Supplementary Table 2: Aberrant brain network activation in addiction (results per brain regions)

First author	Drug	Drug Use Status	N	Task	Interventions	Behavioral effects	Brain effects	Correlation with drug use	Study Site	% female	Gender com-parison
							Cue exposure				
Lee 2013	ALC	abs	A 17 HC 25	Drug Cues IAPS (negative + positive)	n.a.	A>HC: ↑craving	A>HC (Drug): IPL A>HC (negative): visual	n.s.	Korea	29	no
Seo 2013	ALC	abs	A 30 HC 30	Drug Script/ Stress Script	TAU	A>HC: ↑craving G*T (A ↑)(Drug Cue): ↑anxiety	HC>A (Drug): anterior insula, premotor, FEF, vmPFC, rACC, OFC, dmPFC, PCC, precuneus, IPL, temporal pole, auditory, visual, cerebellum HC>A (Stress): anterior insula, premotor, FEF, vmPFC, dmPFC, rACC, OFC, PCC, precuneus, IPL, temporal pole, auditory, visual, cerebellum A>HC (Neutral): vmPFC, rACC, PCC, precuneus, visual, cerebellum HC>A (Neutral): anterior insula, premotor, FEF, OFC, IPL, temporal pole, IPL	Relapse (Neutral) ↑: ventral striatum, vmPFC, rACC Relapse (Stress) ↓: posterior insula, vlPFC, vmPFC, rACC, PCC, auditory Craving ↑: ventral striatum, vmPFC, rACC, precuneus	USA	22	no
Kim 2014	ALC	abs	A 38 HC 26	Drug/Aversive Videos	n.a.	A>HC: ↑craving	A>HC (Drug): aPFC HC>A (Drug): visual A>HC (negative): visual HC>A: (negative): hippocampus, dlPFC, auditory	n.s.	Korea	29	no
Sjoerds 2014a	ALC	abs	A 30 HC 15	Drug Cues	n.a.	A>HC: ↑craving	n.s.	n.s.	Netherlands	47	no
Wiers 2015	ALC	abs	A 38 HC 17	Drug Cues	n.a.	A>HC: ↑craving	n.s.	n.a.	Germany	0	no
Arcurio 2015	ALC	abs	A 15 HC 16	Decision to Drink Task	n.a.	A>HC: Endorsed alcohol despite high risk	A>HC (Endorsed Alcohol): SN, dorsal striatum, anterior insula, vlPFC, dlPFC, SMA, visual, cerebellum G*T (A ↑)(Endorsed Alcohol): anterior insula, vlPFC, premotor, IPL, visual, cerebellum	n.a.	USA	100	no
Czapla 2017	ALC	abs	A 19 HC 21	Drug Cue Go/NoGo	detox	n.s.	A>HC (drug)(conflict): visual, cerebellum A>HC (conflict): vmPFC, dmPFC, rACC, dACC A>HC (conflict)(drug cue): visual HC>A (conflict) (no drug cue): IPL, sensory	n.a.	Germany	10	no
de Sousa Fernandes Perna 2017	ALC CAN	abs	ALC 20 CAN 21 HC 20	Marketing clips with Drug Cues	CAN or ALC	ALC, CAN > HC: approach score for CAN	Group difference: hippocampus, precuneus	ALC/CAN administration ↓: SMA	Netherlands	50	no

Study	Drug	Abst	Sample	Task		Behavioral	G*T	Correlations	Country	N	
Cousijn 2012	CAN	abs	A 33 HC 36	Approach-Avoidance Task	n.a.	n.s.	n.s.	Lifetime CAN ↑: parahippocampal, amygdala, insula, vlPFC, vmPFC, precuneus, IPL, visual, cerebellum Addiction Severity ↓: dlPFC, dACC	Netherlands	36	no
Cousijn 2013a	CAN	abs	A 31 HC 21 cU 20	Drug Cues	n.a.	A>HC: ↑craving	n.s.	Addiction Severity ↑ : NAc, putamen, caudate, OFC, sgACC, rACC, dmPFC, dACC Craving ↓: dlPFC	Netherlands	35	no
Filbey 2016	CAN	abs	A 53 HC 68	Drug Cues	n.a.	A>HC: ↑craving	G*T (A ↑) (Drug): caudate, pallidum, parahippocampus, thalamus, sgACC, rACC, dACC, dmPFC, PCC, precuneus, cerebellum	Craving (scanner) ↑: caudate body, pallidum, parahippocampus, amygdala, thalamus, vlPFC, OFC, dACC, dmPFC, PCC, temporal pole, cerebellum Craving (pre/post)↑: insula, IPL, motor, sensory, visual, auditory Withdrawal ↑: insula, premotor, dACC, IPL, temporal pole, sensory, visual, auditory CAN metabolites ↑: visual	USA	38	no
Roberts 2013	CAN MDMA	uri-	30 MDMA 25 CAN 30 HC	Drug Cues, IAPS (negative)	n.a.	G*T(MDMA↓)(drug cues): speed HC> MDMA: accuracy	MDMA > HC: dlPFC, visual G*T (↓MDMA) (drug cues): aPFC G*T(↑MDMA) (drug cues): vlPFC/dlPFC, visual G*T(↑MDMA)(negative): aPFC G*T(↓MDMA)(negative): vlPFC/dlPFC, visual	n.s.	Ireland	40	no
Bell 2014a	COC	parR	A 20 HC 19	Drug Cues SST	n.a.	A>HC: ↑craving	n.s.	n.s.	USA	0	no
Ray 2015	COC	uri-	A 20 HC 17	Drug Cues	n.a.	A>HC: ↑craving	G*T (A ↑) (Drug): ventral striatum, dorsal striatum, hippocampus, parahippocampus, amygdala, thalamus, insula, vlPFC, dlPFC, premotor, SMA, OFC, aPFC, sgACC, rACC, dACC, dmPFC, PCC, IPL, SPL, temporal pole	n.a.	USA	25	no
Kober 2016	COC	n.a.	A 30 HC 45	Drug/Sad Videos	n.a.	A>HC: ↑craving	G*T (A ↑)(Drug)(Early): rACC G*T (A ↑)(Drug)(Late): dmPFC, dACC	n.a.	USA	40	YES
Li 2012	HER	uri-	A 24 HC 20	Drug Cues	n.a.	A>HC: ↑craving	G*T (A ↑) (Drug): NAc, caudate, putamen, hippocampus, parahippocampus, amygdala, thalamus, vlPFC, dlPFC, premotor, SMA, vmPFC, OFC, sgACC, rACC, dACC, dmPFC, PCC	n.s.	China	0	no
Wang 2014	HER	meth	A 30 HC 17	Drug Cues	MMT	n.s.	G*T (A ↑) (Drug): parahippocampus, thalamus, vlPFC, SMA, dACC, precuneus, cerebellum	MMT ↓: caudate	China	0	no

