Feng et al.

**Neural substrates of motivational dysfunction across neuropsychiatric conditions: Evidence from meta-analysis and lesion network mapping**

***Supplementary Information***

**Validation analysis using LOEO scheme**

***LOEO methods***

We implemented additional analyses to validate the results of the conventional ALE meta-analysis approach. First, we implemented a leave-one-experiment-out (LOEO) analysis for each ALE meta-analysis to ensure that the main meta-analytic results were not driven by the coordinates from a single experiment. In each fold, one experiment was excluded and the ALE meta-analysis was conducted on the remaining N-1 experiments. Subsequently, we conducted a conjunction analysis on the ALE results of all folds to identify the brain regions that were robustly engaged. That, the identified brain regions were present in at least 80% folds of the LOEO analysis. These analyses were employed to validate our main ALE meta-analytic findings.

***LOEO results***

*Reward anticipation*

In healthy controls, consistent maxima in the bilateral VS (extending to the amygdala, thalamus, and AI), SMA, precentral gyrus, inferior occipital gyrus, and right calcarine were identified in the LOEO analysis (**Fig. S1A**).

In clinical/at-risk conditions, consistent maxima were found in the bilateral VS, AI, and left precentral gyrus in the LOEO analysis (**Fig. S1B**).

With respect to the contrasts of hypoactivation in clinical/at-risk conditions relative to the controls, consistent maxima in the left VS were found in the LOEO analysis (**Fig. S1C**).

*Loss anticipation*

In healthy controls, consistent maxima in the bilateral VS, thalamus, AI, and SMA were identified in the LOEO analysis (**Fig. S2A**).

In clinical/at-risk conditions, consistent maxima were found in the bilateral VS, SMA, precentral gyrus, and left AI in the LOEO analysis (**Fig. S2B**).

With respect to the contrasts of hypoactivation in clinical/at-risk conditions relative to the controls, consistent maxima in the left VS, middle occipital gyrus and cuneus were found in the LOEO analysis (**Fig. S2C**).

*Reward consumption*

In healthy controls, consistent maxima in the bilateral VS (extending to the amygdala), vmPFC and posterior cingulate cortex were identified in the LOEO analysis (**Fig. S3A**).

In clinical/at-risk conditions, consistent maxima were found in the right VS and bilateral vmPFC in the LOEO analysis (**Fig. S3B**).

**Lesion network mapping (RSFC analysis)**

Connectivity patterns of identified brain lesion locations were assessed. The analysis was based on resting-state functional magnetic resonance imaging (rs-fMRI) images of 116 healthy adult volunteers (57 males; 21.80 ± 2.41 years old; age range 18-30; Beijing Normal University, China). During rs-fMRI scanning, participants were instructed to close their eyes, keep still, remain awake, and not think about anything systematically. The rs-fMRI study was conducted in accordance with the Declaration of Helsinki and approved by the local Ethics Committee. Written informed consents was obtained from all participants, who were all right-handed and had no history of neurological or psychiatric disorders.

The resting-state functional images were acquired with a Siemens TRIO 3 Tesla scanner at the Beijing Normal University Imaging Center for Brain Research. The rs-fMRI scan consisted of 150 contiguous volumes acquired with an echo-planar imaging (EPI) sequence (axial slices, 33; slice thickness, 3.5 mm; interslice gap, 0.7 mm; TR, 2000 ms; TE, 30 ms; flip angle, 90°; voxel size, 3.5 × 3.5 × 3.5 mm3; FOV, 244 × 244 mm2), whereas high-resolution structural images were acquired with a 3D sagittal T1-weighted magnetization-prepared rapid acquisition with gradient-echo (MP-RAGE) sequence (sagittal slices, 144; TR, 2530 ms; TE, 3.39 ms; slice thickness, 1.33 mm; voxel size, 1 × 1 × 1.33 mm3; flip angle, 7°; inversion time, 1100ms; FOV, 256 × 256 mm2).

Neuroimaging data analyses were performed with the DPABI software package (<http://rfmri.org/dpabi>) (Yan, Wang, Zuo, & Zang, 2016), which is a convenient software plug-in based on SPM ([http://www.fil.ion.ucl.ac.uk/spm](http://www.fil.ion.ucl.ac.uk/spm/)). The first 10 volumes of the functional images were discarded for signal equilibrium and participants’ adaptation to scanning noise. The images were then realigned for head movement correction. Sixteen participants (8 males) were excluded from further analysis under the criteria of head motion exceeding 1.5 mm maximum translation, 1.5° rotation and mean frame-wise displacement with 0.2 mm throughout the course of scans (Power, Barnes, Snyder, Schlaggar, & Petersen, 2012; Yan, et al., 2013). To normalize functional images, participants’ structural brain images were first co-registered to their own mean functional images and were subsequently segmented. The parameters derived from segmentation were used to normalize each participant’s functional images into the standard Montreal Neurological Institute space (MNI template, resampling voxel size was 2 × 2 × 2 mm3). Next, linear trends of time courses were removed, and a band-pass filtering (0.01-0.1 Hz) was applied to the time series of each voxel to reduce the effect of low-frequency drifts and high-frequency physiological noise (Biswal, Zerrin Yetkin, Haughton, & Hyde, 1995; Zuo, et al., 2010). Subsequently, four common nuisance variables were regressed out: (i) the global mean signal, (ii) the white matter (WM) signal, (iii) the cerebrospinal fluid signal (Fox, et al., 2005; Snyder & Raichle, 2012), and (iv) 24 movement regressors, including autoregressive models of motion incorporating 6 head motion parameters, 6 head motion parameters one time point prior, and the 12 corresponding squared items (Friston, Williams, Howard, Frackowiak, & Turner, 1996). Time points with excessive motion were then censored to remove residual motion artifact (Power, et al., 2012). Finally, head motion was further controlled in data preprocessing, such that volumes with an *FD* > 0.5 mm, along with the immediately preceding volume and 2 subsequent volumes, were considered micromovement-containing volumes, and each volume was modeled as a separate regressor in a nuisance covariates regression (Power, et al., 2014; Yan, et al., 2013).

***Seed-to-Voxel connectivity.*** To characterize the functional connectivity profiles of each lesion, we first implemented a seed-based analysis, in which the functional connectivity (bivariate correction) between the average BOLD signals from given seed regions and all other voxels in the brain was computed. The Pearson’s correlation coefficients obtained at each voxel were transformed into Fisher’s *z* values to indicate the degree of connectivity between each ROI and the voxel. First-level, subject-specific, connectivity maps for each ROI were then employed in a second-level analysis in which a one-sample t-test was performed to create a single connectivity *t*-map for each lesion. These Lesion networks were then thresholded (*P* < 0.00001, uncorrected) and binarized. The resulting network maps of all lesions were overlaid to identify a common lesion network with a threshold of 75% (i.e., regions connected to at least 79 out of 105 lesions) (see also Fischer, et al., 2016; Joutsa, Horn, Hsu, & Fox, 2018).

**Supplementary Figures and Tables**

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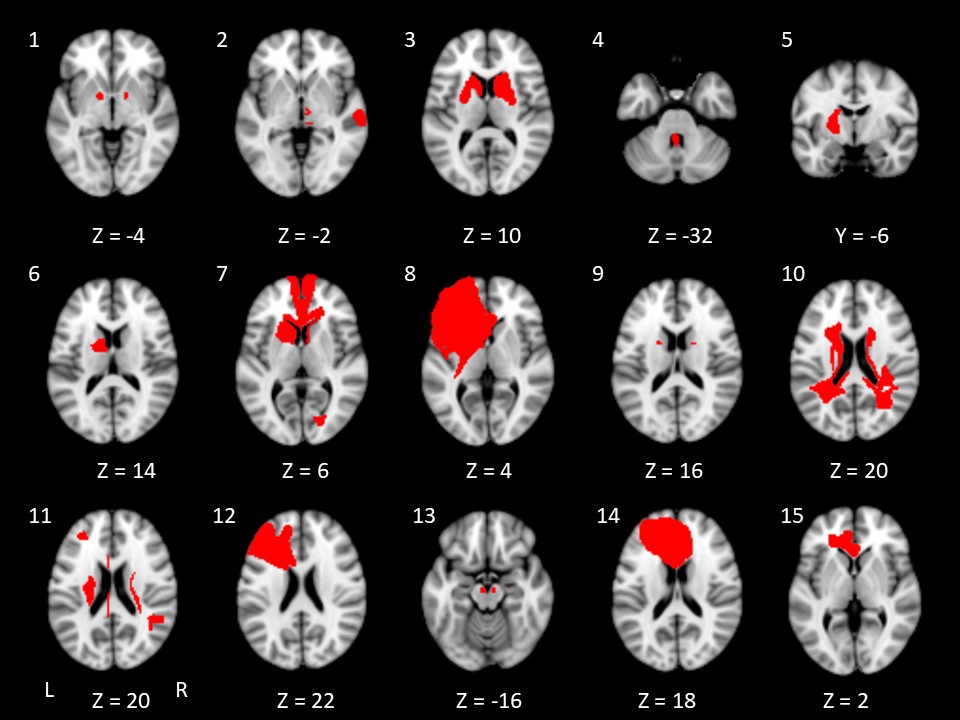
**Figure S1. Significant clusters identified in all folds of the leave-one-experiment-out analysis of reward anticipation. (A).** Consistent maxima identified for healthy controls. **(B).** Consistent maxima identified for clinical/at-risk conditions. **(C).** Consistent maxima found for hypoactivation of clinical/at-risk conditions relative to healthy controls.

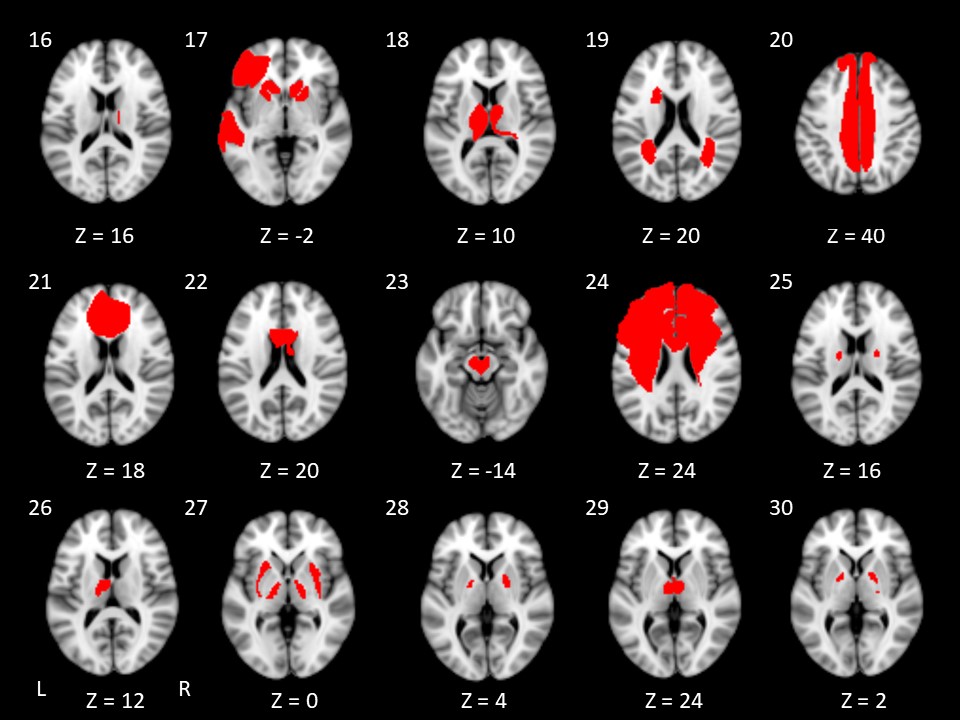
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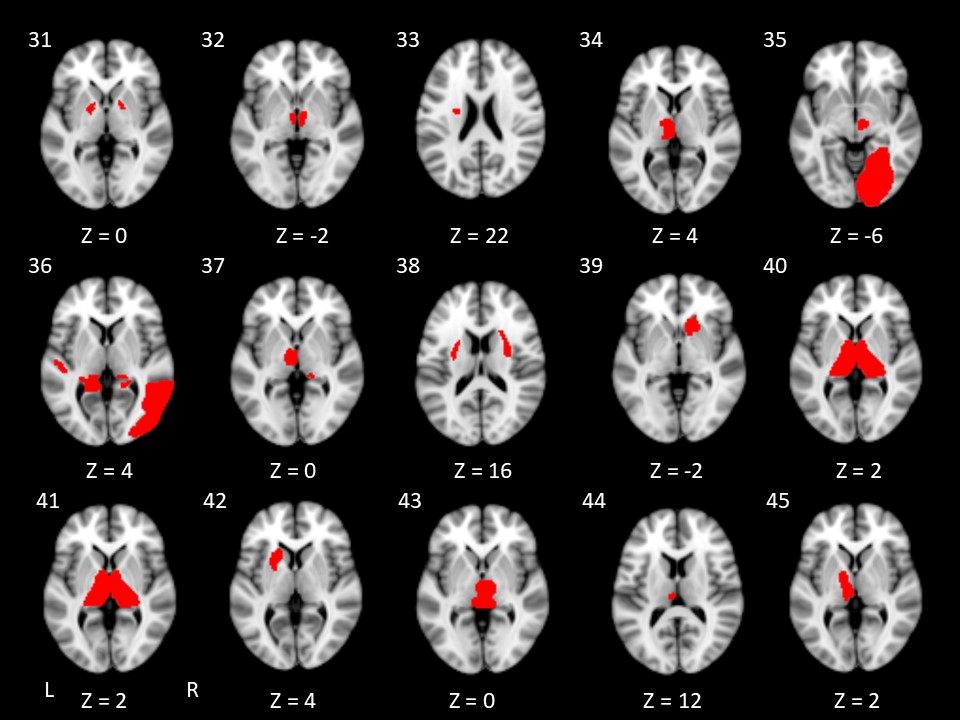
**Figure S2. Significant clusters identified in all folds of the leave-one-experiment-out analysis of loss anticipation. (A).** Consistent maxima identified for healthy controls. **(B).** Consistent maxima identified for clinical/at-risk conditions. **(C).** Consistent maxima found for hypoactivation of clinical/at-risk conditions relative to healthy controls.

