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Supplemental Information

Disrupted Prefrontal Regulation of Striatal

Subjective Value Signals in Psychopathy

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SUPPLEMENTAL INFORMATION



Figure S1, Related to Figure 1. Screen capture of the inter-temporal decision-making task. Across many trials, participants chose between smaller-but-sooner and larger-but-later options.

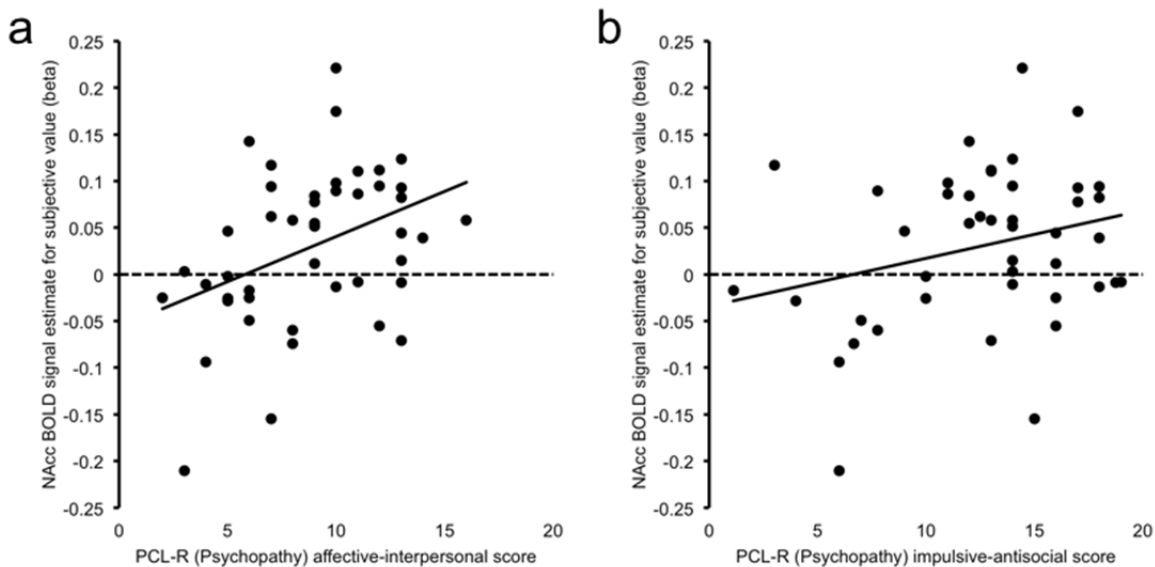


Figure S2, Related to Figure 1. Subjective value-related BOLD activity in the nucleus accumbens (NAcc) tracks psychopathy factor scores. (A) Scatter plot illustrates the significant positive correlation between the Factor 1 (affective-interpersonal) psychopathy scores and subjective value-related BOLD signal within right NAcc. (B) In contrast, the correlation between Factor 2 (impulsive-antisocial) psychopathy scores and NAcc BOLD was not significant.

Suprathreshold focus MNI coordinates (mm)	Anatomical label	Z-score	Cluster size	Uncorrected p	FDR-corrected p	p-value for correlation with PCL-R
6 38 2	pgACC	5.08	234	< 0.001	0.018	0.019
8 44 -6	vmPFC	4.95	234	< 0.001	0.022	0.004
8 29 28	right dACC	4.80	234	< 0.001	0.038	0.072
38 44 38	right dPFC	4.78	374	< 0.001	0.038	0.408
-24 -28 -12	left PHG	4.61	75	< 0.001	0.046	0.559

Table S1, Related to Figure 2. Suprathreshold foci identified via rsFC, using right NAcc ROI as seed. All values reported in table significant at $p_{FDR(\text{Peak-level})} < 0.05$.