Study	Substance	Use	Sample	Task		Behavioral	Brain activation	Correlation	Country		
Tabata baei-Jafari 2014	HER	uri-meth	A 20 A (MMT) 20 HC 20	Drug Cues	MMT	n.s.	A>HC: vlPFC, rACC, dACC A(MMT)>HC: visual, cerebellum	A>A(MMT) ↑: vlPFC, auditory	Iran	0	no
Li 2015	HER	meth	A 44 HC 20	Drug Cues	MMT	n.s.	G*T (A ↑) (Drug): NAc, caudate, putamen, pallidum, parahippocampus, dlPFC, OFC, rACC, dACC, precuneus, SPL, IPL, temporal pole, visual, cerebellum	Relapsers>Non-relapsers ↑: NAc, cerebellum	China	0	no
Yin 2012	METH	abs	A 26 HC 26	Drug Cues	n.a.	n.a.	n.s.	n.a.	China	46	no
Vollstädt-Klein 2011	NIC	use	A 22 HC 21	Drug Cues	n.a.	n.a.	n.s.	Addiction Severity ↓: putamen, hippocampus, parahippocampus, amygdala, thalamus, dlPFC, premotor, PCC, precuneus, SPL, IPL, motor, visual	Germany	0	no
Yalach kov 2013	NIC	use	A 15 HC 15	Drug Cues	n.a.	A>HC: ↑Haptic Drug Cue Recognition	HC>A: vlPFC, dlPFC, SMA, visual G*T (A ↓)(Drug): visual	n.a.	Germany	53	no
Hong 2017	NIC	n.a.	A 15 HC 15	Drug/Aversive Videos	n.a.	n.a.	A>HC (Drug): sgACC, temporal pole HC>A (Drug): premotor A>HC (negative): premotor HC>A: (negative): insula, dlPFC, sgACC, dACC, precuneus, auditory, cerebellum	NIC Dependence ↑: sgACC	Korea	0	no
Reward processing											
Roman czuk-Seifert h 2015	ALC	abs	A 15 HC 17	MID	n.a.	n.s.	n.s.	n.s.	Germany	0	no
Grodin 2016	ALC	abs	A 17 HC 17	MID	n.a.	A>HC: ↑misses, errors	A>HC (Anticipation) (Low effort): NAc, dorsal caudate A>HC (Anticipation)(Unpredictable effort): NAc, dorsal caudate, SMA, precuneus, SPL, visual, auditory, cerebellum G*T(↓A)(Loss)(High effort): dorsal caudate	n.a.	USA	35	no
Alexander 2015	ALC CAN POLY	use	ALC 3 CAN 7 POLY 15 HC 24	Incentive Change-Signal Task	n.a.	HC>A: Faster Go responses	n.s.	n.a.	USA	48	no