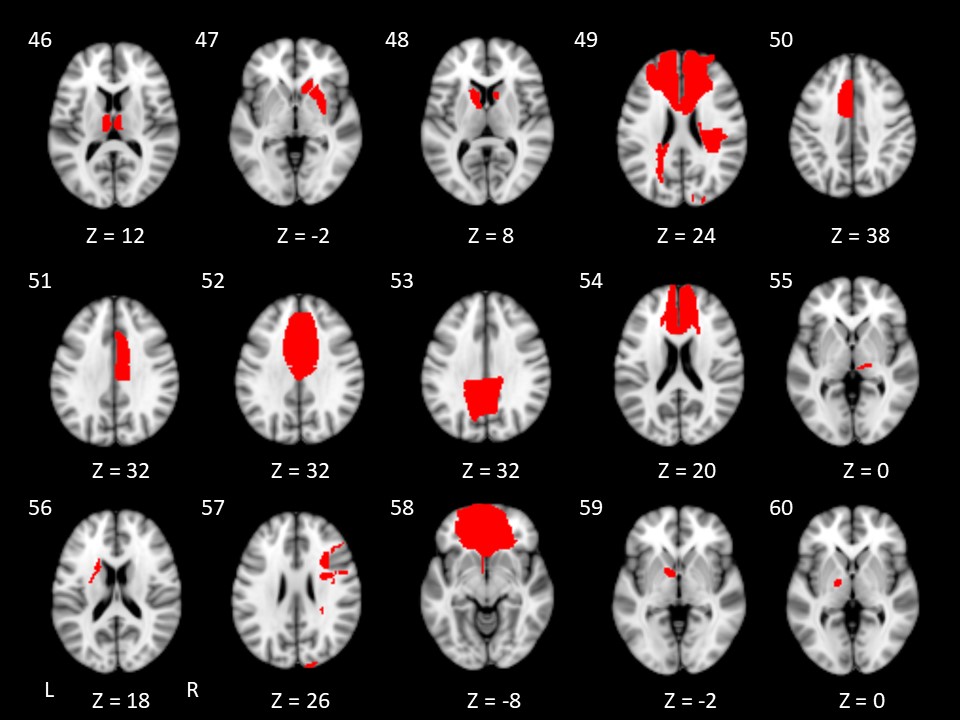


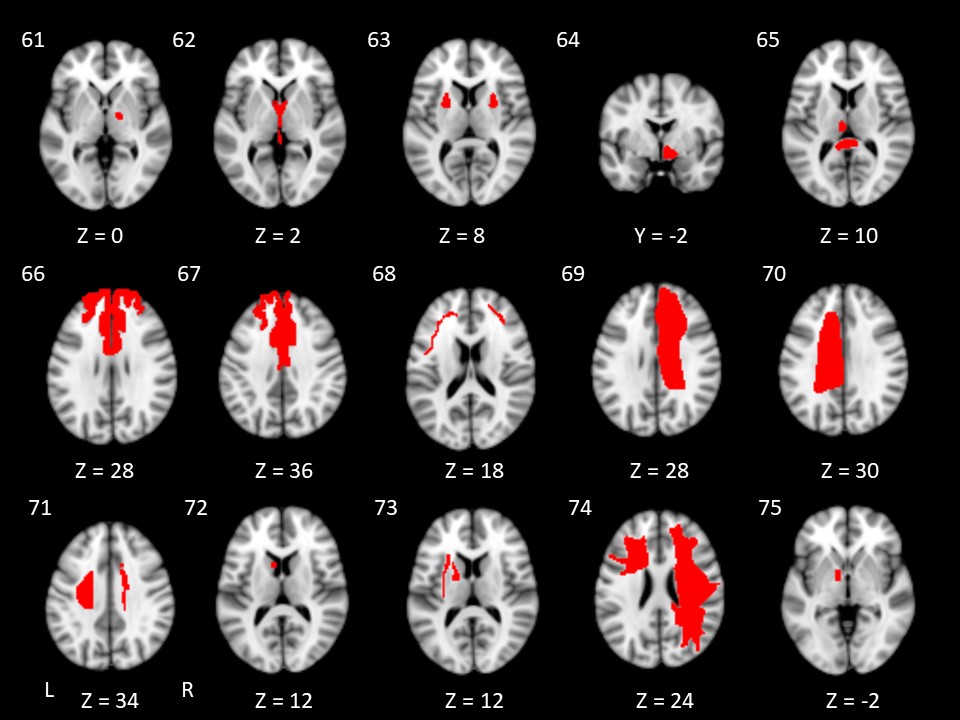
**Figure S3. Significant clusters identified in all folds of the leave-one-experiment-out analysis of reward consumption. (A).** Consistent maxima identified for healthy controls. **(B).** Consistent maxima identified for clinical/at-risk conditions.

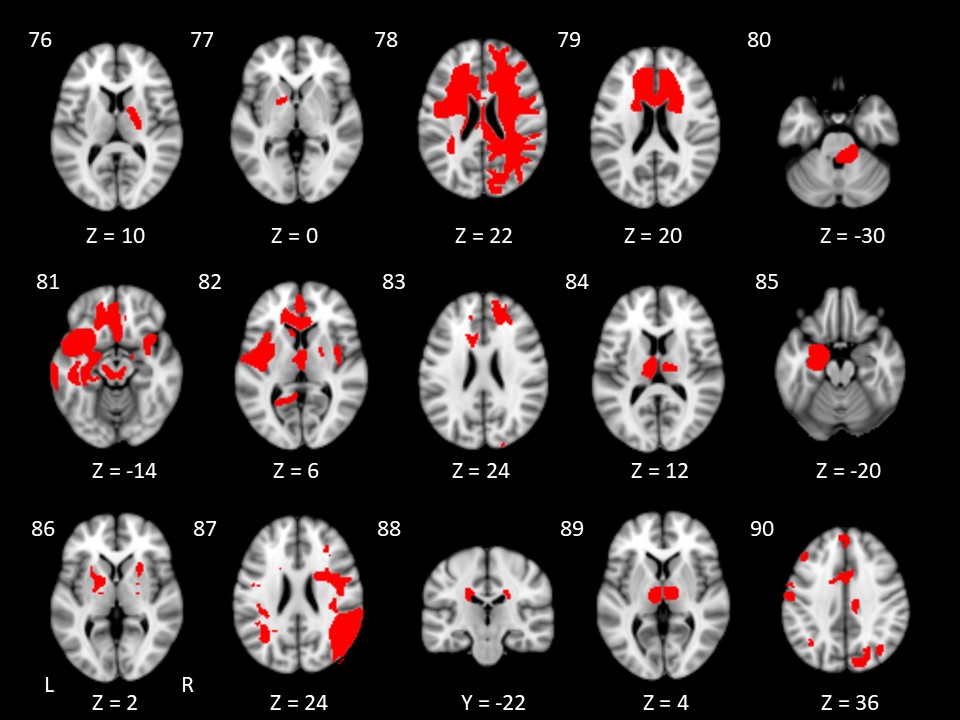


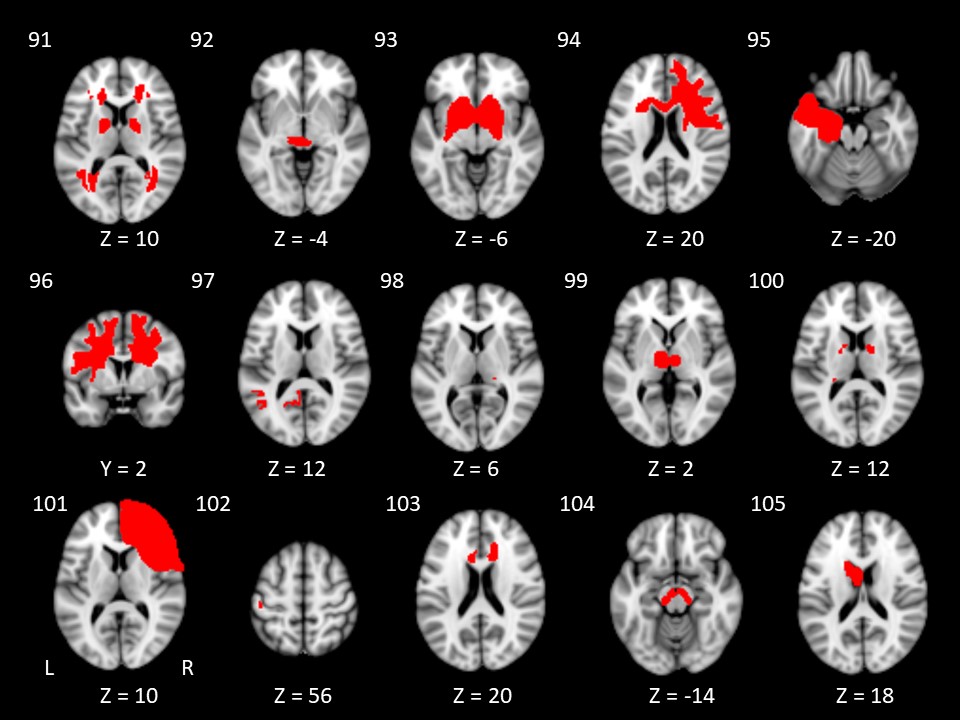




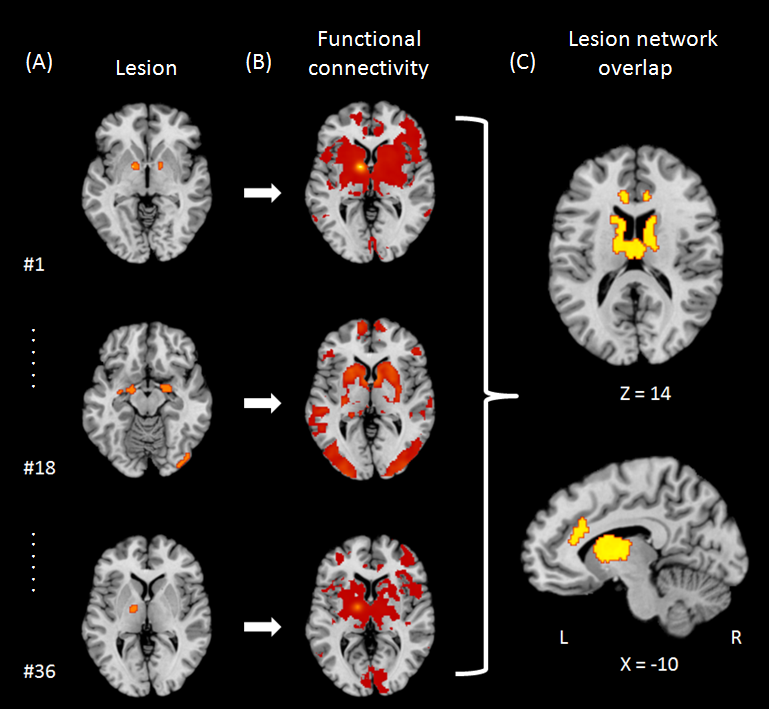








**Figure S4. Lesion causing apathy or anhedonia.** Each lesion, numbered 1 through 105, was regenerated by hand onto a reference brain (MNI152 template).



**Figure S5. Lesion network mapping technique.** (A) Individual lesions were manually traced onto a standardized MNI brain template. (B) Functional connectivity maps for each lesion location were computed using a normative resting-state functional connectivity database. (C) The 105 lesion network maps from each study were then thresholded, binarized, and overlaid to identify connections common to the greatest number of studies.

**Table S1. Studies included in the present meta-analysis.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Reward\_Anticipation**  **(RA)** | | | |  | **Reward\_** **Consumption (RC)** | | | |  | **Loss\_Anticipation**  **(LA)** | | | |  | **Loss\_Consumption**  **(LC)** | | | |
| **HC** | **NC** | **HC vs NC** | **NC vs HC** |  | **HC** | **NC** | **HC vs NC** | **NC vs HC** |  | **HC** | **NC** | **HC vs NC** | **NC vs HC** |  | **HC** | **NC** | **HC vs NC** | **NC vs HC** |
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| Abler et al. (2005) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Abler et al. (2007) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Adcock et al. (2006) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Alves et al. (2011) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Alves et al. (2013) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |
| Arrondo et al. (2015) | 1 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Asari et al. (2017) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Balodis et al. (2012) | 1 | 0 | 1 | 1 |  | 1 | 0 | 1 | 0 |  | 1 | 0 | 1 | 0 |  | 1 | 0 | 1 | 0 |
| Balodis et al. (2014) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |
| Balodis et al. (2016) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |
| Beck et al. (2009) | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Bjork et al. (2007) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Bjork et al. (2008a) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 1 | 0 | 0 |
| Bjork et al. (2008b) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| Bjork et al. (2010a) | 2 | 0 | 0 | 0 |  | 2 | 0 | 0 | 0 |  | 2 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |
| Bjork et al. (2010b) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| Bjork et al. (2012) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Bustamante et al. (2014) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Carl et al. (2016) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Carmona et al. (2012) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Carter et al. (2009) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Choi et al. (2012) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 1 | 2 |  | 0 | 0 | 0 | 0 |
| Cope et al. (2019) | 0 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Costumero et al. (2013) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Dichter et al. (2012a) | 0 | 0 | 1 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Dichter et al. (2012b) | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Dichter et al. (2012c) | 0 | 0 | 0 | 1 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Enzi et al. (2012a) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Enzi et al. (2012b) | 1 | 2 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 2 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Figee et al. (2011) | 1 | 1 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Filbey et al. (2013) | 1 | 1 | 0 | 1 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| Filippi et al. (2019) | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Funayama et al. (2014) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Goerlich et al. (2017) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Grant et al. (2021) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |
| Hanssen et al. (2015) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Helfinstein et al. (2013) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Herbort et al. (2016) | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Jia et al. (2011) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Johnson et al. (2019) | 1 | 1 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Juckel et al. (2012) | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 1 |  | 0 | 0 | 0 | 0 |
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| Knutson et al. (2001a) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Knutson et al. (2001b) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Knutson et al. (2003) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Knutson et al. (2004) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Kollmann et al. (2017) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Lahat et al. (2018) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
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| Simon et al. (2010) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Smoski et al. (2011) | 0 | 0 | 1 | 0 |  | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Spreckelmeyer et al. (2009) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Spreckelmeyer et al. (2013) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Stark et al. (2011) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Staudinger et al. (2011) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Stoy et al. (2011) | 1 | 2 | 5 | 0 |  | 0 | 0 | 1 | 2 |  | 1 | 1 | 5 | 0 |  | 0 | 0 | 1 | 0 |
| Stoy et al. (2012) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Stroehle et al. (2008) | 1 | 0 | 0 | 0 |  | 0 | 1 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Subramaniam et al. (2015) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 1 | 0 |
| Suzuki et al. (2019) | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Telzer et al. (2020) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Treadway et al. (2013) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |
| Tsurumi et al. (2014) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Ubl et al. (2015) | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| van Duin et al. (2016) | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |
| van Hell et al. (2010) | 0 | 0 | 2 | 2 |  | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Verdejo-Roman et al. (2017) | 0 | 0 | 1 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| von Rhein et al. (2015) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Walter et al. (2009) | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Weidacker et al. (2021) | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |
| Weiland et al. (2014) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Welborn et al. (2020) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |
| Wittmann et al. (2005) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Wotruba et al. (2014) | 0 | 0 | 0 | 1 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Wrase et al. (2007a) | 1 | 1 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 1 | 1 |  | 0 | 0 | 0 | 0 |
| Wrase et al. (2007b) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Wu et al. (2014) | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Yan et al. (2016) | 1 | 1 | 1 | 0 |  | 1 | 1 | 1 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 1 | 0 | 0 |
| Yao et al. (2020) | 1 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 1 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 |
| Yau et al. (2012) | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Ye et al. (2011) | 1 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| Yip et al. (2016) | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |  | 0 | 0 | 1 | 0 |  | 0 | 0 | 0 | 0 |
| Zhornitsky et al. (2021) | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |  | 0 | 0 | 0 | 0 |  | 1 | 1 | 0 | 0 |