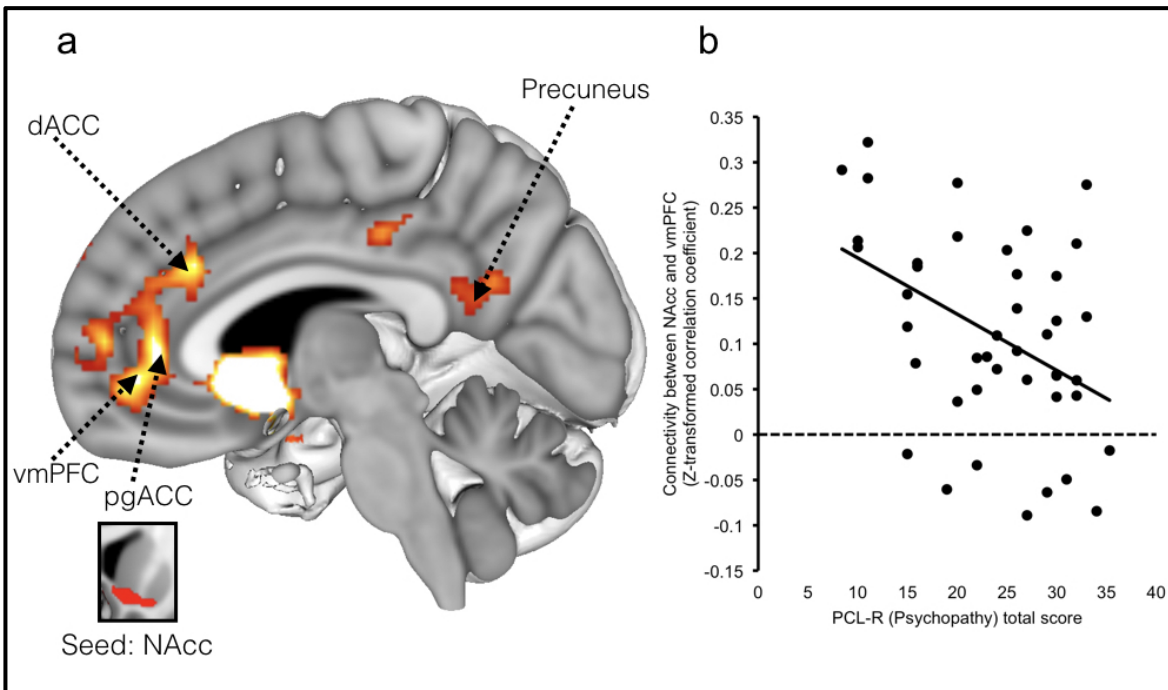


Figure S3, Related to Figure 2. Main effect of rsFC with NAcc. (A) SPM Depicts regions with significant functional connectivity to right NAcc. A threshold of $p_{FDR(\text{Cluster-level})} < 0.05$ (height defining threshold of $t > 3$) is used here for visualization; however, peak-level FDR correction was used for inference (see Table S1). (B) Scatter plot illustrates relationship between PCL-R scores and NAcc-vmPFC rsFC, using vmPFC focus identified in (A).

Variable Pair	Pearson Correlation	Partial Correlation	Robust Regression	Robust Regression with Covariates	Case Exclusion (Cooks D with cutoff = 4/n)
BOLD-PCLR (PCLR total score)	r = 0.335, p = 0.024	r = 0.254, p = 0.105	t = 2.19, p = 0.034	t = 1.57, p = 0.124	t = 2.75, p = 0.009 ^a
PCLR-rsFC (rsFC: psychopathy regression)	r = -0.586, p < 0.001	r = -0.581, p < 0.001	t = -4.58, p < 0.001	t = -4.11, p < 0.001	t = -7.00, p < 0.001 ^b
PCLR-rsFC (rsFC: main effect)	r = -0.429, p = 0.004	r = -0.464, p = 0.002	t = -3.11, p = 0.003	t = -2.84, p = 0.007	t = -4.26, p = 0.001 ^b
rsFC-Striatal BOLD (rsFC: psychopathy regression)	r = -0.382, p = 0.011	r = -0.410, p = 0.009	t = -2.41, p = 0.021	t = -2.30, p = 0.027	t = -2.25, p = 0.03 ^a
rsFC-Striatal BOLD (rsFC: Main Effect)	r = -.308, p = 0.045	r = -.362, p = 0.022	t = -1.78, p = 0.083	t = -1.84, p = 0.074	t = -1.51, p = 0.138 ^c
Striatal BOLD-Arrest	r = 0.295, p = 0.049	r = 0.328, p = 0.034	t = 2.34, p = 0.024	t = 1.97, p = 0.056	t = 2.18, p = 0.035 ^b
rsFC-Arrest (rsFC: psychopathy regression)	r = -0.395, p = 0.009	r = -0.393, p = 0.012	t = -3.03, p = 0.004	t = -2.40, p = 0.021	t = -2.92, p = 0.006 ^a
rsFC-Arrest (rsFC: main effect)	r = -0.391, p = 0.009	r = -0.371, p = 0.018	t = -2.68, p = 0.011	t = -1.99, p = 0.054	t = -2.71, p = 0.01 ^a