Study	Drug	Abs	N	Task	Tx	Behavioral	Neuroimaging (A vs HC)	Treatment	Country	%	med
Murphy 2017	ALC POLY	abs	ALC 18 POLY 32 HC 33	MID	n.a.	n.s.	n.s.	n.a.	UK	n.a.	no
Yip 2014	CAN	Abs/use	A 20 HC 20	MID	n.a.	n.s.	HC>A (Loss Anticipation): dlPFC, vlPFC, SMA HC>A (Win): SMA, SPL, motor, sensory A>HC (Loss): caudate, putamen, pallidum, thalamus, hippocampus, SPL, IPL, sensory, auditory	n.a.	USA	0	no
Enzi 2015	CAN	abs	A 15 HC 15	MID	n.a.	n.s.	n.s.	n.s.	Germany	0	no
Jia 2011	COC	use	A 20 HC 20	MID	CBT, Incentives	n.s.	n.s.	n.s.	USA	40	no
Hester 2013	COC	parR	A 15 HC 15	Go/NoGo with punishment	n.a.	HC>A (loss): accuracy, learning G*T(↓A) (loss): speed, post-error slowing	n.s.	n.s.	USA	13	no
Worhunsky 2014	COC	uri-	A 24 HC 24	Simulated Slot Machine	n.a.	n.s.	A>HC (Win anticipation): putamen, caudate, hippocampus, insula, dACC, vlPFC, dlPFC, SMA, dmPFC, visual, auditory A>HC (near miss): dmPFC	n.a.	USA	33	no
Balodis 2016	COC	uri-	A 29 HC 28	MID	CBT	n.a.	A>HC (Win Anticipation): vlPFC A>HC (Loss Anticipation): vlPFC, auditory	Treatment ↑: SN, caudate, lentiform nucleus, thalamus, PCC, precuneus, cerebellum	USA	26	no
Bischof-Grethe 2017	METH	uri-	A 17 HC 23	Probablistic Feedback Expectancy Task	n.a.	n.s.	HC>A (Anticipation): dorsal striatum, thalamus, insula, dlPFC, premotor, dACC, IPL sensory, visual G*T (Anticipation): vlPFC, dACC, IPL, SPL A>HC (Outcome): parahippocampus, thalamus, dlPFC, SMA, dACC, visual G*T (Outcome): motor, visual	n.s.	USA	0	no
Rose 2013	NIC	use	A 28 HC 28	MID	20 mg NIC	n.s.	n.s.	G*T (A ↑)(NIC administration): PCC A (NIC administration): premotor	USA	54	no
Decision Making											
Arcurio 2015	ALC	abs	A 15 HC 16	Decision to Drink Task	n.a.	A>HC: Endorsed alcohol despite high risk	A>HC (Endorsed Alcohol): SN, dorsal striatum, anterior insula, vlPFC, dlPFC, SMA, visual, cerebellum G*T (A ↑)(Endorsed Alcohol): anterior insula, vlPFC, premotor, IPL, visual, cerebellum	n.a.	USA	100	no

Study	Drug	Abs	Sample	Task	Col6	Behavioral	Neural findings	Correlations	Country	%	yes/no
Beylergil 2017	ALC	abs	A 34 HC 26	Two Choice Prediction Task	n.a.	HC>A: Learned reward contingencies, correct choices, loss contingent behavioral change	HC>A (Negative Prediction Error): dlPFC HC>A: (Positive Prediction Error): dlPFC, premotor, FEF, IPL	n.a.	Germany	0	no
Wesley 2011	CAN	abs	A 16 HC 16	IGT	n.a.	HC>A: fewer losses	HC>A (outcome): dmPFC, dACC HC>A (Loss): SMA, dACC, dmPFC, precuneus, SPL, cerebellum	n.a.	USA	63	no
Cousijn 2013b	CAN	abs	A 32 HC 41	IGT	n.a.	n.s.	G*T (A ↑) (Win): insula, OFC, auditory	Weekly Use ↑: dorsal caudate, insula, vlPFC Weekly Use follow-up: ↑ vlPFC, dlPFC, aPFC, visual, auditory	Netherlands	34	no
Gowin 2017	COC	uri-	A 29 HC 40	RGT	n.a.	G*T(A↑): Risky Choice after Loss	A>HC (Decision): motor, auditory G*T (A ↓) (Decision) (High Risk): ventral striatum, SMA, motor, visual, auditory A>HC (Outcome): thalamus, PCC, IPL, visual, auditory, cerebellum HC>A (Outcome): sensory G*T (A ↓)(High Loss): ventral striatum, dorsal striatum, thalamus, insula, vlPFC, dlPFC, premotor, sgACC, precuneus, visual, auditory	Lifetime COC Use ↑ : rACC Time since last use ↑ : dACC	USA	13	no
Meade 2017	COC	abs	A + HIV 18 A 19 HIV 19 HC 17	ICT	n.a.	n.a.	G*T(A ↓) (Decision)(Difficult): insula, vlPFC, dlPFC, premotor, IPL, motor, sensory, visual	n.a.	USA	37	no
Worhunsky 2017	COC	uri-	A 18 HC 27	Loss Chase Task	n.a.	n.s.	G*T(A↓)(Loss): ventral + dorsal putamen/caudate/pallidum, amygdala	n.s.	USA	39	no
Gradin 2014	HER	meth	A 30 HC 23	Reward/Loss Learning Task	MMT	A>HC: speed decision	A>HC (Win Anticipation): auditory HC>A (Loss Anticipation): insula, vlPFC HC>A (Win): dorsal caudate, precuneus, IPL, SPL, visual, cerebellum HC>A (Avoided Loss): ventral striatum, dorsal caudate, parahippocampus, dlPFC, SMA, auditory, cerebellum	MMT ↑ (Win Anticipation): vlPFC, precuneus MMT ↑ (Loss Anticipation): thalamus, OFC, IPL MMT ↓ (Reward): parahippocampus, aPFC, precuneus, IPL, auditory MMT ↓ (Avoided Loss): parahippocampus, thalamus, aPFC, visual, cerebellum	UK	0	no