**HC – healthy controls, NC - Neuropsychiatric conditions**

**Table S2. Contrasts for the meta-analysis of reward anticipation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **N** | **Task** | **Condition** | **Contrast** | **No. of foci** |
| ***Healthy controls (MID)*** | | | | | |
| Aarts et al. (2010) | 20 | monetary incentive delay task | healthy controls | high reward > low reward | 11 |
| Abler et al. (2005) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Abler et al. (2007) | 8 | monetary incentive delay task | healthy controls | reward > no reward | 14 |
| Adcock et al. (2006) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 34 |
| Alves et al. (2011) | 10 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Arrondo et al. (2015) | 21 | monetary incentive delay task | healthy controls | reward > no reward | 29 |
| Asari et al. (2017) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Balodis et al. (2012) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 11 |
| Beck et al. (2009) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Behan et al. (2015) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Bjork et al. (2007) | 20 | uncertain reward in monetary incentive delay tasks | healthy controls | reward > no reward | 16 |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | healthy controls | reward > no reward | 17 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | healthy controls | reward > no reward | 1 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Bjork et al. (2010b) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Bjork et al. (2012) | 23 | monetary incentive delay task | healthy controls | reward > no reward | 26 |
| Bustamante et al. (2014) | 18 | monetary incentive delay task | healthy controls | reward > no reward | 3 |
| Carl et al. (2016) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Carter et al. (2009) | 17 | monetary incentive delay task | healthy controls | reward > no reward | 20 |
| Costumero et al. (2013) | 44 | monetary incentive delay task | healthy controls | reward > no reward | 34 |
| Danamino et al. (2014) | 31 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Dillon et al. (2010) | 32 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Edel et al. (2013) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Enzi et al. (2012a) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | healthy controls | reward > no reward | 9 |
| Figee et al. (2011) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Filbey et al. (2013) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Funayama et al. (2014) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Goerlich et al. (2017) | 45 | monetary incentive delay task | healthy controls | reward > no reward | 24 |
| He et al. (2019) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Helfinstein et al. (2013) | 16 | monetary incentive delay task | healthy controls | parametric analysis with levels of reward | 3 |
| Herbort et al. (2016) | 23 | monetary incentive delay task | healthy controls | reward > no reward | 25 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 33 |
| Juckel et al. (2006) | 10 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Juckel et al. (2012) | 13 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Kappel et al. (2013) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Kappel et al. (2013) | 10 | monetary incentive delay task for children | healthy controls | reward > no reward | 13 |
| Kaufmann et al. (2013) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Kim et al. (2020) | 18 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Kirsch et al. (2003) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 44 |
| Knutson et al. (2001a) | 8 | monetary incentive delay task | healthy controls | reward > no reward | 22 |
| Knutson et al. (2001b) | 9 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Knutson et al. (2003) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Knutson et al. (2004) | 8 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Kollmann et al. (2017) | 41 | monetary incentive delay task | healthy controls | reward > baseline | 15 |
| Lahat et al. (2018) | 40 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Maresh et al.(2014) | 84 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Mechelmans et al. (2017) | 29 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Mehta et al. (2010) | 11 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Michielse et al. (2019) | 40 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Morelli et l. (2021) | 46 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | reward > no reward | 11 |
| Murty et al. (2014) | 26 | monetary incentive delay task | healthy controls | high reward > low reward | 41 |
| Ossewaarde et al. (2011a) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| Ossewaarde et al. (2011b) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Pabon et al. (2020) | 56 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Pfabigan et al. (2014) | 25 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| Pujara et al. (2016) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Rademacher et al. (2010) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 49 |
| Rademacher et al. (2014) | 48 | social incentive delay task | healthy controls | reward > no reward | 8 |
| Romanczuk-Seiferth et al. (2014) | 17 | monetary incentive delay task | healthy controls | reward > no reward | 22 |
| Rose et al. (2013) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Saji et al. (2013) | 18 | monetary incentive delay task | healthy controls | reward > no reward | 20 |
| Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 19 |
| Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 43 |
| Scheres et al. (2007) | 11 | monetary incentive delay task | healthy controls | reward > no reward | 22 |
| Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | healthy controls | reward > no reward | 17 |
| Schlagenhauf et al. (2009) | 15 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Schneider et al. (2018) | 46 | monetary incentive delay task | healthy controls | reward > no reward | 11 |
| Schreiter et al. (2016) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Simon et al. (2010) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Spreckelmeyer et al. (2009) | 32 | monetary incentive delay task | healthy controls | reward > no reward | 30 |
| Spreckelmeyer et al. (2013) | 30 | social incentive delay task | healthy controls | parametric analysis with levels of reward | 15 |
| Stark et al. (2011) | 31 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Staudinger et al. (2011) | 24 | monetary incentive delay task | healthy controls | high reward > low reward | 6 |
| Stoy et al. (2011) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Stoy et al. (2012) | 15 | monetary incentive delay task | healthy controls | reward > baseline | 9 |
| Stroehle et al. (2008) | 10 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Telzer et al. (2020) | 136 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Tsurumi et al. (2014) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 56 |
| van Duin et al. (2016) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Walter et al. (2009) | 16 | monetary incentive delay task | healthy controls | parametric analysis with levels of reward | 10 |
| Weiland et al. (2014) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Wittmann et al. (2005) | 16 | monetary incentive delay task | healthy controls | reward > no reward | 22 |
| Wrase et al. (2007a) | 16 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Wrase et al. (2007b) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Wu et al. (2014) | 52 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | reward > no reward | 33 |
| Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Yau et al. (2012) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Ye et al. (2011) | 16 | monetary incentive delay task | healthy controls | reward > no reward | 31 |
| ***Neuropsychiatric conditions (MID)*** | | | | | |
| Beck et al. (2009) | 19 | monetary incentive delay task | alcohol dependence | reward > no reward | 5 |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | alcohol dependence | reward > no reward | 11 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 4 |
| Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 7 |
| Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 19 |
| Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | reward > no reward | 2 |
| Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 22 |
| Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | reward > no reward | 20 |
| Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 7 |
| Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 6 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | reward > no reward | 5 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | reward > no reward | 1 |
| Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 7 |
| Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | reward > no reward | 10 |
| He et al. (2019) | 21 | monetary incentive delay task | major depressive disorder | reward > no reward | 8 |
| Herbort et al. (2016) | 21 | monetary incentive delay task | borderline personality disorder | reward > no reward | 7 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | reward > no reward | 23 |
| Juckel et al. (2012) | 13 | monetary incentive delay task | schizophrenia prodrome | reward > no reward | 1 |
| Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | reward > no reward | 22 |
| Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 27 |
| Michielse et al. (2019) | 47 | monetary incentive delay task | subclinical psychotic experiences | reward > no reward | 6 |
| Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 16 |
| Murray et al. (2017) | 144 | monetary incentive delay task | risk of antisocial | reward > no reward | 1 |
| Romanczuk-Seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | reward > no reward | 22 |
| Romanczuk-Seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 6 |
| Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | reward > loss | 16 |
| Scheres et al. (2007) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 16 |
| Schreiter et al. (2016) | 20 | monetary incentive delay task | bipolar disorder | reward > no reward | 1 |
| Stoy et al. (2011) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder drug-naive | reward > no reward | 1 |
| Stoy et al. (2011) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 1 |
| Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 7 |
| Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 34 |
| van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | reward > no reward | 10 |
| Walter et al. (2009) | 16 | monetary incentive delay task | schizophrenia | parametric analysis with levels of reward | 3 |
| Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | reward > no reward | 2 |
| Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | reward > no reward | 8 |
| Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | reward > no reward | 7 |
| ***Healthy controls vs Neuropsychiatric conditions (MID)*** | | | | | |
| Alves et al. (2013) | 22 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 4 |
| Arrondo et al. (2015) | 67 | monetary incentive delay task | schizophrenia & major depressive disorder | reward > no reward, healthy controls > patients | 1 |
| Balodis et al. (2012) | 28 | monetary incentive delay task | pathological gambling | reward > no reward, healthy controls > patients | 3 |
| Balodis et al. (2016) | 57 | monetary incentive delay task | cocaine dependence | reward > no reward, posttreatment > pretreatment | 1 |
| Carmona et al. (2012) | 46 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 14 |
| Choi et al. (2012) | 30 | monetary incentive delay task | pathological gambling | reward > no reward, healthy controls > patients | 8 |
| Damiano et al. (2014) | 31 | monetary incentive delay task | oxytocin receptor (OXTR) genotype (rs2268493) | reward > no reward, TC/CC > TT | 21 |
| Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorders | reward > no reward, healthy controls > patients | 15 |
| Dichter et al. (2012b) | 36 | monetary incentive delay task | autism spectrum disorders | reward > no reward, healthy controls > patients | 17 |
| Figee et al. (2011) | 37 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward, healthy controls > patients | 6 |
| Filippi et al. (2019) | 60 | monetary incentive delay task | a family history of alcohol use disorder | reward > no reward, healthy controls > relatives of alcohol use disorder individuals | 3 |
| Johnson et al. (2019) | 48 | monetary incentive delay task | bipolar disorder | reward > no reward, healthy controls > patients | 2 |
| Kappel et al. (2015) | 36 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 2 |
| Kappel et al. (2015) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 1 |
| Kischner et al. (2019) | 50 | monetary incentive delay task | bipolar disorder | reward > no reward, healthy controls > patients | 14 |
| Knutson et al. (2008) | 26 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 1 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | social anxiety | high reward > low reward, negative correlation with social anxiety scores | 6 |
| Mechelmans et al. (2017) | 29 | monetary incentive delay task | impulsivity | reward > no reward, negative correlation with impulsivity | 1 |
| Michielse et al. (2019) | 87 | monetary incentive delay task | subclinical psychotic experiences | reward > no reward, healthy controls > individuals with subclinical psychotic experiences | 2 |
| Morelli et al. (2021) | 46 | monetary incentive delay task | early life stress | reward > no reward, healthy controls > children with early life stress | 1 |
| Murray et al. (2017) | 144 | monetary incentive delay task | antisocial behavior | reward > no reward, negative correlation with antisocial behavior | 5 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 3 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | reward > no reward, healthy controls > patients | 26 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, healthy controls > patients | 40 |
| Schwarz et al. (2020) | 138 | monetary incentive delay task | bipolar disorder | reward > no reward, healthy controls > patients | 12 |
| Smoski et al. (2011) | 22 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 6 |
| Stoy et al. (2011) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 1 |
| Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 3 |
| Stoy et al. (2011) | 25 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 1 |
| Stoy et al. (2011) | 22 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 8 |
| Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, remitters > persisters | 3 |
| Subramaniam et al. (2015) | 57 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 2 |
| van Duin et al. (2016) | 28 | monetary incentive delay task | 22q11 deletion syndrome | reward > no reward, healthy controls > patients | 11 |
| van Hell et al. (2010) | 27 | monetary incentive delay task | cannabis users | reward > no reward, healthy controls > cannabis users | 12 |
| van Hell et al. (2010) | 28 | monetary incentive delay task | cannabis users | reward > no reward, healthy controls > cannabis users | 7 |
| Verdejo-Roman et al. (2017) | 42 | monetary incentive delay task | obesity | reward > no reward, overweight > obesity | 2 |
| Walter et al. (2009) | 32 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 1 |
| Wrase et al. (2007a) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, healthy controls > patients | 3 |
| Yan et al. (2016) | 37 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 6 |
| Yip et al. (2016) | 45 | monetary incentive delay task | cocaine dependence | reward > no reward, healthy controls > patients | 2 |
| ***Neuropsychiatric conditions vs Healthy controls (MID)*** | | | | | |
| Balodis et al. (2012) | 28 | monetary incentive delay task | pathological gambling | reward > no reward, patients > healthy controls | 1 |
| Balodis et al. (2014) | 19 | monetary incentive delay task | binge eating disorder | reward > no reward, binge eating > no binge eating | 10 |
| Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorders | reward > no reward, patients > healthy controls | 23 |
| Dichter et al. (2012b) | 36 | monetary incentive delay task | autism spectrum disorders | reward > no reward, patients > healthy controls | 17 |
| Dichter et al. (2012c) | 38 | monetary incentive delay task | major depressive disorder | reward > no reward, patients > healthy controls | 15 |
| Filbey et al. (2013) | 86 | monetary incentive delay task | marijuana users | reward > loss, marijuana users > healthy controls | 5 |
| Filippi et al. (2019) | 60 | monetary incentive delay task | a family history of alcohol use disorder | reward > no reward, relatives of alcohol use disorder individuals> healthy controls | 2 |
| Grant et al. (2019) | 159 | monetary incentive delay task | body focused repetitive behaviors | reward > no reward, patients > healthy controls | 2 |
| Hanssen et al. (2015) | 151 | monetary incentive delay task | siblings of patients with schizophrenia | reward > baseline, siblings > healthy controls | 4 |
| Jia et al. (2011) | 40 | monetary incentive delay task | cocaine dependence | reward > no reward, patients > healthy controls | 8 |
| Kappel et al. (2015) | 36 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 10 |
| Knutson et al. (2008) | 26 | monetary incentive delay task | major depressive disorder | reward > no reward, patients > healthy controls | 3 |
| Kocsel et al. (2017) | 37 | monetary incentive delay task | rumination symptoms | reward > no reward, positive correlation with rumination scores | 3 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | social anxiety | reward > no reward, high anxiety > low anxiety | 30 |
| Mori et al. (2016) | 30 | monetary incentive delay task | subthreshold depression | reward > no reward, subthreshold depression > healthy controls | 4 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | reward > no reward, patients > healthy controls | 12 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | reward > no reward, patients > healthy controls | 11 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, patients > healthy controls | 1 |
| Schimidt et al. (2021) | 53 | monetary incentive delay task | gambling disorder | reward > no reward, patients > healthy controls | 2 |
| van Hell et al. (2010) | 27 | monetary incentive delay task | cannabis users | reward > no reward, cannabis users > healthy controls | 4 |
| van Hell et al. (2010) | 28 | monetary incentive delay task | cannabis users | reward > no reward, cannabis users > healthy controls | 1 |
| Verdejo-Roman et al. (2017) | 60 | monetary incentive delay task | overweight | reward > no reward, overweight > healthy controls | 8 |
| von Rhein et al. (2015) | 258 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 3 |
| Wotruba et al. (2014) | 45 | monetary incentive delay task | high-risk for psychosis | reward > no reward, high-risk > healthy controls | 4 |
| Sequeira et al. (2021) | 109 | monetary incentive delay task | anxiety | reward > loss, patients > healthy controls | 8 |
|  |  |  |  |  |  |

