Supporting Information

Li et al. 10.1073/pnas.1002467107

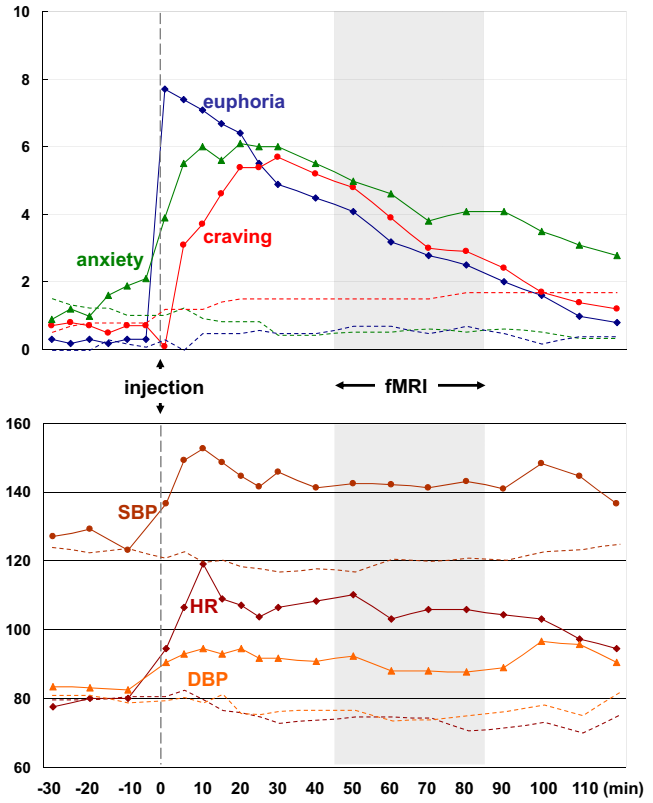

Fig. S1. Psychological assessments (*Upper*) and cardiovascular measures (*Lower*) during methylphenidate (solid line), as compared with saline placebo (dashed line) administration. The vertical dashed line represents time (zero) of injection. As compared with placebo, methylphenidate evoked significant changes in euphoria, craving, and anxiety, as well as increases in blood pressure and heart rate. The shaded areas represent the time period of fMRI. The change in these psychological and cardiovascular measures was computed for the first 30 min after i.v. injection and for the period of fMRI by subtracting the average baseline measure (30 min before injection) from the average measure of each of the two periods.

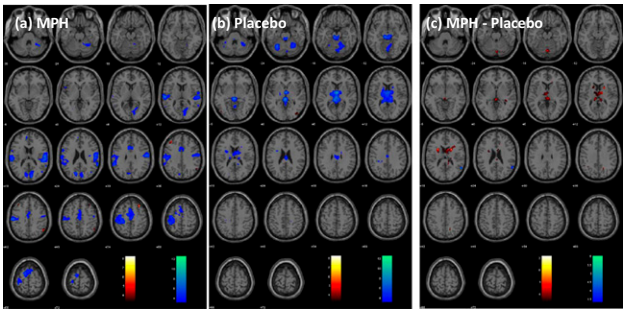

Fig. S2. Regional brain activations during SS versus SE trials, for (*A*) methylphenidate (MPH), (*B*) Placebo sessions; and (*C*) a contrast between MPH and placebo. BOLD contrasts were overlaid on a structural images in axial sections, from $z = -30$ to $z = 72$. Adjacent sections are 6 mm apart. Color bars represent voxel T value. Warm color: SS > SE and winter: SE > SS, for (*A*) and (*B*); For (*C*), Warm color: MPH > placebo (SS − SE) and winter: MPH < placebo (SS − SE). $P < 0.005$, uncorrected, for all contrasts.