Study	Group	Status	Sample	Task	Manip	Behavioral	Imaging Results	Connectivity/Other	Country	%	Meta
Gowin 2014	METH	abs	A 68 HC 40	RGT	n.a.	n.s.	A>HC (Decision): parahippocampus, visual, auditory, cerebellum HC>A (Decision): rACC, auditory G*T: caudate, premotor, FEF, SMA, dACC, PCC, IPL, motor, auditory G*T (A ↓) (High win): rACC	n.s.	USA	22	no
Stewart 2014	METH	uri-	A 20 HC 22	Two Choice Prediction Task	aversive breathing	HC>A: Adaptive behavior after loss	HC>A : thalamus, anterior insula, vlPFC, aPFC, dmPFC, IPL, sensory, visual, auditory, cerebellum G*T (↓A) (aversive breathing): ventral striatum, thalamus, posterior insula, dACC, PCC, IPL, sensory, visual G*T (A ↓)(Loss): dACC, PCC	n.a.	USA	0	no
Kohno 2014	METH	use	A 25 HC 27	BART	n.a.	HC>A: wins	HC>A (Decision)(High Risk): dlPFC G*T(A ↑) (Win): caudate, anterior insula	n.a.	USA	52	no
Koester 2013	STIM	abs	A 15 cU 18 HC 15	Gambling	n.a.	A, cU>HC: high risk choices	HC,cU>A (Decision)(High Reward): motor A, cU>HC (Decision)(High Risk): visual	n.a.	Germany	33	no
Tanabe 2013	STIM	rem	A 32 HC 30	IGT	n.a.	G*T (A ↓): monetary gain	HC>A (Prediction Error): ventral striatum, insula, thalamus, OFC, auditory	n.s.	USA	41	no
Yamamoto 2014	SUB	rem	A 37 HC 43	IGT	n.a.	HC>A: risk avoidance	A>HC (Decision): ventral striatum, dorsal striatum, pallidum, thalamus, insula, dlPFC, SMA, OFC, dACC, dmPFC, precuneus, SPL, IPL, visual, auditory, cerebellum HC>A (Outcome): VTA, ventral striatum, dorsal putamen, amygdala, dACC, IPL, sensory	n.a.	USA	n.a.	no
Inhibitory Control											
Bednarski 2012	ALC	abs	A 20 HC 21	SST	n.a.	n.s.	HC>A (speeded responses): dorsal putamen, hippocampal region, vlPFC	n.s.	USA	45	no
Schulte 2012	ALC	parR	A 18 HC 17	Stroop Match to Sample	n.a.	n.s.	A>HC (conflict): midbrain(SN/STN), hypothalamus A>HC (no-conflict): midbrain(SN/STN), hypothalamus, PCC, precuneus, visual A>HC (conflict with repetition): PCC, visual HC>A (conflict with switching): hippocampus	n.s.	USA	0	no
Fryer 2013	ALC	abs/rem	cA 16 prA 15 frA 13 HC 20	picture Go/NoGo (alcohol cues)	n.a.	n.s.	HC,frA>prA,cA (conflict)(drug cue): IPL, sensory frA>HC>prA,cA (conflict) (drug cue): dACC	craving (↑A): rACC/dmPFC, cerebellum	USA	23	no

Study	Drug	Use	N	Task		Behavioral	Imaging	Correlation	Country		
Schmaal 2013	ALC	uri-	A 16 HC 16	SST	n.a.	n.s.	n.s.	n.s.	Netherlands	0	no
Sjoerds 2014b	ALC	abs	A 31 HC 16	SST	n.a.	n.s.	n.s.	n.s.	Netherlands	45	no
Hu 2015	ALC	uri-	A 24 HC 70	SST	n.a.	HC>A: Faster Go responses HC>A: Greater Go Accuracy	HC>A (conflict anticipation): caudate, dACC, dlPFC, hippocampus, dmPFC, temporal pole, motor, visual A>HC (conflict anticipation): IPL, SMA	ALC use last month ↑: thalamus, cerebellum	USA	25	no
Czapla 2017	ALC	abs	A 19 HC 21	Drug Cue Go/NoGo	detox	n.s.	A>HC (drug): visual, cerebellum A>HC (conflict) (any cue): vmPFC, rACC, dACC, dmPFC A>HC (conflict)(drug cue): visual HC>A (conflict) (no drug cue): IPL, sensory	n.a.	Germany	10	no
Murphy 2017	ALC POLY	abs	ALC 18 POLY 25 HC 31	Go/NoGo	n.a.	n.s.	ALC>HC,POLY: midbrain	n.s.	UK	n.a.	no
Kober 2014	CAN	use	A 20 HC 20	cwStroop	n.a.	n.s.	HC>A (conflict): VTA, ventral/dorsal striatum, parahippocampus/amygdala, thalamus, dlPFC	abstince during treatment ↑: dACC, PCC, IPL, visual abstince 1-year follow-up ↑: ventral striatum, vlPFC, sgACC, PCC, temporal pole, visual, cerebellum abstince 1-year follow-up ↓: anterior insula, putamen	USA	0	no
Zimmermann 2017	CAN	abs	A 23 HC 20	Reappraisal of Emotion	n.a.	HC>A: downregulation emotion	A>HC (regulation): premotor,SMA, sensory, gustatory	n.s.	Germany	0	no
Tomasi 2010	COC	use	A 20 HC 20	DW Stroop	n.a.	n.s.	HC>A: caudate, thalamus, dlPFC, premotor, rACC	n.a.	USA	15	no
Barros-Loscertales 2011	COC	uri-	A 16 HC 16	counting Stroop	n.a.	HC>A: speed neutral trials	HC>A: vlPFC, IPL, auditory	n.s.	Spain	0	no
Albein-Urios 2012	COC	uri-	A 17 HC 18	Reappraisal of Emotion	n.a.	n.s.	G*T (A ↓): thalamus, insula, vlPFC, dlPFC, PCC, IPL, SPL, visual, cerebellum	n.a.	Spain	6	no
Moeller 2012	COC	use/ abs/ parR	A 33 HC 20	cwStroop	20 mg MPH	n.s.	A>HC (conflict): visual, cerebellum	n.a.	USA	15	no

