

Test and retest of the emotional responses in adolescents prenatally exposed to cocaine

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Introduction Prenatal cocaine exposure (PCE) is associated with arousal dysregulation [1, 2] but the interaction of this particular effect with neural development over adolescence has not been explored. In this study, we measured fMRI responses to emotional stimuli in the same groups of PCE and control adolescents while they performed the same task at two different time points (~26 months apart). Due to maturity or familiarity with the stimuli and task, control participants exhibited decreased emotional fMRI responses at the second time. However, the emotional responses in the same regions of PCE participants did not significantly change across time. Our data suggest a long-term and stable PCE effect on emotional arousal regulation.

Method Eleven control (5M6F) and twenty-three PCE (15M8F) adolescents were scanned (EPI-BOLD fMRI sequence, TR/TE/FA/FOV=3000ms/30ms/90°/192cm, 30 axial slices, thickness/gap=3mm/0mm, matrix=64×64) with a 3T Siemens scanner at different ages (Control: 15.1 and 17.1 y.o., PCE: 15.0 and 17.2 y.o.). They performed a working memory task during the scans with emotionally neutral (e.g. a cup) or negative (e.g. a viper) pictures as distracters [2]. The task instruction, visual stimuli and imaging parameters were identical for the two scanning sessions.

AFNI (<http://afni.nimh.nih.gov>) was used for fMRI data analysis via general linear modeling. Specifically, brain activations were identified by BOLD signal contrast between the emotionally neutral and negative conditions. Regression coefficients (beta values) of these emotional responses from each participant were further submitted to an Exposure (PCE vs. control) × Test (first session vs. second session) ANOVA analysis, with confounding factors of gender and other unmatched factors between the groups (including tobacco, alcohol and marijuana exposures) controlled as covariants.

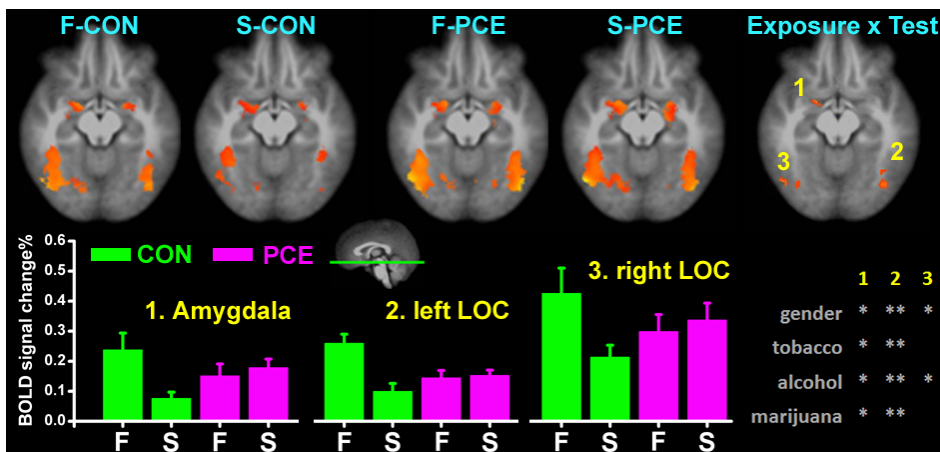


Figure 1. Activation map ($p < 0.01$, corrected) and BOLD signal percent change comparison between groups and sessions. F/S: First/Second fMRI session; CON/PCE: control/prenatal cocaine exposure. Asterisks depict the p -value of Exposure by Test interaction with corresponding confounding factor statistically controlled (*: $p < 0.05$; **: $p < 0.01$).

effect in these regions generally cannot be attributed to gender or multi-drug exposure differences between the groups.

Conclusion The present study reveals more neural imaging evidence supporting the view that PCE has a long-term effect on stress response and emotional arousal regulation [1, 2]. This altered emotional response may interfere with attention allocation in exposed individuals when performing demanding cognitive tasks in the presence of distraction.

References [1] Mayes, L. 2002. Neurotoxicol Teratol. 24:385. [2] Li et al., 2009. Neurotoxicol Teratol. 31:342.

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