**Table S3. Contrasts for the meta-analysis of loss anticipation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **N** | **Task** | **Condition** | **Contrast** | **No. of foci** |
| ***Healthy controls (MID)*** | | | | | |
| Asari et al. (2017) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 3 |
| Balodis et al. (2012) | 14 | monetary incentive delay task | healthy controls | loss > no loss | 13 |
| Beck et al. (2009) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 10 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 5 |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 18 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 11 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 13 |
| Bustamante et al. (2014) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Carter et al. (2009) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 20 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 9 |
| Filbey et al. (2013) | 27 | monetary incentive delay task | healthy controls | loss > reward | 9 |
| Funayama et al. (2014) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 5 |
| He et al. (2019) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 1 |
| Herbort et al. (2016) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 26 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 12 |
| Juckel et al. (2006) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 16 |
| Juckel et al. (2012) | 13 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| Kaufmann et al. (2013) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 18 |
| Kim et al. (2020) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 5 |
| Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | loss > no loss | 16 |
| Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | loss > no loss | 11 |
| Knutson et al. (2001a) | 8 | monetary incentive delay task | healthy controls | loss > no loss | 9 |
| Knutson et al. (2003) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 7 |
| Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 24 |
| Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| Kollmann et al. (2017) | 41 | monetary incentive delay task | healthy controls | loss > baseline | 8 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | healthy controls | loss > no loss | 6 |
| Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 7 |
| Pabon et al. (2020) | 56 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| Pfabigan et al. (2014) | 25 | monetary incentive delay task | healthy controls | loss > no loss | 17 |
| Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 7 |
| Samanez-Larkin et al.(2007) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 9 |
| Samanez-Larkin et al.(2007) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 3 |
| Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 18 |
| Schlagenhauf et al. (2009) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 5 |
| Schreiter et al. (2016) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Stark et al. (2011) | 31 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Stoy et al. (2011) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Stoy et al. (2012) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 12 |
| Telzer et al. (2020) | 136 | social incentive delay task | healthy controls | punishment > neutral | 7 |
| Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | loss > no loss | 13 |
| Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 34 |
| van Duin et al. (2016) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 12 |
| Weidacker et al. (2019) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | loss > no loss | 13 |
| Wrase et al. (2007a) | 16 | monetary incentive delay task | healthy controls | loss > no loss | 3 |
| Wrase et al. (2007b) | 14 | monetary incentive delay task | healthy controls | loss > no loss | 18 |
| Wu et al. (2014) | 52 | monetary incentive delay task | healthy controls | loss > no loss | 13 |
| Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 8 |
| Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 10 |
| Yau et al. (2012) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| ***Neuropsychiatric conditions (MID)*** | | | | | |
| Beck et al. (2009) | 19 | monetary incentive delay task | children of alcoholics | loss > no loss | 2 |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | alcohol dependence | loss > no loss | 14 |
| Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | loss > no loss | 2 |
| Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 15 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 6 |
| Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 6 |
| Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | loss > no loss | 6 |
| He et al. (2019) | 21 | social incentive delay task | major depressive disorder | punishment > neutral | 8 |
| Herbort et al. (2016) | 21 | monetary incentive delay task | borderline personality disorder | loss > no loss | 2 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | loss > no loss | 6 |
| Juckel et al. (2012) | 13 | monetary incentive delay task | schizophrenia prodrome | loss > no loss | 2 |
| Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive-compulsive disorder | loss > no loss | 17 |
| Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | loss > no loss | 14 |
| Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | loss > no loss | 12 |
| Murray et al. (2017) | 144 | monetary incentive delay task | risk of antisocial | loss > no loss | 2 |
| Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 13 |
| Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | loss > no loss | 17 |
| Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | loss > no loss | 3 |
| Schreiter et al. (2016) | 20 | monetary incentive delay task | bipolar disorder | loss > no loss | 9 |
| Stoy et al. (2011) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss | 1 |
| Stoy et al. (2012) | 15 | monetary incentive delay task | major depressive disorder | loss > no loss | 2 |
| Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 25 |
| van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss | 9 |
| Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | loss > no loss | 2 |
| Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 18 |
| Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | loss > no loss | 6 |
| ***Healthy controls vs Neuropsychiatric conditions (MID)*** | | | | | |
| Alves et al. (2013) | 22 | monetary incentive delay task | schizophrenia | loss > no loss, healthy controls > patients | 6 |
| Balodis et al. (2012) | 28 | monetary incentive delay task | pathological gambling | loss > no loss, healthy controls > patients | 3 |
| Balodis et al. (2016) | 57 | monetary incentive delay task | cocaine dependence | loss > no loss, posttreatment > pretreatment | 2 |
| Choi et al. (2012) | 30 | monetary incentive delay task | pathological gambling | loss > no loss, healthy controls > patients | 2 |
| Jung et al. (2010) | 40 | monetary incentive delay task | obsessive-compulsive disorder | loss > no loss, healthy controls > patients | 2 |
| Mori et al. (2016) | 30 | monetary incentive delay task | subthreshold depression | loss > no loss, healthy controls > subthreshold depression | 2 |
| Murray et al. (2017) | 144 | monetary incentive delay task | antisocial behavior | loss > no loss, negative correlation with antisocial behavior | 2 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | loss > no loss, healthy controls > patients | 1 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | loss > no loss, healthy controls > patients | 2 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, healthy controls > patients | 19 |
| Stoy et al. (2011) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 2 |
| Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 2 |
| Stoy et al. (2011) | 25 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 1 |
| Stoy et al. (2011) | 22 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 5 |
| Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 3 |
| van Duin et al. (2016) | 28 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss, healthy controls > patients | 16 |
| Wrase et al. (2007a) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, healthy controls > patients | 1 |
| Yip et al. (2016) | 45 | monetary incentive delay task | cocaine dependence | loss > no loss, healthy controls > patients | 3 |
| ***Neuropsychiatric conditions vs Healthy controls (MID)*** | | | | | |
| Balodis et al. (2014) | 19 | monetary incentive delay task | binge eating disorder | loss > no loss, binge eating > no binge eating | 13 |
| Choi et al. (2012) | 30 | monetary incentive delay task | pathological gambling | loss > no loss, patients > healthy controls | 1 |
| Choi et al. (2012) | 28 | monetary incentive delay task | obsessive-compulsive disorder | loss > no loss, patients > healthy controls | 3 |
| Grant et al. (2021) | 159 | monetary incentive delay task | body focused repetitive behaviors | loss > no loss, patients > healthy controls | 4 |
| Juckel et al. (2012) | 26 | monetary incentive delay task | schizophrenia | loss > no loss, patients > healthy controls | 1 |
| Jung et al. (2010) | 40 | monetary incentive delay task | obsessive-compulsive disorder | loss > no loss, patients > healthy controls | 1 |
| Pecina et al. (2014) | 72 | monetary incentive delay task | BDNF Val66Met Polymorphism | loss > no loss, Met66 carriers Val/Val | 6 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | loss > no loss, patients > healthy controls | 7 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | loss > no loss, patients > healthy controls | 18 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, patients > healthy controls | 16 |
| Wrase et al. (2007a) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, patients > healthy controls | 1 |
|  |  |  |  |  |  |

**Table S4. Contrasts for the meta-analysis of reward consumption.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **N** | **Task** | **Condition** | **Contrast** | **No. of foci** |
| ***Healthy controls (MID)*** | | | | | |
| Aarts et al. (2010) | 20 | monetary incentive delay task | healthy controls | reward > loss | 4 |
| Abler et al. (2007) | 8 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Balodis et al. (2012) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Bjork et al. (2007) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | healthy controls | reward > no reward | 13 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 9 |
| Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Bjork et al. (2010b) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Bjork et al. (2012) | 23 | monetary incentive delay task | healthy controls | reward > no reward | 7 |
| Bustamante et al. (2014) | 18 | monetary incentive delay task | healthy controls | reward > no reward | 3 |
| Carl et al. (2016) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 3 |
| Danamino et al. (2014) | 31 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Dillon et al. (2010) | 32 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Figee et al. (2011) | 19 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Filbey et al. (2013) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| He et al. (2019) | 20 | monetary incentive delay task | healthy controls | reward > no reward | 14 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Knutson et al. (2001b) | 9 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Knutson et al. (2003) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 4 |
| Knutson et al. (2004) | 8 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | reward > no reward | 28 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| Morelli et al. (2021) | 46 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Rademacher et al. (2010) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 20 |
| Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | healthy controls | reward > no reward | 30 |
| Schneider et al. (2018) | 46 | monetary incentive delay task | healthy controls | reward > no reward | 18 |
| Simon et al. (2010) | 24 | monetary incentive delay task | healthy controls | reward > no reward | 8 |
| Suzuki et al. (2019) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 12 |
| Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | reward > no reward | 2 |
| Tsurumi et al. (2014) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 6 |
| Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | reward > no reward | 15 |
| Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | reward > no reward | 10 |
| Wrase et al. (2007b) | 14 | monetary incentive delay task | healthy controls | reward > no reward | 11 |
| Wu et al. (2014) | 52 | monetary incentive delay task | healthy controls | reward > no reward | 16 |
| Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | reward > no reward | 23 |
| Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | reward > no reward | 5 |
| Zhornitsky et al. (2019) | 45 | monetary incentive delay task | healthy controls | reward > no reward | 14 |
| ***Neuropsychiatric conditions (MID)*** | | | | | |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | alcohol dependence | reward > no reward | 9 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 13 |
| Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 6 |
| Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 8 |
| Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | reward > no reward | 2 |
| Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 2 |
| Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 11 |
| Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | reward > no reward | 2 |
| He et al. (2019) | 21 | monetary incentive delay task | major depressive disorder | reward > no reward | 24 |
| Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | reward > no reward | 2 |
| Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 6 |
| Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 9 |
| Murray et al. (2017) | 144 | monetary incentive delay task | risk of antisocial | reward > no reward | 1 |
| Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | reward > no reward | 28 |
| Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 34 |
| Stroehle et al. (2008) | 10 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 3 |
| Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 5 |
| Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 20 |
| Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | reward > no reward | 10 |
| Yao et al. (2020) | 22 | monetary incentive delay task | internet gambling disorder | reward > no reward | 4 |
| Zhornitsky et al. (2019) | 50 | monetary incentive delay task | cocaine-dependence | reward > no reward | 11 |
| ***Healthy controls vs Neuropsychiatric conditions (MID)*** | | | | | |
| Balodis et al. (2012) | 28 | monetary incentive delay task | pathological gambling | reward > no reward, healthy controls > patients | 2 |
| Damiano et al. (2014) | 31 | monetary incentive delay task | oxytocin receptor (OXTR) genotype (rs237887) | reward > no reward, AG/GG > AA | 6 |
| Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorders | reward > no reward, healthy controls > patients | 9 |
| Dichter et al. (2012c) | 38 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 17 |
| Dillon et al. (2010) | 32 | monetary incentive delay task | polymorphisms in the DAT1 and COMT genes | reward > no reward, positive correlation with protective allele count | 11 |
| Figee et al. (2011) | 37 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward, healthy controls > patients | 3 |
| Johnson et al. (2019) | 48 | monetary incentive delay task | bipolar disorder | reward > no reward, healthy controls > patients | 1 |
| Knutson et al. (2008) | 26 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 8 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | reward > no reward, healthy controls > patients | 19 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | reward > no reward, healthy controls > patients | 9 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, healthy controls > patients | 1 |
| Smoski et al. (2011) | 22 | monetary incentive delay task (pleasant image) | major depressive disorder | reward > no reward, healthy controls > patients | 2 |
| Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, remitters > persisters | 1 |
| van Hell et al. (2010) | 27 | monetary incentive delay task | cannabis users | reward > no reward, healthy controls > patients | 13 |
| Yan et al. (2016) | 37 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 4 |
| ***Neuropsychiatric conditions vs Healthy controls (MID)*** | | | | | |
| Balodis et al. (2014) | 19 | monetary incentive delay task | binge eating disorder | reward > no reward, binge eating > no binge eating | 6 |
| Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorders | reward > no reward, patients > healthy controls | 30 |
| Dichter et al. (2012b) | 36 | monetary incentive delay task | autism spectrum disorders | reward > no reward, patients > healthy controls | 34 |
| Dichter et al. (2012c) | 38 | monetary incentive delay task | autism spectrum disorders | reward > no reward, patients > healthy controls | 2 |
| Hanssen et al. (2015) | 151 | monetary incentive delay task | siblings of patients with schizophrenia | reward > baseline, siblings > healthy controls | 4 |
| Jia et al. (2011) | 40 | monetary incentive delay task | cocaine dependence | reward > no reward, patients > healthy controls | 7 |
| Jung et al. (2010) | 40 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward, patients > healthy controls | 5 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | social anxiety | high reward > low reward, high social anxiety > low social anxiety | 60 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | reward > no reward, patients > healthy controls | 1 |
| Romanczuk-Seiferth et al. (2015) | 35 | monetary incentive delay task | pathological gambling | reward > no reward, patients > healthy controls | 6 |
| Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, patients > healthy controls | 20 |
| Schimidt et al. (2021) | 53 | monetary incentive delay task | gambling disorder | reward > no reward, patients > healthy controls | 3 |
| Stoy et al. (2011) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 1 |
| Stoy et al. (2011) | 25 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 3 |
| Stroehle et al. (2008) | 20 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 7 |
| van Hell et al. (2010) | 27 | monetary incentive delay task | cannabis users | reward > no reward, patients > healthy controls | 17 |
| von Rhein et al. (2015) | 258 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, patients > healthy controls | 3 |
|  |  |  |  |  |  |

**Table S5. Contrasts for the meta-analysis of loss consumption.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **N** | **Task** | **Condition** | **Contrast** | **No. of foci** |
| ***Healthy controls (MID)*** | | | | | |
| Balodis et al. (2012) | 14 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | healthy controls | loss > no loss | 8 |
| Bjork et al. (2010a) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 1 |
| Bjork et al. (2010b) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 1 |
| Filbey et al. (2013) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 2 |
| He et al. (2019) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 3 |
| Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | loss > no loss | 5 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | healthy controls | loss > no loss | 24 |
| Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | loss > no loss | 1 |
| Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 10 |
| Weidacker et al. (2019) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 1 |
| Welborn et al. (2020 | 36 | monetary incentive delay task | healthy controls | loss > no loss | 17 |
| Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 4 |
| Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 3 |
| Zhornitsky et al. (2021) | 45 | monetary incentive delay task | healthy controls | loss > no loss | 19 |
| ***Neuropsychiatric conditions (MID)*** | | | | | |
| Bjork et al. (2008a) | 23 | monetary incentive delay task | alcohol dependence | loss > no loss | 2 |
| Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | loss > no loss | 6 |
| Bjork et al. (2010a) | 12 | monetary incentive delay task | externalizing disorders | loss > no loss | 1 |
| Filbey et al. (2013) | 59 | monetary incentive delay task | marijuana users | loss > no loss | 3 |
| He et al. (2019) | 21 | monetary incentive delay task | major depressive disorder | loss > no loss | 2 |
| Murray et al. (2017) | 144 | monetary incentive delay task | risk of antisocial | loss > no loss | 1 |
| Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 11 |
| Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 4 |
| Zhornitsky et al. (2021) | 50 | monetary incentive delay task | cocaine-dependence | loss > no loss | 17 |
| ***Healthy controls vs Neuropsychiatric conditions (MID)*** | | | | | |
| Balodis et al. (2012) | 28 | monetary incentive delay task | pathological gambling | loss > no loss, healthy controls > patients | 8 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | loss > no loss, healthy controls > patients | 11 |
| Stoy et al. (2011) | 22 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 2 |
| Subramaniam et al. (2015) | 57 | monetary incentive delay task | schizophrenia | loss > no loss, healthy controls > patients | 3 |
| ***Neuropsychiatric conditions vs Healthy controls (MID)*** | | | | | |
| Balodis et al. (2014) | 19 | monetary incentive delay task | binge eating disorder | loss > no loss, binge eating > no binge eating | 5 |
| Maresh et al. (2014) | 84 | monetary incentive delay task | social anxiety | loss > no loss, high social anxiety > low social anxiety | 18 |
| Pizzagalli et al. (2009) | 57 | monetary incentive delay task | major depressive disorder | loss > no loss, patients > healthy controls | 2 |
|  |  |  |  |  |  |

**Table S6. Significant clusters from the main meta-analysis of reward anticipation.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Laterality** |  | **Brain Regions** |  | **BA (edit)** |  | **MNI Coordinates (mm)** |  | **peak Z score** |  | **Cluster Size (mm³)** |
| ***Healthy controls*** | | | | | | | | | | |
| L/R |  | ventral striatum, extending to amygdala, thalamus, and AI |  | / |  | -12 8 -4 |  | 8.5047 |  | 46768 |
| L/R |  | SMA |  | 6/32/24/8 |  | 2 4 54 |  | 6.6733 |  | 8904 |
| R |  | middle occipital gyrus |  | 18/17/19 |  | 32 -86 -4 |  | 5.8084 |  | 3880 |
| L |  | precentral gyrus |  | 6/4/3 |  | -40 -22 56 |  | 4.4409 |  | 2232 |
| L |  | middle occipital gyrus |  | 18/17/19 |  | -22 -91 -8 |  | 4.4409 |  | 1512 |
| L/R |  | calcarine |  | 18/30/31/23/17 |  | 18 -70 10 |  | 5.799 |  | 1400 |
| R |  | precentral gyrus |  | 6 |  | 46 -2 46 |  | 4.4728 |  | 1288 |
| ***Neuropsychiatric conditions*** | | | | | | | | | | |
| L/R |  | ventral striatum |  | / |  | -10 6 2 |  | 8.2338 |  | 7960 |
| R |  | ventral striatum |  | / |  | 14 10 -4 |  | 8.269 |  | 5088 |
| L |  | AI |  | / |  | -32 20 0 |  | 4.8007 |  | 1760 |
| R |  | AI |  | / |  | 32 22 4 |  | 5.4757 |  | 1464 |
| L |  | precentral gyrus |  | 4/6 |  | -46 -10 48 |  | 4.0256 |  | 776 |
| ***Hypoactivity*** | | | | | | | | | | |
| L |  | ventral striatum |  | / |  | -6 6 -2 |  | 4.9171 |  | 1672 |

AI: anterior insula; SMA: supplementary motor area; *P*(FWE) < 0.05 at the cluster level with a cluster-forming threshold of *P* < 0.001 using 10,000 permutations.

