Indiscriminate Amygdala Response to Mothers and Strangers following Early Maternal Deprivation

Supplemental Information

Supplemental Methods

Psychophysiological Interaction Analysis. A general linear model (GLM) analysis was performed in AFNI for each participant with regressors for task, seed region timeseries, interaction of task and timeseries, and six motion regressors. Two psychological (task) regressors modeled whether a given trial consisted of viewing a mother or stranger face. The physiological (seed region timeseries) regressor comprised the timeseries for the left amygdala cluster, as defined functionally based on the primary analysis examining group differences in amygdala activation to mothers and strangers. Two interaction regressors modeled the interaction of the psychological regressors and the physiological regressor, such that each interaction regressor identified regions whose timeseries correlated in a task-dependent manner with the amygdala timeseries. The GLM analyses fit the percent signal change timeseries to each regressor, and linear and quadratic trends were modeled for each voxel's timeseries to control for correlated drift. The individual-level regression coefficients were then submitted group level analyses.

Supplemental Data

Table S1. CBCL scores by group

	Comp	**PI**	**Sig.**
n	24[a]	29[b]	—
Anxiety/Depression - %ile	56 (13)	77 (20)	p <0.001
Attention Problems - %ile	55 (12)	87 (17)	p < 0.001
Aggressive Behavior - %ile	52 (8)	77 (20)	p < 0.001
Internalizing Problems - %ile	33 (28)	71 (27)	p < 0.001
Externalizing Problems - %ile	26 (23)	71 (31)	p < 0.001
Total CBCL Score - %ile	27 (26)	78 (24)	p < 0.001

CBCL, Child Behavior Checklist; Comp, comparison; PI, previously institutionalized; Sig., significance.
[a] n = 10 missing data from Comp group.
[b] n = 4 missing data from PI group.

Table S2. Other activated regions for Group x Stimulus Type interaction

Talairach Coordinates	# of Voxels	Region	Brodmann's Area
[-2, -30, -23]	639	L culmen	NA
[35, 4, 17]	280	R middle frontal gyrus	R BA10/46
[1, 23, 51]	153	R superior frontal gyrus	R BA6/8
[39, -63, -18]	151	R fusiform gyrus	R BA 37

BA, Brodmann area; L, left; R, right.
*whole-brain correction for multiple comparisons applied.

Table S3. Psychophysiological interaction analysis using the functionally-defined amygdala as seed region examining group differences in functional coupling for the discrimination between mother and stranger stimuli (mother-stranger)

Talairach Coordinates	# of Voxels	Region	Direction of Effect
[-44, 5, 36]	354	R precentral gyrus	PI > Comp
[-2, -26, 48]	177	R medial frontal gyrus	PI > Comp
[-65, 32, -4]	147	R middle temporal gyrus	PI > Comp
[44, 62, 45]	118	L inferior parietal lobule	PI > Comp
[20, -38, 9]	94	L anterior cingulate	Comp > PI
[17, 68, 54]	65	L superior parietal lobule	PI > Comp

Comp, comparison; L, left; PI, previously institutionalized; R, right.
*whole-brain correction for multiple comparisons applied.

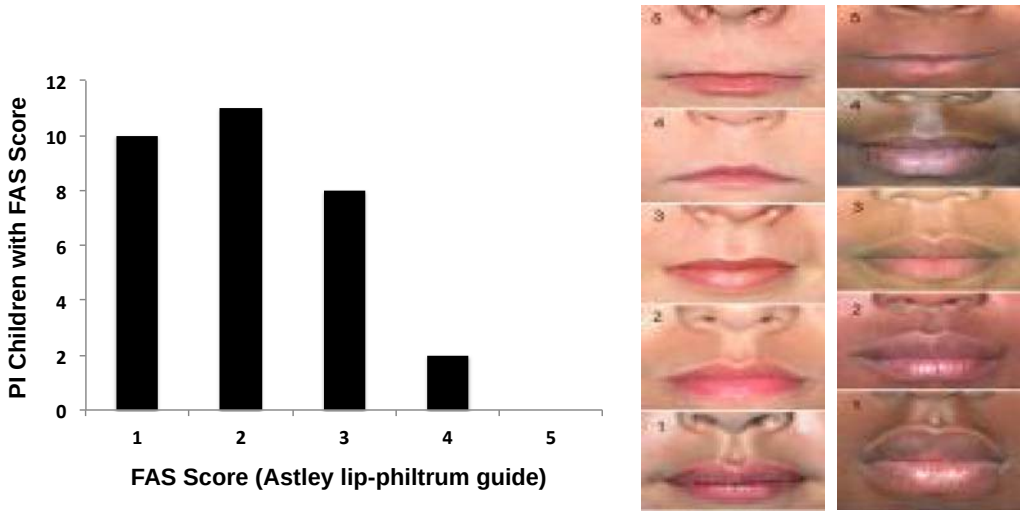

Figure S1. Distribution of fetal alcohol spectrum (FAS) facial features in the previously institutionalized (PI) sample and Astley *et al.* lip/philtrum scale (1). Roughly one-half of PI participants rated 1-2 on a 5-point scale of FAS-type facial features, which suggests little to no suggestion of prenatal alcohol exposure. There was no significant linear relationship between FAS score and indiscriminate friendliness ($p > 0.05$). Reprinted with permission from SJ Astley.