Worhunsky 2013	COC	abs	A 20 HC 20	cwStroop	CBT+ cognitive enhancer	A>HC: error rate	n.s.	previous CBT (↓A): anterior insula, dACC weeks current CBT (↓A): ventral putamen, anterior insula, dACC current abstinence (↑A): dorsal caudate, thalamus, amygdala, parahippocampus, vlPFC current abstinence (↓A): vmPFC, sgACC depression (↓A): vmPFC, sgACC ALC use (↓A): vmPFC, sgACC	USA	40	no
Hester 2013	COC	par R	A 15 HC 15	Go/NoGo with punishment	n.a.	HC>A (loss): accuracy, learning G*T(↓A) (loss): speed, post-error slowing	n.s.	n.s.	USA	13	no
Bell 2014a	COC	par R	A 20 HC 19	Drug Cues SST	n.a.	A>HC: ↑craving	n.s.	n.s.	USA	0	no
Bell 2014b	COC	par R	A 27 HC 45	Go/NoGo	n.a.	n.s.	n.s.	n.s.	USA	11	no
Moeller 2014a	COC	use/abs	A 33 HC 20	cwStroop	n.a.	n.s.	A>HC (conflict): visual, cerebellum HC>A (conflict): dlPFC HC>A (error): vlPFC, IPL	n.a.	USA	0	no
Moeller 2014b	COC	use/abs	A 21 HC 17	cwStroop	n.a.	n.s.	A>HC (error): dlPFC HC>A (conflict): IPL A>HC (conflict): hippocampus	n.s.	USA	0	no
Meade 2017	COC	abs	AHIV 18 A 19 HIV 19 HC 17	ICT	n.a.	n.a.	G*T(A ↓) (Decision)(Difficult): insula, vlPFC, dlPFC, premotor, IPL, motor, sensory, visual	n.a.	USA	37	no
Moeller 2014c	COC	use/abs	A 16 HC 15	cwStroop	20 mg MPH	n.s.	A>HC (conflict): insula, dlPFC, visual, cerebellum	n.a.	USA	6	no
Roberts 2010	MDMA	abs	A 20 HC 20	Go/NoGo	n.a.	n.s.	A>HC (conflict): vlPFC, dlPFC, premotor, IPL A>HC (error): dmPFC, PCC, visual	n.s.	Ireland	50	YES
Jan 2014	METH	use	A 15 HC 18	cwStroop	18 mg MPH	HC>A: speed	A>HC (conflict): premotor/FEF G*T (↑A) (conflict): IPL	n.a.	New Zealand	27	no

Study				Task		Behavioral	Brain findings		Country		
Luijten 2013	NIC	use	A 25 HC 25	Go/NoGo	2 mg Haloperidol	A>HC (NoGo): error HC>A: speed	HC>A (conflict): parahippocampus, aPFC, dACC A>HC (conflict): PCC	n.a.	Netherlands	28	no
Carroll 2015	NIC	use	A 24 HC 20	Flanker task	n.a.	A>HC: miss rate	n.s.	n.s.	USA	50	no
Morein-Zamir 2013	STIM	use	A 32 HC 41	SST	n.a.	HC>A: speed	n.s.	n.s.	UK	6	no
Smith 2013	STIM	use	A 42 HC 47	cwStroop	n.a.	HC>A: speed	n.s.	n.s.	UK	5	no
Smith 2014	STIM	use	A 41 cU 26 HC 47	cocaine Stroop	n.a.	A>HC: error rate, attentional bias cocaine HC>A: speed	A,HC>cU (conflict): OFC, PCC	n.s.	UK	12	no
Harle 2014	STIM	uri-	A 158 HC 47	SST	n.a.	A>HC (long stop signal delay): error	HC>A: parahippocampus, PCC, auditory HC>A (conflict anticipation): dorsal caudate, insula, dACC, vlPFC, dlPFC, parahippocampus, HC>A (prediction error): aPFC, dACC, insula HC>A (inhibitory success): parahippocampus HC>A (stop success): vlPFC, precuneus A>HC (attempted stop): dACC, SPL, sensory	reward dependence (↓A): vlPFC	USA	39	YES
Social-Emotional Processing											
Gilman 2010	ALC	abs	A 15 HC 15	IAPS (negative + positive)	n.a.	n.s.	HC>A (Passive Viewing): precuneus A>HC (Non-emotional task): putamen, insula, vlPFC, dlPFC, premotor, SMA, sensory A>HC (Emotional task): putamen, thalamus, insula, vlPFC, premotor, SMA, IPL, sensory HC>A (Passive Viewing)(Positive): parahippocampus HC>A (Non-emotional task)(Positive): IPL A>HC (Non-emotional task)(Positive): parahippocampus, dlPFC A>HC (Non-emotional task)(Negative): aPFC, SMA A>HC (Emotional task)(Positive): thalamus, SMA, auditory A>HC (Emotional task)(Negative): insula, dACC, SMA	n.a.	USA	53	no
Maurage 2012	ALC	abs	A 22 HC 22	Cyberball task (social exclusion)	n.a.	n.s.	HC>A (being excluded): vlPFC, dACC A>HC (being excluded): mid insula A>HC (being included): dACC, parahippocampus	n.a.	Belgium	0	no