**Table S7. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of reward anticipation in healthy controls.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Contrast** | **Average contribution (%)** |
| ventral striatum, extending to amygdala, thalamus, and AI | Adcock et al. (2006) | 12 | monetary incentive delay task | reward > no reward | 3.03 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 2.98 |
|  | Carter et al. (2009) | 17 | monetary incentive delay task | reward > no reward | 2.83 |
|  | Spreckelmeyer et al. (2009) | 32 | monetary incentive delay task | reward > no reward | 2.6 |
|  | Murty et al. (2014) | 26 | monetary incentive delay task | high reward > low reward | 2.51 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 2.46 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | reward > no reward | 2.25 |
|  | Treadway et al. (2013) | 38 | monetary incentive delay task | reward > no reward | 2.23 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 2.14 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 2.1 |
|  | Enzi et al. (2012a) | 19 | monetary incentive delay task | reward > no reward | 2.04 |
|  | Goerlich et al. (2017) | 45 | monetary incentive delay task | reward > no reward | 1.85 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 1.77 |
|  | Costumero et al. (2013) | 44 | monetary incentive delay task | reward > no reward | 1.72 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 1.69 |
|  | Saji et al. (2013) | 18 | monetary incentive delay task | reward > no reward | 1.67 |
|  | Knutson et al. (2001a) | 8 | monetary incentive delay task | reward > no reward | 1.65 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 1.61 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | reward > no reward | 1.6 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 1.57 |
|  | Wittmann et al. (2005) | 16 | monetary incentive delay task | reward > no reward | 1.5 |
|  | Knutson et al. (2001b) | 9 | monetary incentive delay task | reward > no reward | 1.47 |
|  | Spreckelmeyer et al. (2013) | 30 | social incentive delay task | parametric analysis with levels of reward | 1.46 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 1.45 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 1.43 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | reward > no reward | 1.38 |
|  | Abler et al. (2005) | 12 | monetary incentive delay task | reward > no reward | 1.37 |
|  | Mechelmans et al. (2017) | 29 | monetary incentive delay task | reward > no reward | 1.33 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 1.31 |
|  | Maresh et al.(2014) | 84 | monetary incentive delay task | reward > no reward | 1.29 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | reward > no reward | 1.29 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 1.27 |
|  | Rademacher et al. (2014) | 48 | social incentive delay task | reward > no reward | 1.22 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | reward > no reward | 1.21 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 1.21 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | reward > no reward | 1.21 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | reward > no reward | 1.2 |
|  | Knutson et al. (2004) | 8 | monetary incentive delay task | reward > no reward | 1.2 |
|  | Kappel et al. (2013) | 20 | monetary incentive delay task | reward > no reward | 1.15 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | reward > no reward | 1.14 |
|  | Walter et al. (2009) | 16 | monetary incentive delay task | parametric analysis with levels of reward | 1.11 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 1.09 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | reward > no reward | 1.09 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 1.08 |
|  | Kappel et al. (2013) | 10 | monetary incentive delay task for children | reward > no reward | 1.08 |
|  | Michielse et al. (2019) | 40 | monetary incentive delay task | reward > no reward | 1.08 |
|  | Arrondo et al. (2015) | 21 | monetary incentive delay task | reward > no reward | 1.07 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | reward > baseline | 1.03 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 1 |
|  | Juckel et al. (2006) | 10 | monetary incentive delay task | reward > no reward | 0.94 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | reward > no reward | 0.93 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 0.89 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 0.88 |
|  | Staudinger et al. (2011) | 24 | monetary incentive delay task | high reward > low reward | 0.88 |
|  | Beck et al. (2009) | 19 | monetary incentive delay task | reward > no reward | 0.86 |
|  | Juckel et al. (2012) | 13 | monetary incentive delay task | reward > no reward | 0.86 |
|  | Ossewaarde et al. (2011b) | 28 | monetary incentive delay task | reward > no reward | 0.83 |
|  | Simon et al. (2010) | 24 | monetary incentive delay task | reward > no reward | 0.8 |
|  | Romanczuk-Seiferth et al. (2015) | 17 | monetary incentive delay task | reward > no reward | 0.76 |
|  | Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | reward > no reward | 0.72 |
|  | Aarts et al. (2010) | 20 | monetary incentive delay task | high reward > low reward | 0.68 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 0.66 |
|  | Behan et al. (2015) | 20 | monetary incentive delay task | reward > no reward | 0.62 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 0.62 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | reward > no reward | 0.62 |
|  | Bjork et al. (2007) | 20 | uncertain reward in monetary incentive delay tasks | reward > no reward | 0.59 |
|  | Ossewaarde et al. (2011a) | 27 | monetary incentive delay task | reward > no reward | 0.58 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 0.58 |
|  | Funayama et al. (2014) | 20 | monetary incentive delay task | reward > no reward | 0.53 |
|  | Schlagenhauf et al. (2009) | 15 | monetary incentive delay task | reward > no reward | 0.53 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | reward > no reward | 0.51 |
|  | Stroehle et al. (2008) | 10 | monetary incentive delay task | reward > no reward | 0.49 |
|  | Kim et al.(2020) | 18 | monetary incentive delay task | reward > no reward | 0.48 |
|  | Telzer et al. (2020) | 136 | monetary incentive delay task | reward > no reward | 0.46 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 0.39 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | reward > no reward | 0.38 |
|  | Weiland et al. (2014) | 12 | monetary incentive delay task | reward > no reward | 0.3 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | reward > no reward | 0.29 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | reward > no reward | 0.29 |
|  | Pujara et al. (2016) | 14 | monetary incentive delay task | reward > no reward | 0.28 |
|  | Bustamante et al. (2014) | 18 | monetary incentive delay task | reward > no reward | 0.27 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 0.27 |
|  | Tsurumi et al. (2014) | 27 | monetary incentive delay task | reward > no reward | 0.26 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 0.24 |
|  | He et al. (2019) | 20 | monetary incentive delay task | reward > no reward | 0.22 |
|  | Wu et al. (2014) | 52 | monetary incentive delay task | reward > no reward | 0.21 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | reward > no reward | 0.19 |
|  | Mehta et al. (2010) | 11 | monetary incentive delay task | reward > no reward | 0.19 |
|  | Asari et al. (2017) | 19 | monetary incentive delay task | reward > no reward | 0.18 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | reward > no reward | 0.18 |
|  | Pabon et al. (2020) | 56 | monetary incentive delay task | reward > no reward | 0.17 |
|  | Balodis et al. (2012) | 14 | monetary incentive delay task | reward > no reward | 0.15 |
|  | Stark et al. (2011) | 31 | monetary incentive delay task | reward > no reward | 0.13 |
|  | Alves et al. (2011) | 10 | monetary incentive delay task | reward > no reward | 0.11 |
| SMA | Goerlich et al. (2017) | 45 | monetary incentive delay task | reward > no reward | 8.3 |
|  | Maresh et al.(2014) | 84 | monetary incentive delay task | reward > no reward | 5.01 |
|  | Costumero et al. (2013) | 44 | monetary incentive delay task | reward > no reward | 4.91 |
|  | Knutson et al. (2001a) | 8 | monetary incentive delay task | reward > no reward | 4.58 |
|  | Spreckelmeyer et al. (2013) | 30 | social incentive delay task | parametric analysis with levels of reward | 3.1 |
|  | Funayama et al. (2014) | 20 | monetary incentive delay task | reward > no reward | 3.07 |
|  | Knutson et al. (2001b) | 9 | monetary incentive delay task | reward > no reward | 2.96 |
|  | Aarts et al. (2010) | 20 | monetary incentive delay task | high reward > low reward | 2.94 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | reward > no reward | 2.58 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 2.55 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | reward > no reward | 2.53 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 2.48 |
|  | Kappel et al. (2013) | 20 | monetary incentive delay task | reward > no reward | 2.45 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 2.18 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 2.07 |
|  | Ossewaarde et al. (2011a) | 27 | monetary incentive delay task | reward > no reward | 2.05 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 2.01 |
|  | Wittmann et al. (2005) | 16 | monetary incentive delay task | reward > no reward | 1.92 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 1.91 |
|  | Michielse et al. (2019) | 40 | monetary incentive delay task | reward > no reward | 1.91 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 1.89 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 1.88 |
|  | Ossewaarde et al. (2011b) | 28 | monetary incentive delay task | reward > no reward | 1.84 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | reward > no reward | 1.83 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 1.8 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 1.78 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 1.75 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | reward > no reward | 1.72 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 1.71 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 1.67 |
|  | Behan et al. (2015) | 20 | monetary incentive delay task | reward > no reward | 1.63 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 1.6 |
|  | Staudinger et al. (2011) | 24 | monetary incentive delay task | high reward > low reward | 1.58 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | reward > no reward | 1.52 |
|  | Kim et al.(2020) | 18 | monetary incentive delay task | reward > no reward | 1.52 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 1.46 |
|  | Pabon et al. (2020) | 56 | monetary incentive delay task | reward > no reward | 1.41 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 1.35 |
|  | Stark et al. (2011) | 31 | monetary incentive delay task | reward > no reward | 1.24 |
|  | Tsurumi et al. (2014) | 27 | monetary incentive delay task | reward > no reward | 1.18 |
|  | Saji et al. (2013) | 18 | monetary incentive delay task | reward > no reward | 1.02 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 0.93 |
|  | Arrondo et al. (2015) | 21 | monetary incentive delay task | reward > no reward | 0.86 |
|  | Enzi et al. (2012a) | 19 | monetary incentive delay task | reward > no reward | 0.86 |
|  | Kappel et al. (2013) | 10 | monetary incentive delay task for children | reward > no reward | 0.65 |
|  | Walter et al. (2009) | 16 | monetary incentive delay task | parametric analysis with levels of reward | 0.58 |
|  | Romanczuk-Seiferth et al. (2014) | 17 | monetary incentive delay task | reward > no reward | 0.32 |
|  | Bjork et al. (2007) | 20 | uncertain reward in monetary incentive delay tasks | reward > no reward | 0.25 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 0.22 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 0.22 |
|  | Simon et al. (2010) | 24 | monetary incentive delay task | reward > no reward | 0.07 |
|  | Mechelmans et al. (2017) | 29 | monetary incentive delay task | reward > no reward | 0.05 |
|  | Asari et al. (2017) | 19 | monetary incentive delay task | reward > no reward | 0.04 |
|  | Rademacher et al. (2014) | 48 | social incentive delay task | reward > no reward | 0.02 |
| middle occipital gyrus | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 6.76 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 6.25 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 5.67 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 5.28 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 4.95 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 3.96 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 3.92 |
|  | Telzer et al. (2020) | 136 | monetary incentive delay task | reward > no reward | 3.92 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 3.83 |
|  | van Duin et al. (2016) | 12 | monetary incentive delay task | reward > no reward | 3.67 |
|  | Juckel et al. (2012) | 13 | monetary incentive delay task | reward > no reward | 3.65 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 3.39 |
|  | Funayama et al. (2014) | 20 | monetary incentive delay task | reward > no reward | 3.36 |
|  | Carter et al. (2009) | 17 | monetary incentive delay task | reward > no reward | 3.17 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | reward > no reward | 3.05 |
|  | Spreckelmeyer et al. (2013) | 30 | social incentive delay task | parametric analysis with levels of reward | 3.03 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | reward > no reward | 2.95 |
|  | Michielse et al. (2019) | 40 | monetary incentive delay task | reward > no reward | 2.92 |
|  | Kappel et al. (2013) | 20 | monetary incentive delay task | reward > no reward | 2.77 |
|  | Romanczuk-Seiferth et al. (2014) | 17 | monetary incentive delay task | reward > no reward | 2.77 |
|  | Spreckelmeyer et al. (2009) | 32 | monetary incentive delay task | reward > no reward | 2.74 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 2.61 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 2.6 |
|  | Weiland et al. (2014) | 12 | monetary incentive delay task | reward > no reward | 1.89 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 1.77 |
|  | Behan et al. (2015) | 20 | monetary incentive delay task | reward > no reward | 1.74 |
|  | Stoy et al. (2011) | 12 | monetary incentive delay task | reward > no reward | 1.6 |
|  | Maresh et al.(2014) | 84 | monetary incentive delay task | reward > no reward | 1.52 |
|  | He et al. (2019) | 20 | monetary incentive delay task | reward > no reward | 1.42 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 0.9 |
|  | Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | reward > no reward | 0.73 |
|  | Morelli et l. (2021) | 46 | monetary incentive delay task | reward > no reward | 0.46 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 0.31 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 0.2 |
|  | Abler et al. (2005) | 12 | monetary incentive delay task | reward > no reward | 0.16 |
| precentral gyrus | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 6.13 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 5.74 |
|  | Stark et al. (2011) | 31 | monetary incentive delay task | reward > no reward | 5.47 |
|  | Knutson et al. (2001b) | 9 | monetary incentive delay task | reward > no reward | 5.43 |
|  | Goerlich et al. (2017) | 45 | monetary incentive delay task | reward > no reward | 5.22 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 5.15 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | reward > no reward | 5.13 |
|  | Costumero et al. (2013) | 44 | monetary incentive delay task | reward > no reward | 5.07 |
|  | Behan et al. (2015) | 20 | monetary incentive delay task | reward > no reward | 5 |
|  | Kappel et al. (2013) | 20 | monetary incentive delay task | reward > no reward | 4.7 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 4.69 |
|  | Romanczuk-Seiferth et al. (2014) | 17 | monetary incentive delay task | reward > no reward | 4.62 |
|  | Arrondo et al. (2015) | 21 | monetary incentive delay task | reward > no reward | 4.53 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 4.49 |
|  | Ossewaarde et al. (2011b) | 28 | monetary incentive delay task | reward > no reward | 3.98 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 3.83 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 3.68 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 3.4 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 3.02 |
|  | Murty et al. (2014) | 26 | monetary incentive delay task | high reward > low reward | 2.8 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 2.4 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 2.1 |
|  | Wittmann et al. (2005) | 16 | monetary incentive delay task | reward > no reward | 1.23 |
|  | Ossewaarde et al. (2011a) | 27 | monetary incentive delay task | reward > no reward | 0.84 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | reward > no reward | 0.57 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 0.35 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 0.21 |
| middle occipital gyrus | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 15.15 |
|  | Funayama et al. (2014) | 20 | monetary incentive delay task | reward > no reward | 9.33 |
|  | Behan et al. (2015) | 20 | monetary incentive delay task | reward > no reward | 6.48 |
|  | Aarts et al. (2010) | 20 | monetary incentive delay task | high reward > low reward | 6.32 |
|  | Telzer et al. (2020) | 136 | monetary incentive delay task | reward > no reward | 6.05 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | reward > no reward | 5.58 |
|  | Saji et al. (2013) | 18 | monetary incentive delay task | reward > no reward | 5.49 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 5.18 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 5.14 |
|  | Maresh et al.(2014) | 84 | monetary incentive delay task | reward > no reward | 5.02 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 4.8 |
|  | Weiland et al. (2014) | 12 | monetary incentive delay task | reward > no reward | 3.83 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 3.02 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 3.02 |
|  | Morelli et l. (2021) | 46 | monetary incentive delay task | reward > no reward | 2.86 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 2.4 |
|  | Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | reward > no reward | 2.24 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 2.03 |
|  | Spreckelmeyer et al. (2009) | 32 | monetary incentive delay task | reward > no reward | 1.9 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | reward > no reward | 1.48 |
|  | Juckel et al. (2012) | 13 | monetary incentive delay task | reward > no reward | 1.04 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 0.84 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | reward > baseline | 0.28 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 0.26 |
|  | Spreckelmeyer et al. (2013) | 30 | social incentive delay task | parametric analysis with levels of reward | 0.19 |
| calcarine | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 10.05 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 9.01 |
|  | Saji et al. (2013) | 18 | monetary incentive delay task | reward > no reward | 8.64 |
|  | Romanczuk-Seiferth et al. (2014) | 17 | monetary incentive delay task | reward > no reward | 8.48 |
|  | Adcock et al. (2006) | 12 | monetary incentive delay task | reward > no reward | 8.2 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 7.53 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | reward > no reward | 7 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | reward > no reward | 5.51 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 5.15 |
|  | Spreckelmeyer et al. (2009) | 32 | monetary incentive delay task | reward > no reward | 5.07 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 3.5 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | reward > baseline | 3.34 |
|  | Walter et al. (2009) | 16 | monetary incentive delay task | parametric analysis with levels of reward | 3.05 |
|  | Costumero et al. (2013) | 44 | monetary incentive delay task | reward > no reward | 2.98 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | reward > no reward | 2.72 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | reward > no reward | 2.65 |
|  | Ye et al. (2011) | 16 | monetary incentive delay task | reward > no reward | 2.25 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | reward > no reward | 1.41 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 1.34 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | reward > no reward | 1 |
|  | Samanez-Larkin et al. (2007) | 12 | monetary incentive delay task | reward > no reward | 0.26 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 0.23 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 0.22 |
|  | Carter et al. (2009) | 17 | monetary incentive delay task | reward > no reward | 0.13 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 0.12 |
| precentral gyrus | Arrondo et al. (2015) | 21 | monetary incentive delay task | reward > no reward | 10.82 |
|  | Kirsch et al. (2003) | 27 | monetary incentive delay task | reward > no reward | 10.61 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | reward > no reward | 10.48 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | reward > baseline | 8.5 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 7.39 |
|  | Ossewaarde et al. (2011b) | 28 | monetary incentive delay task | reward > no reward | 7.33 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | reward > no reward | 6.77 |
|  | Goerlich et al. (2017) | 45 | monetary incentive delay task | reward > no reward | 6.41 |
|  | Saji et al. (2013) | 18 | monetary incentive delay task | reward > no reward | 6.36 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 6.13 |
|  | Spreckelmeyer et al. (2013) | 30 | social incentive delay task | parametric analysis with levels of reward | 6.07 |
|  | Murty et al. (2014) | 26 | monetary incentive delay task | high reward > low reward | 2.96 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 2.75 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | reward > no reward | 1.88 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 1.48 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 1.39 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 0.74 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 0.67 |
|  | Wittmann et al. (2005) | 16 | monetary incentive delay task | reward > no reward | 0.52 |
|  | Mehta et al. (2010) | 11 | monetary incentive delay task | reward > no reward | 0.39 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 0.2 |
|  |  |  |  |  |  |