Effects of Psychiatric Diagnoses

Post hoc analyses were performed to assess for effect of psychiatric diagnosis using a binary covariate (1 for presence, 0 for absence of psychiatric diagnosis) for psychiatric diagnosis. Each analysis is presented Figures S2-S5.

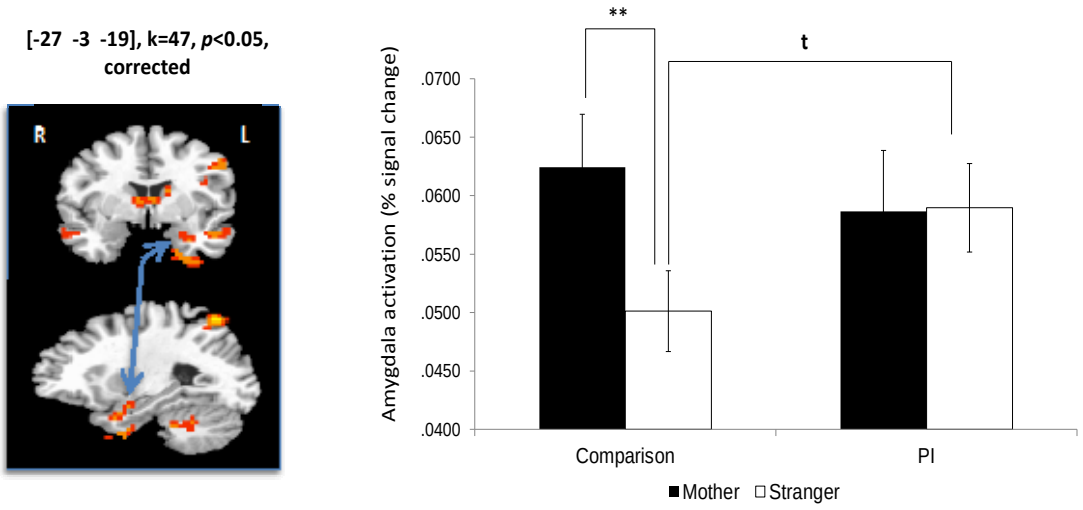

Figure S2. Mean amygdala region of interest (activation-derived) in mother vs. stranger stimuli for Comp and PI children. Predicted values from repeated measures analysis of variance on values extracted from linear mixed effect. Stimulus type x age-at-adoption $F = 3.80$, $p = 0.056$. Model controlling for age-at-scan, age-at-adoption, IQ, and presence of psychiatric diagnosis. *Post hoc t* tests: Mother vs. Stranger – Comp: $^{**}p < 0.001$, PI: $p > 0.05$; Comp vs. PI – Mother: $p > 0.05$, Stranger: PI > Comp trend (t), $p = 0.09$. Comp, comparison group; L, left; PI, previously institutionalized group; R, right.

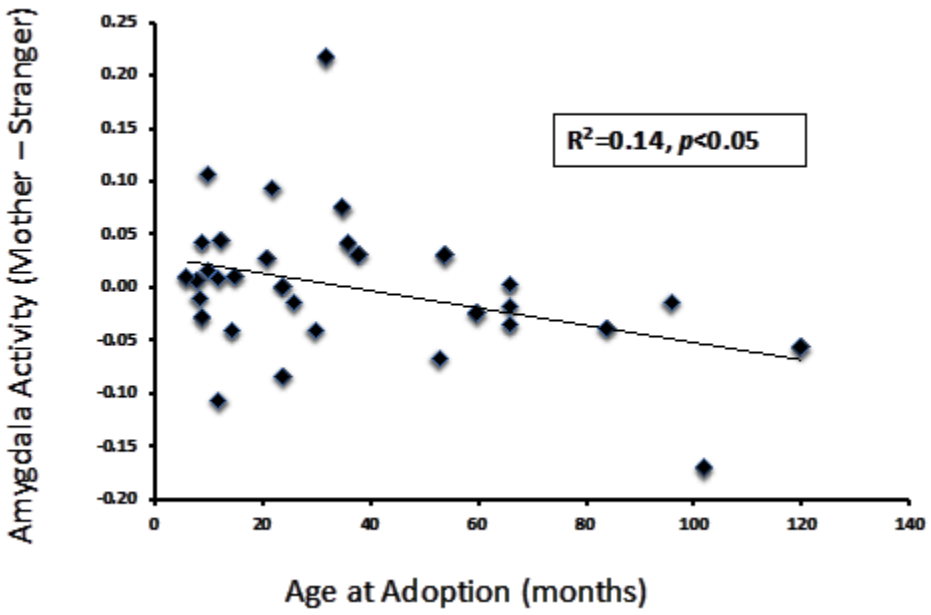

Figure S3. Correlation between Mother minus Stranger amygdala response vs. age-at-adoption. Pearson r = -0.37, p < 0.05. Controlling for IQ, age-at-scan, and presence of psychiatric diagnosis in model.