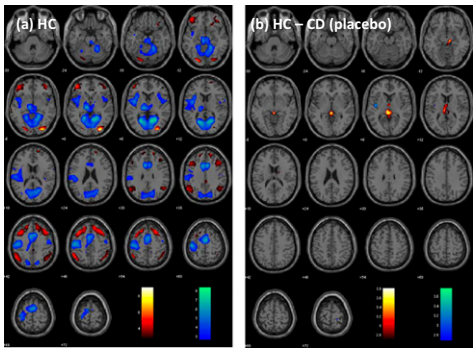

Fig. S3. Regional brain activations during SS versus SE trials, for (*A*) 36 healthy control (HC) participants; warm color: SS > SE; winter color: SE > SS; and (*B*) comparing HC and the 10 cocaine-dependent volunteers (CD) during the P session; Warm color: HC > CD (SS − SE); winter color: CD > HC (SS − SE). BOLD contrasts were overlaid on a structural image in axial sections, from $z = -30$ to $z = 72$. Adjacent sections are 6 mm apart. Color bars represent voxel T value. $P < 0.005$, uncorrected, for all contrasts.

Table S1. Regional brain activation: SS vs. SE

Cluster size, voxels	Voxel Z value	MNI coordinate, mm			Side	Identified brain region
		x	*y*	*z*		
MPH, SS > SE						
24	4.30	30	26	55	R	Middle frontal gyrus
37	4.15	54	−61	43	R	Inferior parietal lobule
22	3.90	−36	35	37	L	Middle frontal gyrus
MPH, SE > SS						
568	4.89	57	−16	19	R	Superior temporal gyrus
344	4.64	−12	−73	22	L	Cuneus
	4.14	12	−85	19	R	Cuneus
1076	4.59	−60	−22	10	L	Superior/transverse temporal gyrus
	4.25	−57	−22	43	L	Superior temporal gyrus
	4.12	−54	−43	31	L	Precentral cortex
92	4.15	36	−49	−26	R	Cerebellar cortex
661	4.11	−12	2	67	R/L	Supplementary motor area
	3.95	−3	14	55	R/L	Presupplementary motor area
18	3.61	−6	50	22	R/L	Anterior cingulate cortex
41	3.19	−60	5	25	L	Superior temporal gyrus
Placebo, SS > SE						
31	3.27	39	−82	1	R	Middle/transverse occipital gyrus
16	3.22	−48	−76	−8	L	Middle/transverse occipital gyrus
Placebo, SE > SS						
1582	5.02	3	−7	1	R/L	Thalamus/epithalamus
	4.43	0	−31	−2	R/L	Thalamus/epithalamus
	4.32	−9	−34	7	R/L	Thalamus/epithalamus
112	3.99	−30	−64	−26	L	Cerebellar cortex
95	3.70	3	−22	25	R/L	Corpus callosum
40	3.16	6	−34	−44	R/L	Midbrain/tectum/pretectal region

$P < 0.005$, uncorrected, and 15 voxels in extent of activation; MPH, M session.

Table S2. Regional brain activations: methylphenidate (MPH) > placebo for SS > SE

Cluster size, voxels	voxel Z value	MNI coordinate, mm *x*	*y*	*z*	Side	Identified brain region
MPH > placebo, SS > SE						
453	3.91	24	8	16	R/L	Thalamus/epithalamus/caudate/putamen
	3.85	−24	8	19	R/L	Thalamus/epithalamus/caudate/putamen
	3.77	9	8	22	R/L	Thalamus/epithalamus/caudate/putamen
40	3.45	3	−76	−20	R/L	Cerebellar cortex
15	3.25	39	−73	−26	R	Cerebellar cortex
MPH < Placebo, SS > SE						
30	3.60	57	−58	19	R	Superior temporal sulcus

$P < 0.005$, uncorrected, and 15 voxels in extent of activation.