Author/Year	Group	Type	N	Task	Setting	Behavioral	Brain Results	Correlation	Country	Age	
Lee 2013	ALC	abs	A 17 C 25	Drug Cues IAPS (negative + positive)	n.a.	A>HC (Drug Cue): ↑ craving, positive emotion HC>A (Positive): ↓ positive emotion	A>HC (Drug): IPL A>HC (Negative): visual	n.s.	Korea	29	no
Seo 2013	ALC	abs	A 30 HC 30	Drug Script/ Stress Script	in patient treatment	A>HC: ↑craving G*T (A ↑)(Drug Cue): ↑anxiety	HC>A (Drug): anterior insula, premotor, FEF, vmPFC, dmPFC, rACC, OFC, PCC, precuneus, IPL, temporal pole, auditory, visual, cerebellum HC>A (Stress): anterior insula, premotor, FEF, vmPFC, rACC, OFC, dmPFC, PCC, precuneus, IPL, temporal pole, auditory, visual, cerebellum A>HC (Neutral): vmPFC, rACC, PCC, precuneus, visual, cerebellum HC>A (Neutral): anterior insula, premotor, FEF, OFC, IPL, temporal pole, IPL	Relapse (Neutral) ↑: ventral striatum, vmPFC, rACC Relapse (Stress)↓: posterior insula, vlPFC, vmPFC, rACC, PCC, auditory Craving ↑: ventral striatum, vmPFC, rACC, precuneus	USA	22	no
Kim 2014	ALC	abs	A 38 HC 26	Drug/Aversive Videos	n.a.	A>HC: ↑craving	A>HC (Drug): aPFC HC>A (Drug): visual A>HC (Negative): visual HC>A: (Negative): hippocampus, dlPFC, auditory	n.s.	Korea	29	no
Ford 2014	CAN	use	A + MDD 14 A 15 MDD 15 HC 17	preferred music (passive listening)	n.a.	n.s.	n.s.	days used last month ↑: OFC, sgACC, rACC, dACC	Canada	33	no
Wesley 2016	CAN	use	A 16 HC 17	IAPS (negative + positive) (rating emotion)	n.a.	n.s.	HC>A (emotion): vmPFC/dmPFC, sgACC/rACC	n.a.	USA	47	no
Roberts 2013	CAN MDMA	uri-	MDMA 30 CAN 25 HC 30	Drug Cues, IAPS (negative)	n.a.	G*T(MDMA↓)(drug cues): speed HC> MDMA: accuracy	MDMA > HC: dlPFC, visual G*T (↓MDMA) (drug cues): aPFC G*T(↑MDMA) (drug cues): vlPFC/dlPFC, visual G*T(↑MDMA)(negative): aPFC G*T(↓MDMA)(negative): vlPFC/dlPFC, visual	n.s.	Ireland	40	no

Study	Drug	Status	Sample	Task	Col6	Col7	Findings	Correlations	Country	N	Med
Asensio 2010	COC	uri-	A 32 HC 26	IAPS (negative + positive)	n.a.	n.a.	HC>A (positive): NAc/putamen/caudate, thalamus, dACC, SMA, premotor, IPL/SPL A>HC (negative): dlPFC, premotor, sensory	n.a.	Spain	0	no
Caldwell 2015	COC	abs	A 87 HC 87	Social agression images (evaluating non-emotional content)	n.a.	n.a.	HC>A(agressive): parahippocampus, thalamus, vlPFC, vmPFC, sgACC, rACC, dmPFC, visual, auditory	duration abstinence ↓: PCC	USA	0	no
Crunelle 2015	COC	n.a.	A 51 HC 32	Affect Matching (angry + fearful faces)	n.a.	n.s.	A>HC (negative): hippocampus, amygdala, thalamus	n.s.	Netherlands	0	no
Canterberry 2016	COC	use	A 20 HC 20	IAPS (negative + positive)	n.a.	n.a.	HC>A: rACC/mPFC, PCC, auditory HC>A (positive): rACC/mPFC, PCC HC>A (negative): rACC/mPFC	cigarettes/day ↑: visual CAN comorbidity ↓: visual	USA	50	YES
Kober 2016	COC	n.a.	A 30 HC 45	Drug/Sad Videos	n.a.	A>HC: ↑craving	G*T (A ↑)(Drug)(Early): rACC G*T (A ↑)(Drug)(Late): dmPFC, dACC	n.a.	USA	40	YES
Daughters 2017	COC	n.a.	A 21 HC 25	PASAT-M (distress induction)	n.a.	HC>A: distress tolerance	HC>A (distress): premotor/FEF, SMA, SPL	n.a.	USA	10	no
Costumero 2017	COC	n.a.	A 20 HC 21	Erotic Images	n.a.	n.s.	G*T (A ↓)(erotic): vlPFC, dlPFC, SMA, OFC, SPL, IPL, temporal pole, visual, auditory	Duration of Abstinence ↑: vlPFC, dlPFC, SMA, OFC, SPL, IPL, temporal pole, visual, auditory	Spain	0	no
Schmidt 2014	HER	meth	A 22 HC 17	Fearful faces (evaluating gender)	HER administration (individualized dose)	G*T(↑A)(placebo): state anxiety, cortisol/ACTH (stress) G*T (↓A) (HER administration): craving, ACTH (stress)	A>HC (placebo administration): amygdala, precuneus	n.s.	Swiss	36	no
Payer 2011	METH	use	A 25 HC 23	Angry + fearful faces (Affect Matching + Labeling)	n.a.	n.a.	HC>A (negative): vlPFC	n.a.	USA	41	YES