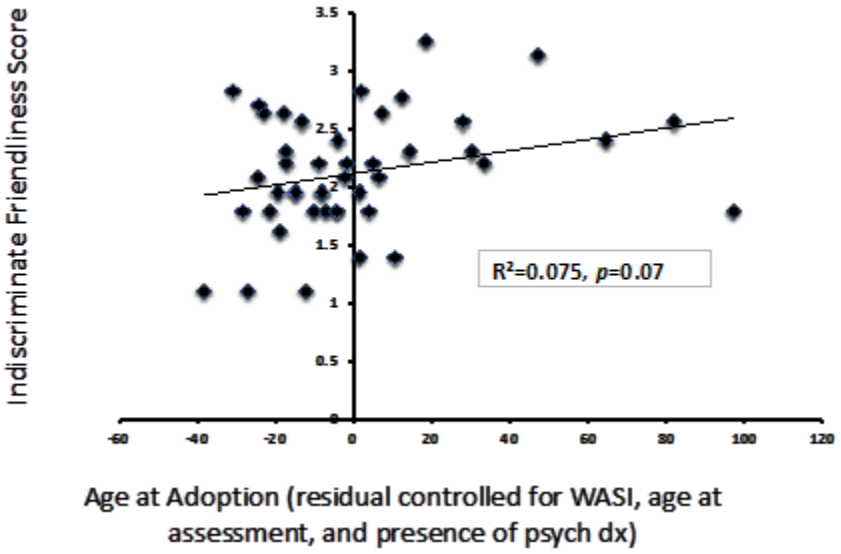

Figure S4. Indiscriminate friendliness vs. age-at-adoption. Partial correlation (r = 0.28, p = 0.07) controlled for IQ and age-at-scan with covariate for presence of psychiatric diagnosis (psych dx). WASI, Wechsler Abbreviated Scale of Intelligence.

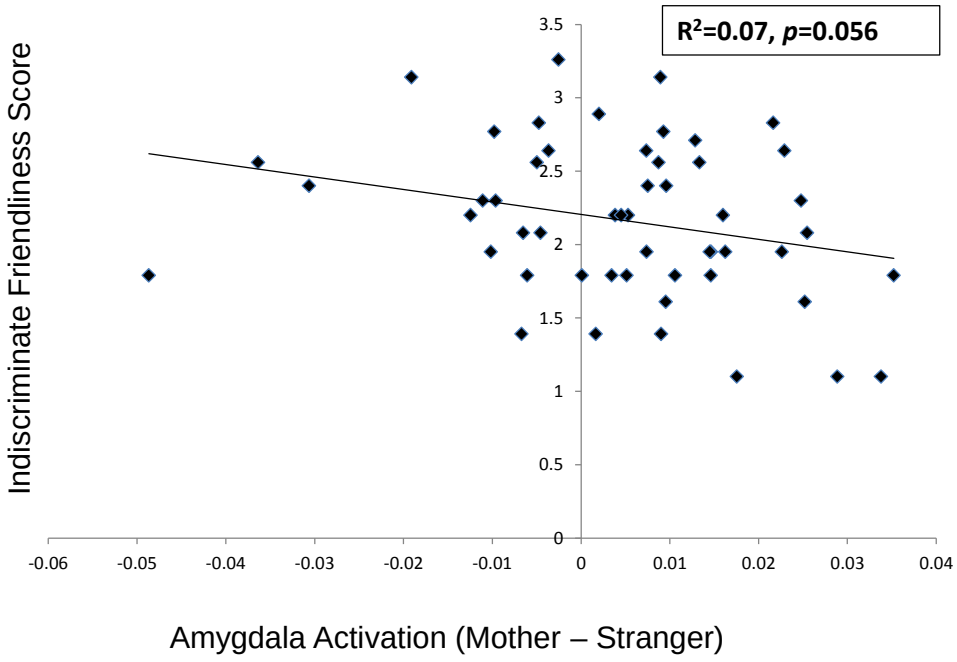

Figure S5. Imaging and outside-scanner ratings of indiscriminate friendliness. Pearson correlation between predicted values from repeated measures analysis of variance (controlling for IQ, age-at-scan, age-at-adoption, and presence of psychiatric diagnosis) for mother vs. stranger amygdala activity graphed against indiscriminate friendliness ratings outside scanner (r = -0.27, p = 0.056).

Supplemental Reference

1. Astley SJ (2006): Comparison of the 4-digit diagnostic code and the Hoyme diagnostic guidelines for fetal alcohol spectrum disorders. *Pediatrics*. 118:1532-1545.