AI: anterior insula; SMA: supplementary motor area

**Table S8. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of reward anticipation in clinical/at-risk conditions.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | C**ondition** | **Contrast** | **Average contribution (%)** |
| ventral striatum | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 9.95 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 9.7 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 8.34 |
|  | Herbort et al. (2016) | 21 | monetary incentive delay task | borderline personality disorder | reward > no reward | 5.5 |
|  | Romanczuk-Seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | reward > no reward | 5.49 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 5.13 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 4.89 |
|  | Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 4.35 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 4.16 |
|  | Michielse et al. (2019) | 47 | monetary incentive delay task | subclinical psychotic experiences | reward > no reward | 4.14 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | reward > loss | 3.94 |
|  | Walter et al. (2009) | 16 | monetary incentive delay task | schizophrenia | parametric analysis with levels of reward | 3.87 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | reward > no reward | 3.65 |
|  | Romanczuk-Seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 3.61 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 3.52 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 2.83 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | reward > no reward | 2.36 |
|  | Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 2.19 |
|  | Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | reward > no reward | 2.17 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | reward > no reward | 2.11 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | reward > no reward | 1.76 |
|  | Beck et al. (2009) | 19 | monetary incentive delay task | alcohol dependence | reward > no reward | 1.68 |
|  | Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 1.46 |
|  | Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 1.29 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | reward > no reward | 1.09 |
|  | van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | reward > no reward | 0.72 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | reward > no reward | 0.07 |
| ventral striatum | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | reward > no reward | 7.01 |
|  | Romanczuk-Seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | reward > no reward | 6.09 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 6.02 |
|  | Herbort et al. (2016) | 21 | monetary incentive delay task | borderline personality disorder | reward > no reward | 5.76 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 5.42 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 5.3 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | reward > no reward | 3.95 |
|  | Beck et al. (2009) | 19 | monetary incentive delay task | alcohol dependence | reward > no reward | 3.91 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 3.91 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | reward > loss | 3.63 |
|  | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 3.59 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | reward > no reward | 3.49 |
|  | Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | reward > no reward | 3.48 |
|  | Michielse et al. (2019) | 47 | monetary incentive delay task | subclinical psychotic experiences | reward > no reward | 3.43 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 3.33 |
|  | Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 3.33 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | reward > no reward | 3.29 |
|  | Walter et al. (2009) | 16 | monetary incentive delay task | schizophrenia | parametric analysis with levels of reward | 3.15 |
|  | He et al. (2019) | 21 | monetary incentive delay task | depression | reward > no reward | 2.96 |
|  | Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 2.91 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | reward > no reward | 2.86 |
|  | Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 2.85 |
|  | Romanczuk-Seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 2.72 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | reward > no reward | 2.68 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | reward > no reward | 2.53 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | reward > no reward | 2.18 |
|  | van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | reward > no reward | 0.23 |
| AI | Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 11.53 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 11.41 |
|  | Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 10.83 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | reward > no reward | 9.99 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 9.78 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 9.54 |
|  | Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | reward > loss | 9.43 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | reward > no reward | 9.04 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | reward > no reward | 7.42 |
|  | Romanczuk-Seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | reward > no reward | 6.55 |
|  | Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 4.15 |
|  | Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 0.18 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 0.14 |
| AI | Rose et al. (2013) | 28 | monetary incentive delay task | nicotine smoker | reward > loss | 20.53 |
|  | Michielse et al. (2019) | 47 | monetary incentive delay task | subclinical psychotic experiences | reward > no reward | 13.93 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | reward > no reward | 13.22 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 12.35 |
|  | Edel et al. (2013) | 12 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 11.18 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 10.63 |
|  | Tsurumi et al. (2014) | 23 | monetary incentive delay task | pathological gambling | reward > no reward | 10.16 |
|  | Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | reward > no reward | 7.28 |
|  | van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | reward > no reward | 0.64 |
| precentral gyrus | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 24.45 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | reward > no reward | 23.11 |
|  | Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 20.72 |
|  | Scheres et al. (2007) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward | 17.25 |
|  | Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | reward > no reward | 13.93 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 0.51 |
|  |  |  |  |  |  |  |

AI: anterior insula; SMA: supplementary motor area

**Table S9. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of hypoactivation of clinical/at-risk conditions relative to healthy controls during reward anticipation.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Condition** | **Contrast** | **Average contribution (%)** |
| ventral striatum | Figee et al. (2011) | 37 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward, healthy controls > patients | 19.05 |
|  | van Hell et al. (2010) | 27 | monetary incentive delay task | cannabis users | reward > no reward, healthy controls > cannabis users | 15.32 |
|  | Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorders | reward > no reward, healthy controls > patients | 13.4 |
|  | Wrase et al. (2007a) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, healthy controls > patients | 11.22 |
|  | Dichter et al. (2012b) | 36 | monetary incentive delay task | autism spectrum disorders | reward > no reward, healthy controls > patients | 11.06 |
|  | Kappel et al. (2015) | 36 | monetary incentive delay task | attention deficit hyperactivity disorder | reward > no reward, healthy controls > patients | 10.66 |
|  | Damiano et al. (2014) | 31 | monetary incentive delay task | oxytocin receptor (OXTR) genotype (rs2268493) | reward > no reward, TC/CC > TT | 9.65 |
|  | Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | reward > no reward, healthy controls > patients | 5.72 |
|  | Yan et al. (2016) | 37 | monetary incentive delay task | schizophrenia | reward > no reward, healthy controls > patients | 2.51 |
|  | van Hell et al. (2010) | 28 | monetary incentive delay task | cannabis users | reward > no reward, healthy controls > cannabis users | 1.38 |

**Table S10. Significant clusters from the main meta-analysis of loss anticipation.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Laterality** |  | **Brain Regions** |  | **BA (edit)** |  | **MNI Coordinates (mm)** |  | **peak Z score** |  | **Cluster Size (mm³)** |
| ***Healthy controls*** | | | | | | | | | | |
| L/R |  | ventral striatum, extending to amygdala, thalamus, and AI |  | / |  | -12 8 -4 |  | 8.2605 |  | 14176 |
| R |  | ventral striatum |  | / |  | 10 8 4 |  | 8.2662 |  | 10032 |
| L/R |  | SMA |  | 6/32/24 |  | 2 2 54 |  | 5.5798 |  | 4024 |
| L |  | middle occipital gyrus |  | 17 |  | -16 -92 -8 |  | 5.7411 |  | 880 |
| ***Neuropsychiatric conditions*** | | | | | | | | | | |
| L/R |  | SMA |  | 6/24 |  | 8 0 62 |  | 5.6292 |  | 1752 |
| L |  | ventral striatum |  | / |  | -10 8 0 |  | 5.4538 |  | 1480 |
| R |  | ventral striatum |  | / |  | 8 4 2 |  | 4.4996 |  | 1128 |
| L |  | precentral gyrus |  | 6/4 |  | -46 -8 52 |  | 4.7095 |  | 1008 |
| R |  | precentral gyrus |  | 6 |  | 44 -4 50 |  | 5.1928 |  | 976 |
| L |  | AI |  | / |  | -34 18 10 |  | 4.1065 |  | 936 |
| L/R |  | thalamus |  | / |  | -4 -10 8 |  | 3.9443 |  | 808 |
| ***Hypoactivity*** | | | | | | | | | | |
| L |  | middle occipital gyrus |  | 18/17/31 |  | -16 -88 12 |  | 5.9268 |  | 1296 |
| L |  | cuneus |  | 31/7/18 |  | -2 -72 26 |  | 4.7138 |  | 808 |
| L |  | ventral striatum |  | / |  | -16 16 -4 |  | 5.1512 |  | 760 |

AI: anterior insula; SMA: supplementary motor area; *P*(FWE) < 0.05 at the cluster level with a cluster-forming threshold of *P* < 0.001 using 10,000 permutations.

**Table S11. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of loss anticipation in healthy controls.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Condition** | **Contrast** | **Average contribution (%)** |
| ventral striatum, extending to amygdala, thalamus, and AI | Carter et al. (2009) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 9.45 |
|  | Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | loss > no loss | 6.27 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 4.82 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 4.55 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 4.13 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | loss > no loss | 4.12 |
|  | Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 4.08 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 4.03 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 3.81 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | healthy controls | loss > no loss | 3.65 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | loss > no loss | 3.55 |
|  | Samanez-Larkin et al.(2007) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 3.35 |
|  | Beck et al. (2009) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 2.99 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 2.85 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | loss > no loss | 2.73 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.7 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | healthy controls | loss > no loss | 2.61 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 2.6 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | loss > no loss | 2.54 |
|  | Juckel et al. (2006) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 2.25 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 2.21 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 2.17 |
|  | Weidacker et al. (2019) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 2.11 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 2.08 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | healthy controls | loss > no loss | 1.81 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 1.53 |
|  | Knutson et al. (2001a) | 8 | monetary incentive delay task | healthy controls | loss > no loss | 1.29 |
|  | Funayama et al. (2014) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 1.19 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 1.12 |
|  | Kim et al. (2020) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 1.1 |
|  | Pabon et al. (2020) | 56 | monetary incentive delay task | healthy controls | loss > no loss | 1.07 |
|  | Telzer et al. (2020) | 136 | social incentive delay task | healthy controls | punishment > neutral | 1.05 |
|  | Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 0.96 |
|  | Juckel et al. (2012) | 13 | monetary incentive delay task | healthy controls | loss > no loss | 0.94 |
|  | Schlagenhauf et al. (2009) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 0.81 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 0.8 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 0.48 |
|  | He et al. (2019) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 0.12 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 0.07 |
| ventral striatum | Carter et al. (2009) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 8.15 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | loss > no loss | 6.62 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | loss > no loss | 5.73 |
|  | Samanez-Larkin et al.(2007) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 4.91 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | healthy controls | loss > no loss | 4.43 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 4.15 |
|  | Treadway et al. (2013) | 38 | monetary incentive delay task | healthy controls | loss > no loss | 3.96 |
|  | Kim et al. (2020) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 3.92 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 3.6 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 3.58 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 3.45 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | healthy controls | loss > no loss | 3.39 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 3.36 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 3.12 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 3.08 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 3.07 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 2.72 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.59 |
|  | Pabon et al. (2020) | 56 | monetary incentive delay task | healthy controls | loss > no loss | 2.14 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.11 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | healthy controls | loss > no loss | 2.02 |
|  | Knutson et al. (2001a) | 8 | monetary incentive delay task | healthy controls | loss > no loss | 1.89 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 1.88 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | healthy controls | loss > no loss | 1.86 |
|  | Schlagenhauf et al. (2008) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 1.82 |
|  | Schlagenhauf et al. (2009) | 15 | monetary incentive delay task | healthy controls | loss > no loss | 1.66 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | loss > no loss | 1.51 |
|  | Bustamante et al. (2014) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 1.44 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 1.43 |
|  | Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 1.26 |
|  | Telzer et al. (2020) | 136 | social incentive delay task | healthy controls | punishment > neutral | 1.1 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | healthy controls | loss > no loss | 1.09 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 0.82 |
|  | Beck et al. (2009) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 0.72 |
|  | Juckel et al. (2006) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 0.66 |
|  | Juckel et al. (2012) | 13 | monetary incentive delay task | healthy controls | loss > no loss | 0.43 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 0.2 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 0.13 |
| SMA | Maresh et al. (2014) | 84 | monetary incentive delay task | healthy controls | loss > no loss | 14.22 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | healthy controls | loss > no loss | 11.84 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | healthy controls | loss > no loss | 8.57 |
|  | Kollmann et al. (2017) | 41 | monetary incentive delay task | healthy controls | loss > baseline | 7.62 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 7.17 |
|  | Herbort et al. (2016) | 23 | monetary incentive delay task | healthy controls | loss > no loss | 6.69 |
|  | Bustamante et al. (2014) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 5.74 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | healthy controls | loss > no loss | 4.87 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | loss > no loss | 4.4 |
|  | Pabon et al. (2020) | 56 | monetary incentive delay task | healthy controls | loss > no loss | 3.67 |
|  | Schreiter et al. (2016) | 20 | monetary incentive delay task | healthy controls | loss > no loss | 3.6 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | healthy controls | loss > reward | 3.03 |
|  | Stark et al. (2011) | 31 | monetary incentive delay task | healthy controls | loss > no loss | 2.89 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.86 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 2.86 |
|  | Kim et al. (2020) | 18 | monetary incentive delay task | healthy controls | loss > no loss | 2.35 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.19 |
|  | Samanez-Larkin et al.(2007) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 2.06 |
|  | Knutson et al. (2001a) | 8 | monetary incentive delay task | healthy controls | loss > no loss | 1.53 |
|  | Yao et al. (2020) | 27 | monetary incentive delay task | healthy controls | loss > no loss | 1.16 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | healthy controls | loss > no loss | 0.53 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 0.07 |
| middle occipital gyrus | Maresh et al. (2014) | 84 | monetary incentive delay task | healthy controls | loss > no loss | 21.1 |
|  | Telzer et al. (2020) | 136 | social incentive delay task | healthy controls | punishment > neutral | 20.54 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 17.92 |
|  | Pfabigan et al. (2014) | 25 | monetary incentive delay task | healthy controls | loss > no loss | 15.95 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 11.61 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | healthy controls | loss > no loss | 5.84 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | healthy controls | loss > no loss | 3.76 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | healthy controls | loss > no loss | 2.41 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | healthy controls | loss > no loss | 0.72 |
|  | Juckel et al. (2006) | 10 | monetary incentive delay task | healthy controls | loss > no loss | 0.13 |

AI: anterior insula; SMA: supplementary motor area

**Table S12. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of loss anticipation in clinical/at-risk conditions.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Condition** | **Contrast** | **Average contribution (%)** |
| SMA | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 25.42 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 17.17 |
|  | Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | loss > no loss | 15.32 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 13.01 |
|  | van Duin et al. (2016) | 16 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss | 11.84 |
|  | Schreiter et al. (2016) | 20 | monetary incentive delay task | bipolar disorder | loss > no loss | 9.69 |
|  | Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | loss > no loss | 4.41 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 2.7 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 0.21 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 0.15 |
| ventral striatum | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 13.83 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 13.5 |
|  | Stoy et al. (2012) | 15 | monetary incentive delay task | major depressive disorder | loss > no loss | 13.39 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 12.9 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | loss > no loss | 10.98 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 10.88 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | loss > no loss | 10.19 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 9.24 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 5.01 |
| ventral striatum | He et al. (2019) | 21 | social incentive delay task | depression | punishment > neutral | 19.78 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 18.46 |
|  | Bustamante et al. (2014) | 17 | monetary incentive delay task | cocaine dependence | loss > no loss | 14.53 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 12.35 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 12.34 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 11.43 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 9.86 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | loss > no loss | 0.55 |
|  | Stoy et al. (2011) | 11 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss | 0.36 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 0.17 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | loss > no loss | 0.13 |
| precentral gyrus | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 28.02 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 22.66 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 20.44 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 19.35 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 9.25 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 0.28 |
| precentral gyrus | Herbort et al. (2016) | 21 | monetary incentive delay task | borderline personality disorder | loss > no loss | 22.99 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 22.93 |
|  | Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | loss > no loss | 20.83 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 17.19 |
|  | Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | loss > no loss | 13.52 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 1.68 |
|  | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 0.87 |
| AI | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 22.45 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 22.42 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | loss > no loss | 15.2 |
|  | Kaufmann et al. (2013) | 19 | monetary incentive delay task | obsessive–compulsive disorder | loss > no loss | 14.58 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 7.91 |
|  | Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | loss > no loss | 7.46 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 4.66 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | loss > no loss | 3.29 |
|  | Mucci et al. (2015) | 28 | monetary incentive delay task | schizophrenia | loss > no loss | 1.86 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 0.18 |
| thalamus | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | loss > no loss | 25.2 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | loss > no loss | 20.45 |
|  | Cope et al. (2019) | 34 | monetary incentive delay task | high risk for alcohol and other substance use disorders | loss > no loss | 13.47 |
|  | Yau et al. (2012) | 20 | monetary incentive delay task | children of alcoholics | loss > no loss | 13.24 |
|  | Wrase et al. (2007a) | 16 | monetary incentive delay task | alcohol dependence | loss > no loss | 12.82 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | loss > no loss | 10.04 |
|  | Schreiter et al. (2016) | 20 | monetary incentive delay task | bipolar disorder | loss > no loss | 2.38 |
|  | Romanczuk-seiferth et al. (2015) | 18 | monetary incentive delay task | pathological gambling | loss > no loss | 1.86 |
|  | Enzi et al. (2012b) | 15 | monetary incentive delay task | premanifest Huntington's disease | loss > no loss | 0.22 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | loss > no loss | 0.11 |
|  | He et al. (2019) | 21 | social incentive delay task | major depressive disorder | punishment > neutral | 0.11 |

AI, anterior insula; SMA, supplementary motor area.

