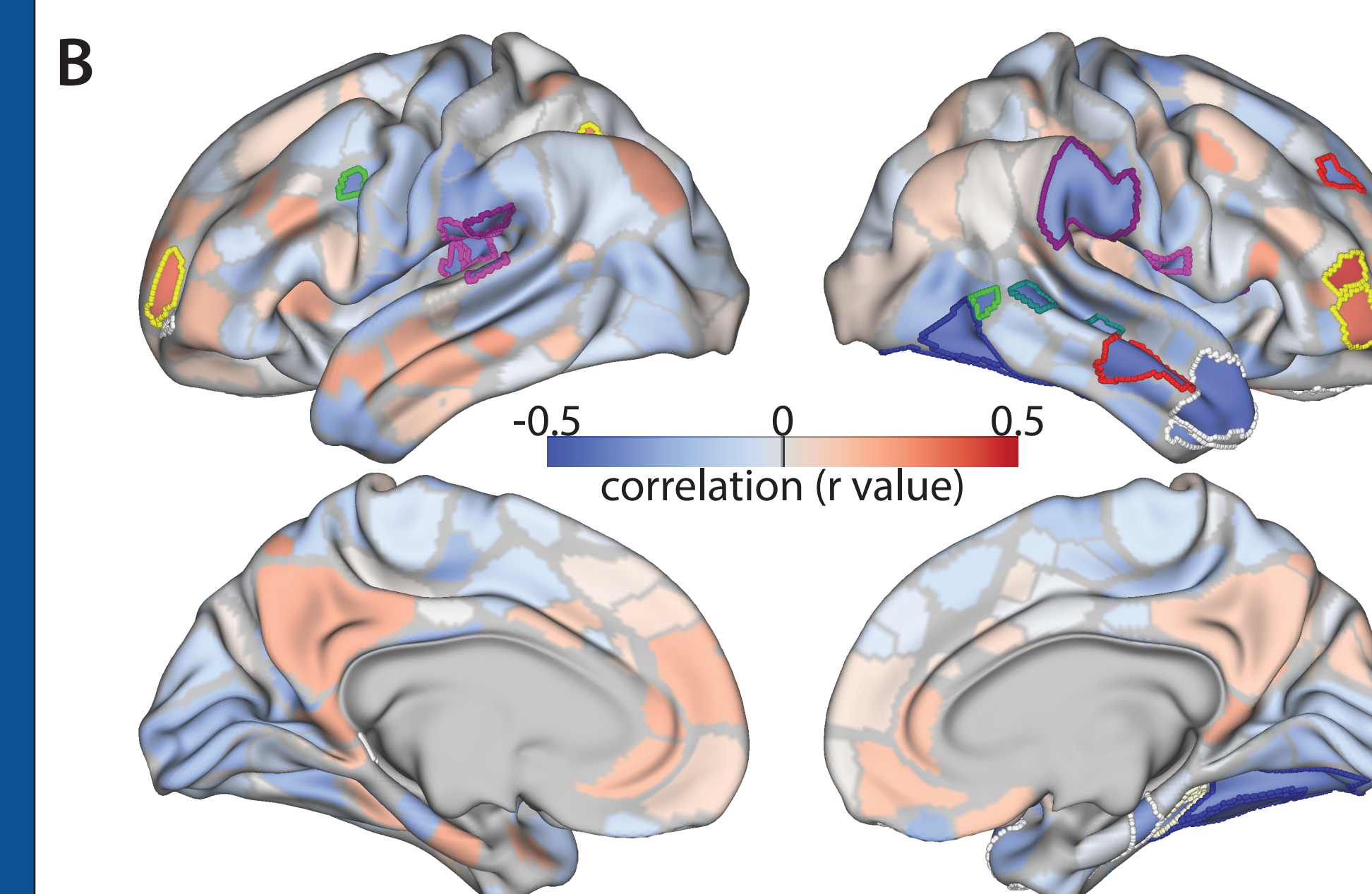
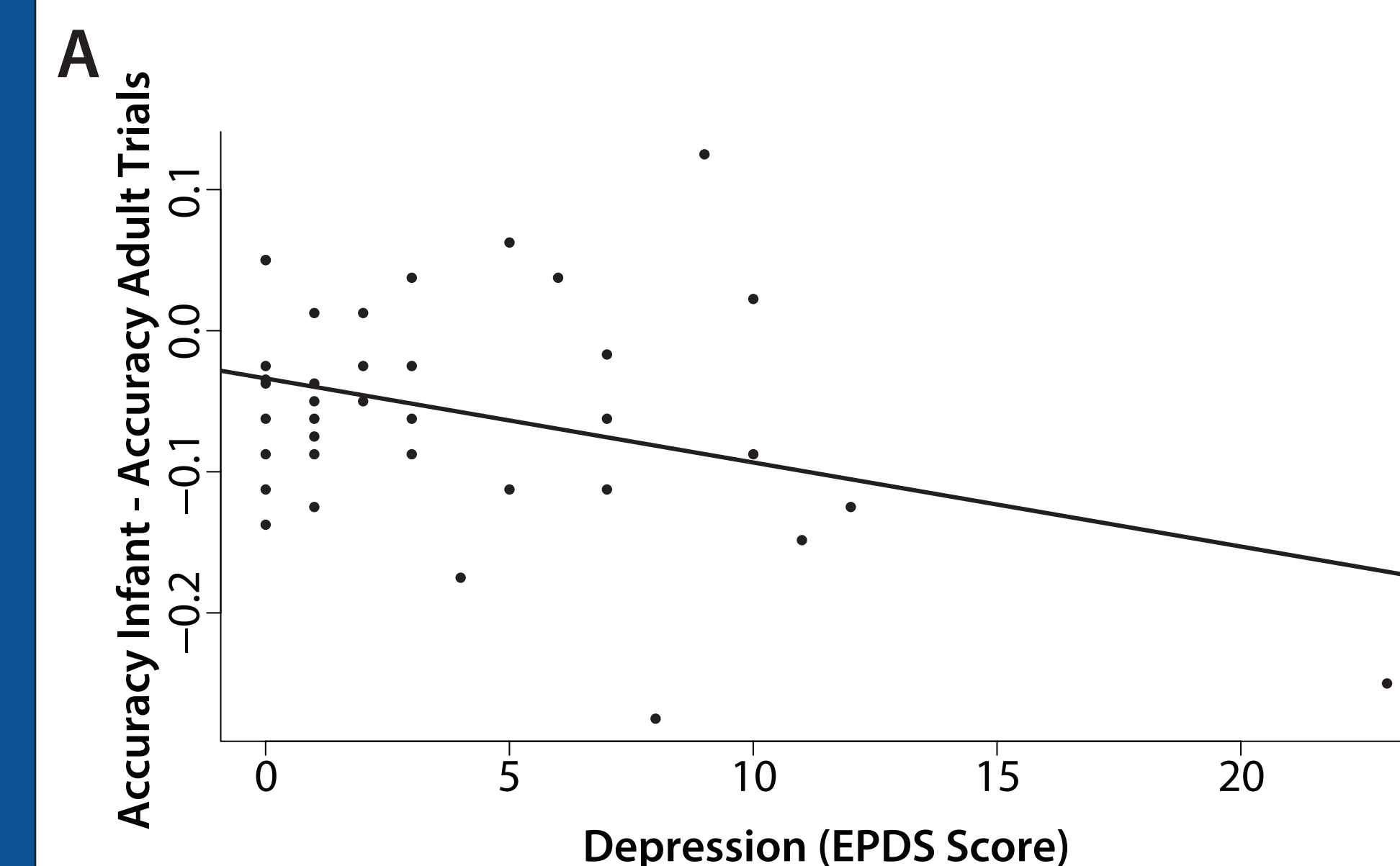


