**Supplemental Methods & Results**

**Practice Trials of Reward Processing Task**

Before completing the full-version of the piñata task (the data from which comprise the reward responsiveness variables used for analysis in the present study), participants completed a practice run of the task. During the 22-trial practice version of the task, each target stimulus was presented between 250 and 300ms on the screen, during which participants could respond. Upon completing the practice trials, each participant was assigned a variable stimulus presentation duration range to be used in the final version of the task based on the accuracy with which they responded during the practice trials (i.e., the proportion of trials that they responded to within the 250-300ms response window). The purpose of this practice run of the task was to ensure that the task was similarly difficult for all participants regardless of gross differences in baseline processing speed that may be attributable to differences in age, sociodemographic factors, or other causes. Thus, the intent is that inferences drawn from results of the final task reflect individual differences in response time between trials of varying reward magnitude after individual differences in processing speed are accounted for by the initial calibration achieved through the practice trials.

**Validity and Reliability of Reward Processing Task**

Helfinstein and colleagues (2013) validated the reward processing task used in the present study for use with child and adolescent participants ranging from 8 to 14 years of age. In this original study, the hit rate is higher and reaction time is faster for 4-star relative to 0-star trials. Importantly, the authors constructed the task using timing for stimulus cue, delay, presentation (response window), and feedback previously used in the most common versions of the more traditional MID tasks, and their behavioral results replicate results from other studies examining adult MID performance. Helfinstein and colleagues (2013) further validated the task by conducting a neuroimaging study to assess whether the task elicits similar neural activation patterns in hypothesized reward processing regions in youth as other more common MID tasks. They find that the task indeed recruited the striatum, mPFC, insula, caudate, and thalamus in the study sample, providing further evidence that behavioral performance on the task recruits brain regions known to be involved in reward processing.

**Cutoffs Used for Stimulus Response Windows**

In the practice task, the stimulus response window varied between 250-300ms. Stimulus response window duration in the final task was decided on for each participant based on their accuracy rate within 250-300ms response window during the practice task (i.e., proportion of trials for which they responded within that response window). The practice task accuracy rate criteria and corresponding response window durations for the final task are presented in the table below:

|  |  |
| --- | --- |
| **Accuracy Rate in Practice Task** | **Stimulus Response Window in Final Task** |
| > 80% | 25% of trials at 200ms, 25% at 225ms, and 50% at 250ms |
| 55% - 79% | 25% of trials at 250ms, 25% at 275ms, and 50% at 300ms |
| 30% - 54% | 25% of trials at 300ms, 25% at 325ms, and 50% at 350ms |
| 5% - 29% | 25% of trials at 350ms, 25% at 375ms, and 50% at 400ms |
| < 4% | 25% of trials at 400ms, 25% at 425ms, and 50% at 450ms |

**Imaging Procedures & Data Processing**

***MRI Session Pretraining to Reduce Motion Artifacts***

Prior to their scan session, all participants underwent training in a mock scanner to minimize head movements during the scan. During this training session, participants laid supine in the mock scanner while watching a movie. A head-mounted motion tracker paused the movie playback if movement of >2 mm in any direction occurred. This method has been shown to significantly reduce head motion once children are in the scanner (de Bie et al., 2010; Raschle et al., 2012). To further reduce head motion, an inflatable head-stabilizing pillow was used during the scan.

***Resting-State Functional Connectivity Acquisition***

Scanning was performed on a 3T Phillips Achieva scanner at the University of Washington Integrated Brain Imaging Center using a 32-channel head coil. T1-weighted MPRAGE volumes were acquired (repetition time = 2530 ms, TE = 3.5 ms, flip angle = 7°, FOV = 256 × 256, 176 slices, in-plane voxel size=1 mm3) for co-registration with fMRI data. Blood oxygenation level dependent (BOLD) signal during functional runs was acquired using a gradient-echo T2\*-weighted echo planar imaging (EPI) sequence. Thirty-seven 3 mm thick slices were acquired sequentially and parallel to the AC-PC line (TR = 2 s, TE = 25 ms, flip angle = 79°, inter-slice gap = 0.6 mm, FOV = 224 × 224 × 132.6, matrix size = 76 × 74). Prior to each scan, four volumes were acquired to allow longitudinal magnetization to reach equilibrium.