Study	Drug	Abstinence	Sample	Task	Col6	Col7	Results	Lifetime use	Country	%	Col12
Payer 2012	MET H	use	A 46 HC 46	Angry + fearful faces (passive viewing)	n.a.	n.a.	HC>A (negative): dlPFC	n.a.	USA	42	YES
Hong 2017	NIC	n.a.	A 15 HC 15	Drug/Aversive Videos	n.a.	n.a.	A>HC (Drug): sgACC, temporal pole HC>A (Drug): premotor A>HC (negative): premotor HC>A: (negative): insula, dlPFC, sgACC, dACC, precuneus, auditory, cerebellum	NIC Dependence ↑: sgACC	Korea	0	no
Landi 2011	SUB	use	26 A 28 HC	Infant faces + voices (passieve viewing/listening)	all pregnant	n.a.	HC>A (happy): parahippocampus, dlPFC, SMA, vmPFC/dmPFC, visual, sensory, cerebellum HC>A (sad): parahippocampus, thalamus, insula, vlPFC, dlPFC, SMA, vmPFC, dACC, precuneus, PCC, IPL, auditory, sensory, cerebellum HC>A(distress): amygdala, parahippocampus, thalamus, vlPFC, dlPFC, SMA, premotor, visual	n.a.	USA	100	no
Sensory processing											
May 2013	MET H	uri-	A 25 HC 17	CPT	soft touch	n.s.	HC>A: dorsal caudate, thalamus, anterior insula, dACC, dlPFC (right), SMA, IPL G*T ↓(A) (touch): thalamus, dACC, visual G*T ↑(A) (touch): dlPFC (left)	n.a.	USA	24	no
Stewart 2014	MET H	uri-	A 20 HC 22	Two Choice Prediction Task	aversive breathing	HC>A: Adaptive behavior after loss	HC>A : thalamus, anterior insula, vlPFC, aPFC, IPL, dmPFC, sensory, visual, auditory, cerebellum G*T (↓A) (aversive breathing): ventral striatum, thalamus, posterior insula, dACC, PCC, IPL, sensory, visual G*T (A ↓) (Loss): dACC, PCC	n.a.	USA	0	no
Stewart 2015a	STIM	uri-	cA 19 pA 18 HC 21	CPT	aversive breathing	n.s.	HC>cA,pA: thalamus, mid insula, dlPFC (right), aPFC, sensory pA,HC>cA: vlPFC, dlPFC (left), SMA G*T↓(cA) (aversive breathing): anterior insula, vlPFC	STIM > CAN use ↓: vlPFC, dlPFC AMP lifetime use ↓: dorsal caudate, thalamus, posterior insula, dlPFC (left) CAN lifetime use ↓: dorsal caudate, thalamus, dACC, auditory, sensory COC lifetime use ↑: posterior insula	USA	48	no
Stewart 2015b	STIM	uri-	cA 18 pA 15 HC 15	CPT	soft touch	n.s.	cA>pA,HC: anterior insula, vlPFC, SMA, IPL G*T(↑cA)(touch): mid insula, auditory	n.s.	USA	50	no
Attention/Working Memory											
Charlet 2014	ALC	abs	A 40 HC 40	N-back	n.a.	n.s.	n.s.	n.s.	Germany	25	no