^a2, ^b3, ^c1

Table S2, Related to Figures 1-5. Pair-wise associations among PCLR, striatal BOLD, resting state connectivity and arrests. Table compares significance for associations between pearson correlation, partial correlation with age and substance abuse covariates, robust regression, and robust regression with age and substance abuse covariates. One participant, who had an ASI cumulative score of 76 – corresponding to a z-score of 3.94 - was excluded from covariate analyses due to concerns about reporting accuracy. For the Case Exclusion column, suprascript letters indicate the number of cases excluded according to the listed cutoff. For case exclusion analyses, OLS regression was implemented in Stata; standard errors were calculated using the Huber-White sandwich estimator to account for heteroscedasticity.

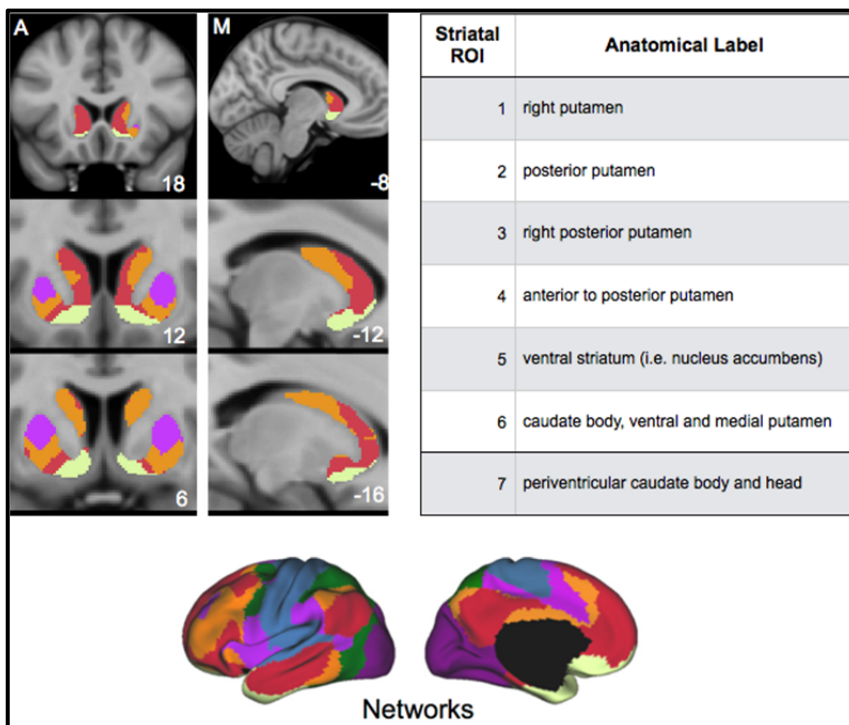


Figure S4, Related to Figure 2. Coronal section depicting four of the seven masks derived from a large (n = 1000) study of striatal functional connectivity. Anatomical labels from Choi et al 2012 are noted in adjacent table. Violet: dorsal putamen (ROI 4). Light Green: nucleus accumbens (ROI 5). Orange: dorsal caudate and ventrolateral putamen (ROI 6). Red: medial caudate (ROI 7). Corresponding cortical regions are depicted on the rendered cortical surface map (below); colors indicate cortical regions functionally connected to corresponding striatal ROIs.

	PCL-R Total	PCL-R F1	PCL-R F2
NEO Novelty Seeking Total	.473	.386	.432
NEO NS2 Subscale - Impulsiveness	.399	.407	.338
Barrat Impulsiveness Scale -11 (BIS-11) Total	-	.300	-
BIS-11 – Self Control Subscale	.329	.341	-
BIS-11 Attention Subscale	-	-	-
BIS-11 Motor Subscale	-	.311	-
Psychopathic Personality Inventory (PPI) - Total	.585	.534	.539
PPI – Emotional/Interpersonal (F1)	.317	-	.310
PPI – Impulsive-Antisocial (F2)	.436	.411	.408

Table S3, Related to Figure 1. Pearson correlation (r) values for pairwise tests of association between PCL-R Total, PCL-R F1 and PCL-R F2 scores with several measures of trait impulsivity. All listed values are significant at $p < 0.05$ (two-tailed); non-significant values are indicated with a “-”.