**Resting-State fMRI Pre-Processing**

The resting state fMRI data were preprocessed following guidelines for optimal reduction of the influence of motion artifact from Ciric and colleagues (2017). This processing pipeline was implemented using Make, a software tool that allows for the integration of multiple software packages (Askren et al., 2016). We then registered the timeseries to the middle volume using FSL MCFLIRT (Jenkinson et al., 2002). Linear, and non-linear transformations were estimated for registering each subject's resting state timeseries to their T1 image, from the T1 to a sample-specific T1 template, and from that template to Montreal Neurological Institute (MNI) Atlas space. Anatomical co-registration of the functional data with each participant's T1-weighted image and normalization were performed using Advanced Normalization Tools software (ANTs; version 2.1.0), because of superior registration within pediatric samples (Avants et al., 2011). Slice-timing correction was performed using FSL slicetimer (Jenkinson et al., 2002), outlier voxel-values were replaced using AFNI 3dDespike (Cox, 1996), and Gaussian spatial smoothing using a 6 mm-FWHM smoothing kernel was applied using FSL SUSAN (Smith and Brady, 1997). Next, AFNI 3dDeconvolve (Cox, 1996) was used to regress nuisance variables from the timeseries. These variables included a regressor for each volume with a framewise displacement > 0.5 mm, or for which the derivative of variance in BOLD signal across the brain (DVARS) exceeded the upper fence (above 75th percentile + 1.5 x inter-quartile range), or for which the signal intensity was more than 3 SD from the mean. We included a total of 18 other nuisance regressors: six motion parameters and their derivatives, as well as the mean global signal from cerebral spinal fluid, white matter and gray matter (extracted prior to smoothing) and their derivatives. The data were then bandpass filtered using AFNI's 1dBport to retain frequencies in the range 0.01 Hz < f < 0.8 Hz. All participants had at least 4.5 min of usable data following preprocessing and were thus retained for analysis.

***Defining Regions of Interest***

All regions of interest (ROI) were anatomically defined using the individualized structural morphometric output of Freesurfer’s automated process pipeline (surfer.nmr.mgh.harvard.edu) applied to the participant’s T1 image (surfer.nmr.mgh.harvard.edu). Striatal regions, including the Caudate, Putamen and Nucleus Accumbens (NAcc) were estimated in the volume. Each ROI was slightly eroded to reduce partial volume effects, and then binarized to create a mask using mri\_binarize from Freesurfer. Prefrontal regions, including the ventral medial pre-frontal cortex (vmPFC), dorsal anterior cingulate cortex (dACC), and dorsal lateral prefrontal cortex (dlPFC), were defined on the cortical surface using the Glasser atlas (Glasser & Van Essen, 2011). These ROIs were defined in a common template space (fsaverage6) and then projected onto the participant’s individual surface using mri\_surf2surf in Freesurfer. The mean timeseries for all individually-defined ROIs were extracted for each participant for further analyses. Specifically, these extracted timeseries data serve as the dependent variable in models examining fronto-striatal rs-fc as an outcome.

**Results**

**Adversity and Neural Reward Processing**

Neither threat nor deprivation experiences were associated with any of the rs-fc connectivity variables measured after controlling or multiple comparisons (*p*s > .05) (see Table S1).

**Neural Reward Processing and Psychopathology**

None of the rs-fc variables measured were associated prospective depression nor externalizing symptoms after controlling for multiple comparisons (*p*s > .05) (see Table S2).

**Neural Reward Processing as a Moderator**

None of the rs-fc variables measured interacted with threat or deprivation experiences to predict prospective depression or externalizing symptoms (*p*s > .05) (see Table S3).

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**Table S1*.***

***Adversity Associations with Fronto-Striatal Resting-State Functional Connectivity***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Threat Experiences | | | | Deprivation Experiences | | | |
| Variables | *ß* | SE | *t*(131) | *p* | *ß* | SE | *t*(131) | *p* |
| NAcc - dACC | -.14 | .03 | -1.59 | .34 | .11 | .03 | -1.27 | .34 |
| Putamen - dACC | .02 | .03 | .22 | .84 | .11 | .03 | 1.21 | .34 |
| Caudate - dACC | .06 | .04 | .62 | .80 | .09 | .04 | 1.02 | .40 |
| NAcc - mPFC | -.11 | .03 | -1.26 | .48 | -.15 | .03 | -1.73 | .34 |
| Putamen - mPFC | .07 | .03 | .83 | .73 | .11 | .03 | 1.22 | .34 |
| Caudate - mPFC | -.02 | .03 | -.20 | .84 | -.02 | .03 | -.21 | .83 |
| NAcc - vlPFC | -.02 | .03 | -.21 | .84 | .17 | .03 | 1.90 | .34 |
| Putamen - vlPFC | -.16 | .03 | -1.77 | .34 | .11 | .03 | 1.22 | .34 |
| Caudate - vlPFC | -.19 | .03 | -2.14 | .31 | -.07 | .03 | -.82 | .46 |

*Note*: All p-values are FDR-corrected.

NAcc = Nucleus Accumbens; dACC = dorsal Anterior Cingulate Cortex; mPFC = medial Prefrontal Cortex; vlPFC = ventral lateral Prefrontal Cortex.