Table S3. Linear correlation of striatothalamic activation with changes in SSRT as well as psychological and cardiovascular measures

	Euphoria	Craving	Anxiety	HR	SBP	DBP	SSRT
L	0.9471	0.4569	0.4144	0.3080	0.4317	0.5227	0.6626
R	0.3446	0.1034	0.4734	0.4211	0.5343	0.8857	0.8627
L+R	0.5878	0.2021	0.4044	0.3211	0.4453	0.7936	0.7421

Note: *P* values are of Pearson correlation between the change in the psychological /cardiovascular measure or SSRT: MPH (fMRI baseline) − placebo (fMRI baseline) and difference in regional brain activation: MPH (SS − SE) − placebo (SS − SE). L, left striatothalamic cluster; R, right striatothalamic cluster; L+R, combined; HR, heart rate: DBP, diastolic blood pressure.

Table S4. Regional brain activations of SS vs. SE: healthy control subjects (n = 36)

Cluster size, voxels	Voxel Z value	MNI coordinate, mm *x*	*y*	*z*	Side	Identified brain region
SS > SE						
225	6.46	33	−88	−2	R	Occipital cortex
172	5.40	−24	−88	−11	L	Occipital cortex
400	5.18	−51	−52	52	L	Inferior parietal lobule
345	4.98	−42	50	1	L	Orbitofrontal cortex
535	4.91	−36	20	46	L	Middle frontal cortex
672	4.84	45	17	46	R	Middle frontal cortex
220	4.12	45	44	−5	R	Inferior frontal cortex
378	4.08	42	−61	52	R	Inferior parietal lobule
26	3.37	3	−37	37	R/L	Middle/posterior cingulate cortex
30	3.31	−66	−28	−8	L	Cerebellar cortex
SE > SS						
3917	6.16	−21	−64	10	R/L	Lingual G/thalamus/epithalamus/cerebellar cortex/midbrain
	5.99	18	−61	10	R/L	Lingual G/thalamus/epithalamus/cerebellar cortex/midbrain
	5.86	9	−58	4	R/L	Lingual G/thalamus/epithalamus/cerebellar cortex/midbrain
3068	5.57	−9	14	31	R/L	Anterior cingulate cortex/supplementary motor area
	5.35	0	−4	64	R/L	Anterior cingulate cortex/supplementary motor area
	5.33	9	17	37	R/L	Anterior cingulate cortex/supplementary motor area
184	3.88	−54	−4	43	L	Precentral cortex/superior temporal cortex/insula
99	3.72	45	5	7	R	Insula

$P < 0.005$, uncorrected, and 15 voxels in extent of activation; G, gyrus.

Table S5. Regional brain activations: HC versus CD (placebo) for SS > SE

Cluster size (voxels)	Voxel Z value	MNI coordinate (mm)			Side	Identified brain region
		x	*y*	*z*		
HC > Placebo						
260	3.52	−6	−28	7	R/L	Thalamus/epithalamus
	3.52	0	−34	1	R/L	Epithalamus/colliculi
	3.52	9	−25	−14	R/L	Colliculi/pretectal region
Placebo > HC						
27	3.49	−39	−10	7	L	Posterior insula

$P < 0.005$, uncorrected, and 15 voxels in extent of activation; HC, healthy controls; CD, cocaine-dependent volunteers; G, gyrus.

Table S6. Linear correlation of MFC and vmPFC activation with psychological and cardiovascular measures

	Euphoria	Craving	Anxiety	HR	SBP	DBP
MFC	$P < 0.1688$	$P < 0.5875$	$P < 0.8380$	$P < 0.9063$	$P < 0.0805$	$P < 0.7669$
vmPFC	$P < 0.3257$	$P < 0.6412$	$P < 0.2284$	$P < 0.8956$	$P < 0.0017$	$P < 0.1270$

P values are of Pearson correlation between the change in the psychological or cardiovascular measure: methylphenidate (fMRI baseline) − placebo (fMRI baseline) and difference in regional brain activation: methylphenidate (SS − SE) − placebo (SS − SE). HR, heart rate: DBP, diastolic blood pressure.