Study	Subst	use/abs	N	Task		Behavioral	Brain	Correlation	Country	#	
Jansen 2015	ALC	abs	A 26 HC 22	self-paced switch task	n.a.	n.s.	n.s.	n.a.	Netherlands	0	no
Cousijn 2014a	CAN	use/abs	A 22 HC 23	N-back	n.a.	n.s.	n.s.	n.s.	Netherlands	32	no
Cousijn 2014b	CAN	use/abs	A 30 HC 41	N-back	n.a.	n.s.	n.s.	higher CAN use ↑: vlPFC, dlPFC, premotor, aPFC, dACC, IPL	Netherlands	34	no
Rose 2010	NIC	use	A 25 HC 23	Intention/ Attention Task	NIC	A>HC: accuracy	A>HC (Placebo administration): vlPFC, auditory; A>HC (NIC administration) ↑: aPFC, insula, dACC, vlPFC, dlPFC, motor, visual, auditory, cerebellum	n.a.	USA	52	no
Sutherland 2011	NIC	use	A 30 HC 27	Attention + Working Memory (CEFER)	NIC	NIC administration (↑A): speed, accuracy	A>HC: aPFC, insula, dlPFC, SMA	years smoking ↓: insula lifetime number cigarettes smoked ↓: aPFC, insula	USA	53	no
Other tasks											
Bagga 2013	ALC	abs	A 18 HC 18	Semantic Judgement Task	n.a.	n.s.	A>HC: precuneus, IPL, sensory, auditory	n.a.	India	0	no
Bagga 2014	ALC	abs	A 18 HC 18	Abstract Reasoning Task	n.a.	HC>A: speed	A>HC: vlPFC, SPL, sensory, visual	n.a.	India	0	no
Sjoerds 2013	ALC	abs	A 31 HC 19	Instrumental learning	n.a.	HC>A: Better outcome devaluation performance	n.s.	n.s.	Netherlands	42	no
King 2011	CAN	use	A 30 HC 30	Finger tapping	n.a.	A>HC: speed, errors	HC>A (tapping): premotor, motor, visual A>HC (tapping): aPFc, dlPFC, SMA, SPL, sensory	n.a.	USA	47	YES
Carey 2015	CAN	use	A 15 HC 15	Paired Associate Learning Task	n.a.	HC>A: ↑ Accuracy HC>A: ↑ Error correction	G*T (↓A) (corrected errors): putamen, dACC, IPL, hippocampus/parahippocampus, SPL, temporal pole, thalamus, visual	n.a.	Australia	27	no
Riba 2015	CAN	abs	A 16 HC 16	False Memory Induction Paradigm	n.a.	HC>A: Fewer False Memories	n.s.	n.s.	Spain	n.a.	no
Gilman 2016	CAN	abs	A 20 HC 20	Social Influence Paradigm	n.a.	n.s.	A>HC (decision): dlPFC, SPL, auditory	n.a.	USA	50	no

Study	Substance	Status	Groups	Task		Results			Country		
Ghahremani 2011	METH	use	A 16 HC 19	Deterministic Associative Learning Task	n.a.	HC>A: Accuracy	n.s.	n.a.	USA	38	no
Fede 2016	STIM	n.a.	A 131 HC 80	Moral Decision Task	n.a.	n.s.	n.s.	n.s.	USA	0	no

A= Addiction group, HC = Healthy Control group, ↓ = decreased; ↑ = increased, A>HC = higher activation in the Addiction group (main effect), G*T (↓A) = group*task interaction effect with reduction in the addiction group, x = main effect across all conditions;

ALC = alcohol, CAN = Cannabis, COC = cocaine, HER = heroin, MDMA = ecstasy , METH = methamphetamine, NIC = nicotine, POLY = polysubstance, STIM = stimulants;

abs = abstinent (no use 24 hour before scanning), meth = methadone; parR = partial remission (abstinent > 6 months), rem = remission (abstinent > 1 year), uri- = urine negative, uri+ = urine positive, use = not abstinent;

A = Addicted, cA = current Addicted, cU = casual User, lateA = late onset Addicted, pA = past Addicted, prA = partially remitted Addicted, frA = fully remitted Addicted, lowA = addiction with lower level use, highA = addiction with higher level use, HC = Healthy Controls;

ADHD = Attention Deficit Hyperactivity Disorder, MDD = Major Depression Disorder, PD = Personality Disorder;

BART = Balloon Analogue Risk Task, CEFER= Central Executive Functioning-Event-Related, CPT = Continous Performance Test, DMT = Delayed Memory task, cwStroop = color word Stroop, dwStroop = Drug Word Stroop, IAT = Implicit Association Test, ICT = Intertemporal Choice Task, IGT = Iowa Gambling Task, MID = Monetary Incentive Delay, PASAT-M = paced auditory serial addition task, RGT = Risky Gains Task, rStroop = rewarded Stroop, SST = Stop Signal Task, BART = Baloon Analoge Risk Task, PIT = Pavlovian-to-Instrumental-Transfer, MSIT = Multisource Interference Task;

CBT = cognitive behavioral therapy, MMT = Methadone Maintenance Treatment, MPH = Methylphenidate Intervention, TAU = Treatmant as usual;

Grey shaded regions are not relevant for the specific task.

aPFC = anterior prefrontal cortex, dACC = dorsal anterior cingulate cortex, dlPFC = dorsolateral prefrontal cortex, dmPFC = dorsomedial prefrontal cortex, FEF = Frontal eyefield, IPL = inferior parietal lobe, Nac = Nucleus Accumbens, OFC = orbitofrontal cortex, pgACC = perigenual anterior cingulate cortex, PCC = posterior cingulate cortex, rACC = rostral anterior cingulate cortex, sgACC = subgenual anterior cingulate cortex, SMA = supplementary motor area, SPL = superior parietal lobe, vlPFC = ventrolateral prefrontal cortex, vmPFC = ventromedial prefontal cortex, VTA = Ventral Tegmental Area

n.a. = not available, n.s. = not significant