**Table S2*.***

***Fronto-Striatal Resting-State Functional Connectivity Associations with Longitudinal Psychopathology***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Depression Symptoms | | | | Externalizing Symptoms | | | |
| Variables | *b* | SE | *z*(118) | *p* | *ß* | SE | *t*(119) | *p* |
| NAcc - dACC | .30 | .29 | 1.01 | .91 | -.12 | 2.60 | -1.55 | .55 |
| Putamen - dACC | .01 | .29 | .04 | .97 | -.06 | 2.53 | -.78 | .77 |
| Caudate - dACC | .17 | .27 | .63 | .91 | .01 | 2.33 | .12 | .97 |
| NAcc - mPFC | -.19 | .37 | -.51 | .91 | .03 | 3.35 | .35 | .93 |
| Putamen - mPFC | -.28 | .31 | -.89 | .91 | .14 | 2.77 | 1.91 | .52 |
| Caudate - mPFC | .12 | .30 | .40 | .91 | .08 | 2.12 | .98 | .77 |
| NAcc - vlPFC | -.31 | .31 | -1.00 | .91 | -.05 | 2.74 | -.66 | .77 |
| Putamen - vlPFC | -.10 | .31 | -.32 | .91 | -.003 | 2.71 | -.04 | .97 |
| Caudate - vlPFC | -.08 | .34 | -.24 | .91 | -.05 | 2.93 | -.68 | .77 |

*Note*: All p-values are FDR-corrected.

NAcc = Nucleus Accumbens; dACC = dorsal Anterior Cingulate Cortex; mPFC = medial Prefrontal Cortex; vlPFC = ventral lateral Prefrontal Cortex.

**Table S3*.***

***Adversity by Fronto-Striatal Resting-State Functional Connectivity Interactions Predicting Longitudinal Psychopathology***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Depression Symptoms | | | | Externalizing Symptoms | | | |
| Variables | *b* | SE | *z*(118) | *p* | *ß* | SE | *t*(119) | *p* |
| Threat X NAcc - dACC | .04 | .50 | .09 | .93 | .13 | 4.37 | 1.70 | .75 |
| Threat X Putamen - dACC | -.41 | .45 | -.93 | .72 | .07 | 4.14 | .78 | .75 |
| Threat X Caudate - dACC | -.92 | .67 | -1.37 | .72 | -.06 | 5.80 | -.68 | .75 |
| Threat X NAcc - mPFC | 1.46 | .79 | 1.85 | .58 | -.07 | 6.81 | -.48 | .75 |
| Threat X Putamen - mPFC | -.45 | .65 | -.70 | .72 | .05 | 5.75 | .58 | .75 |
| Threat X Caudate - mPFC | .37 | .64 | .58 | .72 | -.004 | 5.13 | -.05 | .96 |
| Threat X NAcc - vlPFC | .34 | .43 | .80 | .72 | -.04 | 4.34 | -.44 | .75 |
| Threat X Putamen - vlPFC | -.09 | .43 | -.20 | .93 | -.08 | 4.21 | -1.04 | .75 |
| Threat X Caudate - vlPFC | .45 | .54 | .83 | .72 | .08 | 4.52 | 1.03 | .75 |
| Deprivation X NAcc - dACC | -.40 | .43 | -.93 | .99 | -.02 | 3.77 | -.23 | .82 |
| Deprivation X Putamen - dACC | -.22 | .48 | -.45 | .99 | 1.83 | 4.22 | .43 | .76 |
| Deprivation X Caudate - dACC | -.12 | .40 | -.30 | .99 | .11 | 3.64 | 1.35 | .76 |
| Deprivation X NAcc - mPFC | .01 | .60 | .02 | .99 | .09 | 5.32 | .70 | .76 |
| Deprivation X Putamen - mPFC | -.06 | .45 | -.13 | .99 | .11 | 4.02 | 1.43 | .76 |
| Deprivation X Caudate - mPFC | .70 | .50 | 1.40 | .99 | -.04 | 4.57 | -.47 | .76 |
| Deprivation X NAcc - vlPFC | -.09 | .51 | -.19 | .99 | -.05 | 4.72 | -.66 | .76 |
| Deprivation X Putamen - vlPFC | -.21 | .43 | -.50 | .99 | -.03 | 3.94 | -.42 | .76 |
| Deprivation X Caudate - vlPFC | -.12 | .57 | -.21 | .99 | -.06 | 5.03 | -.52 | .76 |

*Note*: All p-values are FDR-corrected.

NAcc = Nucleus Accumbens; dACC = dorsal Anterior Cingulate Cortex; mPFC = medial Prefrontal Cortex; vlPFC = ventral lateral Prefrontal Cortex.

A close up of a map

Description automatically generated

**Figure S1.** Child-friendly version of the Monetary Incentive Delay (MID) task.