**Table S13. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of hypoactivation of clinical/at-risk conditions relative to healthy controls during loss anticipation.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Condition** | **Contrast** | **Average contribution (%)** |
| middle occipital gyrus | van Duin et al. (2016) | 28 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss, healthy controls > patients | 28.49 |
|  | Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 23.17 |
|  | Stoy et al. (2011) | 22 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 23.06 |
|  | Stoy et al. (2011) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 20.89 |
|  | Yip et al. (2016) | 45 | monetary incentive delay task | cocaine dependence | loss > no loss, healthy controls > patients | 4.16 |
|  | Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, healthy controls > patients | 0.21 |
| cuneus | van Duin et al. (2016) | 28 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss, healthy controls > patients | 59.33 |
|  | Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, healthy controls > patients | 39.66 |
|  | Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 1.01 |
| middle occipital gyrus | van Duin et al. (2016) | 28 | monetary incentive delay task | 22q11 deletion syndrome | loss > no loss, healthy controls > patients | 28.49 |
|  | Stoy et al. (2011) | 23 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 23.17 |
|  | Stoy et al. (2011) | 22 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 23.06 |
|  | Stoy et al. (2011) | 24 | monetary incentive delay task | attention deficit hyperactivity disorder | loss > no loss, healthy controls > patients | 20.89 |
|  | Yip et al. (2016) | 45 | monetary incentive delay task | cocaine dependence | loss > no loss, healthy controls > patients | 4.16 |
|  | Romanczuk-Seiferth et al. (2015) | 32 | monetary incentive delay task | alcohol dependence | loss > no loss, healthy controls > patients | 0.21 |

**Table S14. Significant clusters from the main meta-analysis of the reward consumption phase.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Laterality** |  | **Brain Regions** |  | **BA (edit)** |  | **MNI Coordinates (mm)** |  | **peak Z score** |  | **Cluster Size (mm³)** |
| ***Healthy controls*** | | | | | | | | | | |
| R |  | ventral striatum |  | / |  | 12 10 -6 |  | 8.2909 |  | 6264 |
| L |  | ventral striatum |  | / |  | -12 10 -6 |  | 7.34 |  | 5464 |
| L |  | vmPFC |  | 32/10/11/24 |  | -2 44 -4 |  | 7.7712 |  | 5232 |
| L/R |  | posterior cingulate cortex |  | 23/30 |  | 6 -56 22 |  | 4.1786 |  | 1024 |
| ***Neuropsychiatric conditions*** | | | | | | | | | | |
| L/R |  | vmPFC |  | 32/10 |  | 0 46 2 |  | 6.5434 |  | 2376 |
| L/R |  | ventral striatum |  | / |  | 10 12 0 |  | 4.4649 |  | 2008 |
| ***Hyperactivity*** | | | | | | | | | | |
| L |  | inferior parietal lobule |  | 40 |  | -48 -48 56 |  | 4.8948 |  | 640 |

*P*(FWE) < 0.05 at the cluster level with a cluster-forming threshold of *P* < 0.001 using 10,000 permutations.

**Table S15. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of reward consumption in healthy controls.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Contrast** | **Average contribution (%)** |
| ventral striatum | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 7.98 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 5.56 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 5.43 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 4.92 |
|  | Zhornitsky et al. (2019) | 45 | monetary incentive delay task | reward > no reward | 4.8 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | reward > no reward | 4.58 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 4.51 |
|  | Knutson et al. (2004) | 8 | monetary incentive delay task | reward > no reward | 4.33 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 3.66 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 3.47 |
|  | Suzuki et al. (2019) | 14 | monetary incentive delay task | reward > no reward | 3.46 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 3.31 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | reward > no reward | 3.28 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | reward > no reward | 3 |
|  | Wu et al. (2014) | 52 | monetary incentive delay task | reward > no reward | 2.98 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 2.97 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | reward > no reward | 2.95 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 2.91 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 2.85 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | reward > no reward | 2.76 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | reward > no reward | 2.67 |
|  | Morelli et al. (2021) | 46 | monetary incentive delay task | reward > no reward | 2.64 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 2.62 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 2.61 |
|  | Knutson et al. (2001b) | 9 | monetary incentive delay task | reward > no reward | 2.57 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 2.03 |
|  | Simon et al. (2010) | 24 | monetary incentive delay task | reward > no reward | 1.78 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | reward > no reward | 1.66 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 1.49 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 0.15 |
|  | He et al. (2019) | 20 | monetary incentive delay task | reward > no reward | 0.05 |
| ventral striatum | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 8.65 |
|  | Zhornitsky et al. (2019) | 45 | monetary incentive delay task | reward > no reward | 8.2 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 7.2 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 6.34 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | reward > no reward | 5.97 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | reward > no reward | 5.53 |
|  | Knutson et al. (2004) | 8 | monetary incentive delay task | reward > no reward | 5.34 |
|  | Suzuki et al. (2019) | 14 | monetary incentive delay task | reward > no reward | 4.59 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 4.3 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 4.26 |
|  | Aarts et al. (2010) | 20 | monetary incentive delay task | reward > loss | 4.21 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | reward > no reward | 4.14 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | reward > no reward | 4.08 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 4.05 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | reward > no reward | 3.75 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 3.55 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | reward > no reward | 3.53 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | reward > no reward | 3.14 |
|  | Dillon et al. (2010) | 32 | monetary incentive delay task | reward > no reward | 2.36 |
|  | Ubl et al. (2015) | 28 | monetary incentive delay task | reward > no reward | 2.18 |
|  | Abler et al. (2007) | 8 | monetary incentive delay task | reward > no reward | 1.51 |
|  | Bjork et al. (2012) | 23 | monetary incentive delay task | reward > no reward | 1.47 |
|  | Mucci et al. (2015) | 22 | monetary incentive delay task | reward > no reward | 1.19 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 0.3 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 0.17 |
| vmPFC | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 6.57 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 6.06 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | reward > no reward | 5 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | reward > no reward | 4.65 |
|  | Simon et al. (2010) | 24 | monetary incentive delay task | reward > no reward | 4.51 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 4.47 |
|  | Suzuki et al. (2019) | 14 | monetary incentive delay task | reward > no reward | 4.4 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | reward > no reward | 4.28 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 4.26 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 4.12 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | reward > no reward | 4.07 |
|  | Filbey et al. (2013) | 27 | monetary incentive delay task | reward > no reward | 4.07 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | reward > no reward | 3.9 |
|  | Danamino et al. (2014) | 31 | monetary incentive delay task | reward > no reward | 3.83 |
|  | Knutson et al. (2008) | 12 | monetary incentive delay task | reward > no reward | 3.74 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 3.7 |
|  | Treadway et al. (2013) | 38 | monetary incentive delay task | reward > no reward | 3.67 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 3.58 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 3.43 |
|  | Kocsel et al. (2017) | 37 | monetary incentive delay task | reward > no reward | 3.01 |
|  | Welborn et al. (2020) | 36 | monetary incentive delay task | reward > no reward | 2.67 |
|  | Knutson et al. (2001b) | 9 | monetary incentive delay task | reward > no reward | 2.53 |
|  | Wrase et al. (2007b) | 14 | monetary incentive delay task | reward > no reward | 2.49 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 2.48 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 2.19 |
|  | Balodis et al. (2012) | 14 | monetary incentive delay task | reward > no reward | 1.04 |
|  | Tsurumi et al. (2014) | 27 | monetary incentive delay task | reward > no reward | 0.99 |
|  | Carl et al. (2016) | 20 | monetary incentive delay task | reward > no reward | 0.2 |
| posterior cingulate cortex | Bjork et al. (2008b) | 13 | monetary incentive delay task | reward > no reward | 15.44 |
|  | Figee et al. (2011) | 19 | monetary incentive delay task | reward > no reward | 14.74 |
|  | Knutson et al. (2003) | 12 | monetary incentive delay task | reward > no reward | 14.67 |
|  | Rademacher et al. (2010) | 28 | monetary incentive delay task | reward > no reward | 12.74 |
|  | Bjork et al. (2004) | 12 | monetary incentive delay task | reward > no reward | 12.13 |
|  | Schneider et al. (2018) | 46 | monetary incentive delay task | reward > no reward | 9.03 |
|  | Yan et al. (2016) | 22 | monetary incentive delay task | reward > no reward | 8.04 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 7.74 |
|  | Kirk et al. (2015) | 44 | monetary incentive delay task | reward > no reward | 2.62 |
|  | Wu et al. (2014) | 52 | monetary incentive delay task | reward > no reward | 1.53 |
|  | Bjork et al. (2010a) | 24 | monetary incentive delay task | reward > no reward | 0.78 |
|  | Kirk et al. (2015) | 34 | monetary incentive delay task | reward > no reward | 0.37 |
|  | Romanczuk-seiferth et al. (2015) | 17 | monetary incentive delay task | reward > no reward | 0.15 |

vmPFC, ventromedial prefrontal cortex

**Table S16. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of reward consumption in clinical/at-risk conditions.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Conditions** | **Contrast** | **Average contribution (%)** |
| vmPFC | Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 17.57 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 12.67 |
|  | Filbey et al. (2013) | 59 | monetary incentive delay task | heavy marijuana users | reward > no reward | 12 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 11.04 |
|  | Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 10.92 |
|  | Johnson et al. (2019) | 24 | monetary incentive delay task | bipolar disorder | reward > no reward | 9.68 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | reward > no reward | 9.51 |
|  | Yan et al. (2016) | 33 | monetary incentive delay task | schizophrenia | reward > no reward | 8.22 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 8.05 |
|  | Carl et al. (2016) | 33 | monetary incentive delay task | major depressive disorder | reward > no reward | 0.31 |
| ventral striatum | Romanczuk-seiferth et al. (2015) | 15 | monetary incentive delay task | alcohol dependence | reward > no reward | 16.99 |
|  | Bjork et al. (2008a) | 23 | monetary incentive delay task | substance dependence | reward > no reward | 15.56 |
|  | Bjork et al. (2012) | 29 | monetary incentive delay task | alcohol dependence | reward > no reward | 14.28 |
|  | Bjork et al. (2010b) | 12 | monetary incentive delay task | externalizing disorders | reward > no reward | 12.78 |
|  | Bjork et al. (2008b) | 13 | monetary incentive delay task | children of alcoholics | reward > no reward | 11.1 |
|  | Zhornitsky et al. (2019) | 50 | monetary incentive delay task | cocaine-dependence | reward > no reward | 10.26 |
|  | Figee et al. (2011) | 18 | monetary incentive delay task | obsessive-compulsive disorder | reward > no reward | 9 |
|  | Ubl et al. (2015) | 30 | monetary incentive delay task | major depressive disorder | reward > no reward | 6 |
|  | Knutson et al. (2008) | 14 | monetary incentive delay task | major depressive disorder | reward > no reward | 4.01 |
|  |  |  |  |  |  |  |

vmPFC, ventromedial prefrontal cortex

**Table S17. Average contribution of each experimental contrast for significant clusters identified for the meta-analysis of hyper-activation of clinical/at-risk conditions relative to healthy controls during reward consumption.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cluster Name** | **Study** | **N** | **Task** | **Condition** | **Contrast** | **Average contribution (%)** |
| inferior parietal lobule | Maresh et al. (2014) | 84 | monetary incentive delay task | social anxiety | high reward > low reward, high social anxiety > low social anxiety | 44.01 |
|  | Dichter et al. (2012c) | 38 | monetary incentive delay task | autism spectrum disorder | reward > no reward, patients > healthy controls | 30.79 |
|  | Balodis et al. (2014) | 19 | monetary incentive delay task | binge eating disorder | reward > no reward, binge eating > no binge eating | 24.86 |
|  | Dichter et al. (2012a) | 31 | monetary incentive delay task | autism spectrum disorder | reward > no reward, patients > healthy controls | 0.35 |