(A) Contrast of happy- versus sad-face trials correlated with depression score elicits differential activation across several brain networks (colors by network assignment; circles = $p < 0.05$ (uncorrected)). (B) Counts of significant brain areas (y-axis) plotted according to assigned network (x-axis).



Effects of face-type

Trend towards interaction between face-type and depression driven by infant face trials with related activation differences in attention and language networks



Omnibus linear mixed effects model showed a trend towards interaction between face-type and depression score ($F(1,245) = 3.38, p = 0.067$). (A) Dissecting this trend, we find correlation between infant-adult accuracy differences and depression scores ($r(35) = -0.348, p < 0.035$). (B) Contrast of infant- versus adult-face trials correlated with depression score (circles = $p < 0.05$ (uncorrected); colors by network assignment).

Conclusions

- Participants with higher depression scores performed worse on trials with happy stimuli
- In the brain, the valence*depression effect was driven predominantly by regions within the default mode network
- We also find a trend towards worse performance in trials with infant stimuli and related patterns in attention circuitry activation

Summary

- We link individual variation in PND symptoms to differences in emotion regulation and brain networks involved in theory of mind and attention
- These behaviors and brain circuits may be key to a healthy postpartum transition

Acknowledgements

- Adult images from Conely MI, Dellarco DV, Leon AC, et al. Psychiatry Research 2018. abcdstudy.org/scientists/abcd-fmri-tasks-and-tools/
- Infant images adopted from Dr. Lane Strathearn with permission and approval by NYSPI IRB