**Table S18. Studies included in the lesion network analysis.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| **StudyID** | **PatientsID** | **Reference** | **Lesion Etiology** | **Age** | **Gender** | **MRI/CT** | **Symptoms** | **Sources** |
| 1 | 1 | Adam et al. (2013) | ischaemic strokes | 41 | m | CT | apathy | Figure1 |
| 2 | 2 | Alexander et al. (2001) | stroke | 36 | f | MRI | akinetic mutism | Figure 1 |
| 3 | 3 | Anello et al. (2019) | unclear | 62 | m | CT | abulia, apathy | Figure 1 |
| 4 | 4 | Baillieux et al. (2006) | tumour resection | 19 | m | MRI | emotional indifference and apathy with markedly reduced verbal output | Figure1 |
| 5 | 5 | Benke et al. (2003) | haemorrhage | 58 | f | MRI | abulia | Figure 1 |
| 5 | 6 | Benke et al. (2003) | haemorrhage | 56 | m | MRI | abulia | Figure 2 |
| 6 | 7 | Caldas et al. (2014) | arterial hypertension | 54 | m | MRI | progressively worsening headaches, apathy, somnolence and left hemiparesis | Figure1 |
| 7 | 8 | Cambruzzi et al. (2014) | gliosarcoma | 56 | m | MRI | apathy and catatonia | Figure1 A B |
| 8 | 9 | Cognat et al. (2010) | stroke | 51 | m | MRI | sudden apathy and pathological gambling-like behaviour | Figure1 |
| 9 | 10 | de Andres et al. (1997) | unclear | 53 | f | MRI/CT | progressive abulia and mutism, delusion, apathy, decreased spontaneity and loss of initiative predominated | Figure 1/2 |
| 9 | 11 | de Andres et al. (1997) | unclear | 43 | f | MRI/CT | acute delirium and a behavioural disorder, apathy | Figure 3/4 |
| 10 | 12 | Faruqi et al. (2019) | stroke | 65 | m | CT | apathy | Figure 1 |
| 11 | 13 | Fields et al.(2010) | developed progressive severe parkinsonism in the second week after aneurysmal subarachnoid haemorrhage | 42 | f | MRI/CT | moderate abulia to severe akinetic mutism, with near complete absence of spontaneous motor or speech activity and only minimal withdrawal to pain | Figure 1 |
| 12 | 14 | Filley et al. (1995) | frontal lobe tumor | 56 | f | CT | progressive apathy, social withdrawal, and poor self-care for three years and was admitted to a psychiatric facility for depression. | Figure1 |
| 12 | 15 | Filley et al. (1995) | frontal lobe tumor | 63 | m | CT | apathetic and irritable and two weeks before admission right hemiparesis and anomia had developed | Figure 2 |
| 12 | 16 | Filley et al. (1995) | temporolimbic tumor | 45 | S | MRI | dysfunction of her recent memory for 12 months before admission. The family noted apathy and poor motivation, and she was seen by a psychiatrist who diagnosed depression. | Figure8 |
| 13 | 17 | Fukuoka et al. (2011) | stroke | 81 | m | MRI/CT | abulic with no spontaneous speech or activity. | Figure 1 |
| 14 | 18 | Goncalves et al. (2008) | unclear | 43 | m | MRI | subacute onset of apathy and memory deficit | Figure 1A |
| 15 | 19 | Haller et al. (2021) | white matter hyperintensities | 35 | f | MRI | apathy | Figure1.B |
| 16 | 20 | Herklots et al. (2015) | haemorrhage | 28 | f | MRI/CT | an abulic state, with apathy, lack of spontaneous movements, spontaneous speech and social interaction | Figure 1 |
| 16 | 21 | Herklots et al. (2015) | haemorrhage | 47 | f | MRI/CT | akinetic mutism | Figure 2 |
| 16 | 22 | Herklots et al. (2015) | haemorrhage | 59 | m | MRI/CT | akinetic mutism | Figure 3 |
| 17 | 23 | Hochman et al. (1985) | stroke | 69 | m | MRI | akinetic mutism | Figure 1 |
| 18 | 24 | Ishii et al. (2019) | Progressive multifocal leukoencephalopathy | 60 | f | MRI | apathy | Figure 1 |
| 19 | 25 | Jeong et al. (2002) | acute mountain sickness | 49 | m | MRI | changes in personality characterized by abulia, indifference, and indecisiveness. | Figure 1 |
| 20 | 26 | Jones et al. (2011) | experienced acute onset of personality change, hypersomnolence, and cognitive decline marked by poor concentration. | 40 | m | MRI | acute-onset amnesia, abulia, poor concentration, hypersomnolence, and reclusiveness | Figure 1 |
| 21 | 27 | Kaita et al. (2021) | neurological wilson disease | Nah | Nah | MRI | apathy | Figure 2 |
| 22 | 28 | Kaphan et al. (2014) | toxic ischemia from carbon monoxide | 25 | m | MRI | apathy | Figure1 |
| 23 | 29 | Koutsuraki et al. (2009) | stroke | 38 | m | MRI | hypophonia, memory dysfunction, time disorientation and apathy | Figure1 |
| 24 | 30 | Krause et al. (2012) | onset 2 weeks post bypass surgery, with possible cerebral hypoxia progressive over 2 years | 38 | m | MRI | nout/palmomental reflex grasping and groping abulia environmental dependency utilization behaviour clonic perseveration imitation behaviour impulse control disturbance upper motor neuron facial weakness dystonic posturing of left hand | Table 1.1 |
| 24 | 31 | Krause et al. (2012) | after global hypoxia after near drowning progressive over 6 months | 37 | f | MRI | Palmomental reflex grasping and groping abulia apathy left upper motor neuron facial weakness Dystonic posturing of the left hand Loss of left arm swing (gait) Continuous, involuntary movements of left arm | Table 1.2 |
| 24 | 32 | Krause et al. (2012) | after aneurysm clipping | 48 | f | MRI | abulia grasping and groping clonic perseveration (right side stereotyped movements) environmental dependency left sided ataxia bilateral third nerve palsy severe memory loss | Table 1.3 |
| 24 | 33 | Krause et al. (2012) | acute onset with improvement over 18 months | 41 | f | MRI | abulia apathy Grasping Pout reflex Clonic verbal perseveration Intentional perseveration Visual grasping (forced visual following) Utilization behaviour Environmental dependency | Table 1.4 |
| 24 | 34 | Krause et al. (2012) | haemorrhage | 50 | m | MRI | abulia environmental dependency intentional perseveration (verbal) impulse control disturbance short-term memory loss mild right hemiparesis fluent aphasia daytime somnolence | Table 1.5 |
| 24 | 35 | Krause et al. (2012) | posterior circulation | 62 | m | MRI | clonic perseveration perseveration of all tasks (drawing, verbal etc.,) imitation behaviour abulia environmental dependency utilization behaviour palmomental reflex left hemiparesis left ataxia occulomotor deficit | Table 1.6 |
| 24 | 36 | Krause et al. (2012) | unclear | 15 | f | MRI | severe abulia apathy severe grasping and groping visual grasping (forced visual following) utilization behaviour optical ataxia pseudoathetosis ataxia | Table 1.7 |
| 24 | 37 | Krause et al. (2012) | posterior circulation stroke | 56 | m | MRI | abulia apathy tonic perseveration severe grasping and groping environmental dependency short-term memory loss daytime somnolence dysarthria left hemiparesis ataxia gaze palsy | Table 1.8 |
| 24 | 38 | Krause et al. (2012) | unknown aetiology | 71 | f | MRI | abulia grasping and groping visual grasping (forced visual following) imitation behaviour clonic perseveration environmental dependency utilization behaviour ideomotor apraxia parkinsonism | Table 1.9 |
| 24 | 39 | Krause et al. (2012) | stroke | 57 | f | MRI | clonic perseveration abulia environmental dependency parkinsonian gait progressive memory loss | Table 1.10 |
| 24 | 40 | Krause et al. (2012) | cerebral lymphoma | 71 | m | MRI | abulia grasping and groping utilization behaviour parkinsonism | Table 1.11 |
| 24 | 41 | Krause et al. (2012) | stroke | 62 | m | MRI | abulia apathy clonic perseveration grasping environmental dependency aphasia | Table 1.13 |
| 24 | 42 | Krause et al. (2012) | haemorrhage | 63 | f | MRI | abulia clonic perseveration | Table 1.14 |
| 24 | 43 | Krause et al. (2012) | cystic ependymoma | 36 | m | MRI | loss of impulse control abulia apathy grasp reflex (inconsistent) palmomental reflex parkinsonism vertical gaze palsy | Table 1.15 |
| 24 | 44 | Krause et al. (2012) | stroke | 56 | f | MRI | abulia apathy severe bilateral grasping ipsilateral (left) ataxia palatal tremor with synchronous movements of left face and diaphragm | Table 1.16 |
| 24 | 45 | Krause et al. (2012) | haemorrhage | 56 | m | MRI | abulia apathy grasping and groping tonic perseveration intentional perseveration | Table 1.17 |
| 24 | 46 | Krolak et al. (2000) | stroke | 53 | m | MRI | acute vigilance disorders and vertical gaze palsy, followed by persisting dementia with severe mnemic disturbance, global aspontaneity and apathy | Figure1 |
| 25 | 47 | Kumral et al. (1999) | stroke and haemorrhage | Nah | Nah | MRI | psychic akinesia had right-sided damage of the internal capsule with MCN or LCN territory infarct | Figure 3 |
| 25 | 48 | Kumral et al. (1999) | acute caudate vascular lesions | Nah | Nah | MRI | abulia, verbal amnesia, impaired conflictual tasks | Figure 3 |
| 26 | 49 | Kumral et al. (2002) | stroke | Nah | Nah | MRI | akinetic mutism, with grasping, urinary in two and , and bilateral hypertonia. | Figure 5a |
| 27 | 50 | kumral et al. (2019) | an acute isolated cingulate infarct | 65 | m | MRI | mutism | Figure 2 |
| 27 | 51 | kumral et al. (2019) | an acute isolated cingulate infarct | 71 | m | MRI | abulia | Figure 2 |
| 27 | 52 | kumral et al. (2019) | an acute isolated cingulate infarct | 68 | m | MRI | mutism | Figure 2 |
| 27 | 53 | kumral et al. (2019) | an acute isolated cingulate infarct | 69 | f | MRI | abulia | Figure 2 |
| 28 | 54 | Kurukumbi et al. (2014) | stroke | 48 | f | MRI | akinetic mutism | Figure 1/2/3/4 |
| 29 | 55 | Lanna et al. (2012) | stroke | 53 | m | MRI | apathy, depression, irritability with emotivism, infantilism and personality change, besides poor speech and forgetfulnes | Table 2 case 4 |
| 29 | 56 | Lanna et al. (2012) | stroke | 74 | f | MRI | progression with apathy, depression, insomnia, forgetfulness, poor speech, slowness and unable to dialogue and do activities of daily living | Table 2 case 6 |
| 30 | 57 | Lim Y C et al. (2007) | stroke | 72 | m | MRI | akinetic mutism, with depression as a possible confounding factor. | Figure1 |
| 31 | 58 | Loe et al. (2021) | an olfactory groove meningioma | 42 | m | CT | apathy | Figure 1/2/4 |
| 32 | 59 | Madureira et al. (1999) | stroke | 64 | m | MRI | apathy,abulia | Figure 1 |
| 32 | 60 | Madureira et al. (1999) | stroke | 70 | m | MRI | apathy,abulia | Figure 2 |
| 32 | 61 | Madureira et al. (1999) | stroke | 64 | f | MRI | apathy,abulia | Figure 4 |
| 33 | 62 | Marien et al. (2013) | stroke | 71 | m | MRI | apathy | Figure 1 |
| 34 | 63 | Martinaud et al. (2019) | bilateral pallidal lesions | 49 | m | MRI | apathy | Figure 1 |
| 35 | 64 | Mateen et al. (2008) | a sudden onset of psychotic symptoms | 35 | m | MRI/PET | inattentive, reclusive, sedentary, hypersomnolent, and apathetic | Figure 1 |
| 36 | 65 | Meleková et al. (2015) | confusion, meningeal syndrome | 32 | m | MRI | suffered from weakness, headache, and fever. Subsequently, he developed apathy, ataxia, and inability to walk | Figure 3 Figure 4 |
| 37 | 66 | Milano et al. (2015) | primary progressive aphasia | 75 | m | MRI/CT | primary progressive speech abulia | Figure 1 |
| 37 | 67 | Milano et al. (2015) | primary progressive aphasia | 60 | f | MRI/CT | primary progressive speech abulia | Figure 2 |
| 38 | 68 | Mitsutake et al. (2019) | neuronal intranuclear inclusion disease | 80 | f | MRI | apathy | Figure 1 |
| 39 | 69 | Nagaratnam et al. (2004) | stroke | 77 | f | MRI/CT | akinetic mutism | Figure 1 |
| 39 | 70 | Nagaratnam et al. (2004) | stroke | 75 | m | MRI/CT | akinetic mutism | Figure 2 |
| 39 | 71 | Nagaratnam et al. (2004) | stroke | 38 | m | MRI/CT | akinetic mutism | Figure 3 |
| 39 | 72 | Nagaratnam et al. (2004) | stroke | 72 | m | MRI/CT | akinetic mutism | Figure 4 |
| 39 | 73 | Nagaratnam et al. (2004) | stroke | 79 | m | MRI/CT | akinetic mutism | Figure 5 |
| 39 | 74 | Nagaratnam et al. (2004) | stroke | 73 | m | MRI/CT | akinetic mutism | Figure 6 |
| 40 | 75 | Naito et al. (2010) | stroke (septic emboli) | 64 | m | MRI/CT | abulia, memory loss | NO.1 |
| 40 | 76 | Naito et al. (2010) | stroke (septic emboli) | 65 | m | MRI/CT | abulia, lethargy | NO.2 |
| 40 | 77 | Naito et al. (2010) | stroke (septic emboli) | 65 | m | MRI/CT | left capsular genu infarction, hydrocephalus | NO.12 |
| 41 | 78 | Naito et al. (2012) | highly active anti-retroviral therapy-resistant human immunodeficiency virus (HIV)-associated progressive multifocal leukoencephalopathy (PML). | 55 | m | MRI | left flaccid hemiplegia and experienced akinetic mutism | Figure 1/2 |
| 42 | 79 | Nicolai et al. (2001) | stroke | 70 | m | MRI | akinetic mutism | Figure 2 |
| 43 | 80 | Nicta et al. (2017) | operative | 17 | m | CT | mutism | Figure 1 |
| 44 | 81 | Njomboro et al. (2012) | anterior cingulate cortex (ACC) lesions | 52 | m | MRI | apathy | Figure 1 |
| 44 | 82 | Njomboro et al. (2012) | anterior cingulate cortex (ACC) lesions | 50 | m | MRI | apathy | Figure 1 |
| 45 | 83 | Okamoto et al. (2004) | stroke | 79 | m | MRI | spastic paraparesis which acutely evolved to tetraparesis with abulia | Figure 1 |
| 46 | 84 | Pluchon et al. (2011) | stroke | 6.5 | f | MRI | mutism | Figure 1 |
| 47 | 85 | Porto et al. (2014) | unclear | 64 | m | MRI | refractory apathy | Figure1 |
| 48 | 86 | Riveros et al. (2019) | lesion of the basal ganglia. | 26 | m | MRI | apathy | Figure 1 |
| 49 | 87 | Satoh et al. (2011) | an infarction in the right parietal lobe | 71 | m | MRI | impairment of emotional experience only in listening to music, that is musical anhednia | Figure 1 |
| 50 | 88 | Satoh et al. (2016) | right putaminal hemorrhage | 63 | m | MRI | musical anhedonia | Figure 1 |
| 51 | 89 | Shetty et al. (2016) | stroke | 77 | f | CT/MRI | akinetic mutism | Figure 1 |
| 52 | 90 | Siegel et al. (2014) | stroke | 38 | m | MRI | abulia, apathy | Figure 2 |
| 53 | 91 | Spagnolo et al. (2011) | acute carbon monoxide poisoning | 62 | m | MRI | akinetic mutism | Figure 1 |
| 54 | 92 | Spinoza.(2016) | tumor | 16 | m | MRI | mutism | Figure 5 |
| 55 | 93 | Suga et al. (2015) | basal ganglia lesion | 5 | m | MRI | mutism | Figure 2/3 |
| 56 | 94 | Tahta et al. (2007) | anterior falx meningioma | 65 | m | MRI | postoperative mutism | Figure 1/ 2 |
| 57 | 95 | Terroni et al. (2015) | stroke | 22 | m | MRI | anhedonic | Figure 2 .C |
| 58 | 96 | Turola et al. (2009) | manifested an initial isolated epileptic seizure and subsequent atypical psychiatric symptoms | 43 | f | MRI/CT | apathy, apraxia, psychomotor slowdown and expressive aphasia | Figure 1/3/4 |
| 59 | 97 | Vachalova et al. (2014) | stroke | 71 | f | MRI | akinetic mutism with myoclonus the diagnosis of the Heidenhain variant of Creutzfeldt–Jakob disease | Figure 1b /1d |
| 60 | 98 | van Der Werf et al. (1999) | lacunar thalamic infarction | 44 | m | MRI | apathy and loss of initiative, in combination with cognitive deficits | 3 |
| 61 | 99 | van Domburg et al. (1996) | temporary amnesic syndrome | 42 | m | MRI/CT | akinetic mutism | Figure 2/4 |
| 62 | 100 | van Son et al. (2014) | stroke | 55 | f | MRI | an encephalopathic state with marked bradyphrenia and apathymarked abulia, right hemiparesis, right hemianopsia, and pseudobulbar palsy | Figure 1 (8) |
| 63 | 101 | White et al. (2019) | a frontal interhemispheric tumor | 9 | m | MRI | abulia | Figure 1 |
| 64 | 102 | Xu et al. (2021) | cortical cerebral microinfarcts | Nah | Nah | MRI | apathy | Figure 1 |
| 65 | 103 | Yang et al. (2007) | stroke | 86 | f | MRI | akinetic mutism | Figure 1 A |
| 66 | 104 | Yang et al. (2015) | bilateral substantia nigra lesions | 7 | m | MRI | akinetic mutism | Figure 1 |
| 67 | 105 | Young et al. (2021) | intracerebral hemorrhage | 48 | f | CT | abulia | Figure1 |
|  |  |  |  |  |  |  |  |  |

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