**Article**

# A shared neural basis underlying psychiatric comorbidity

In the format provided by the
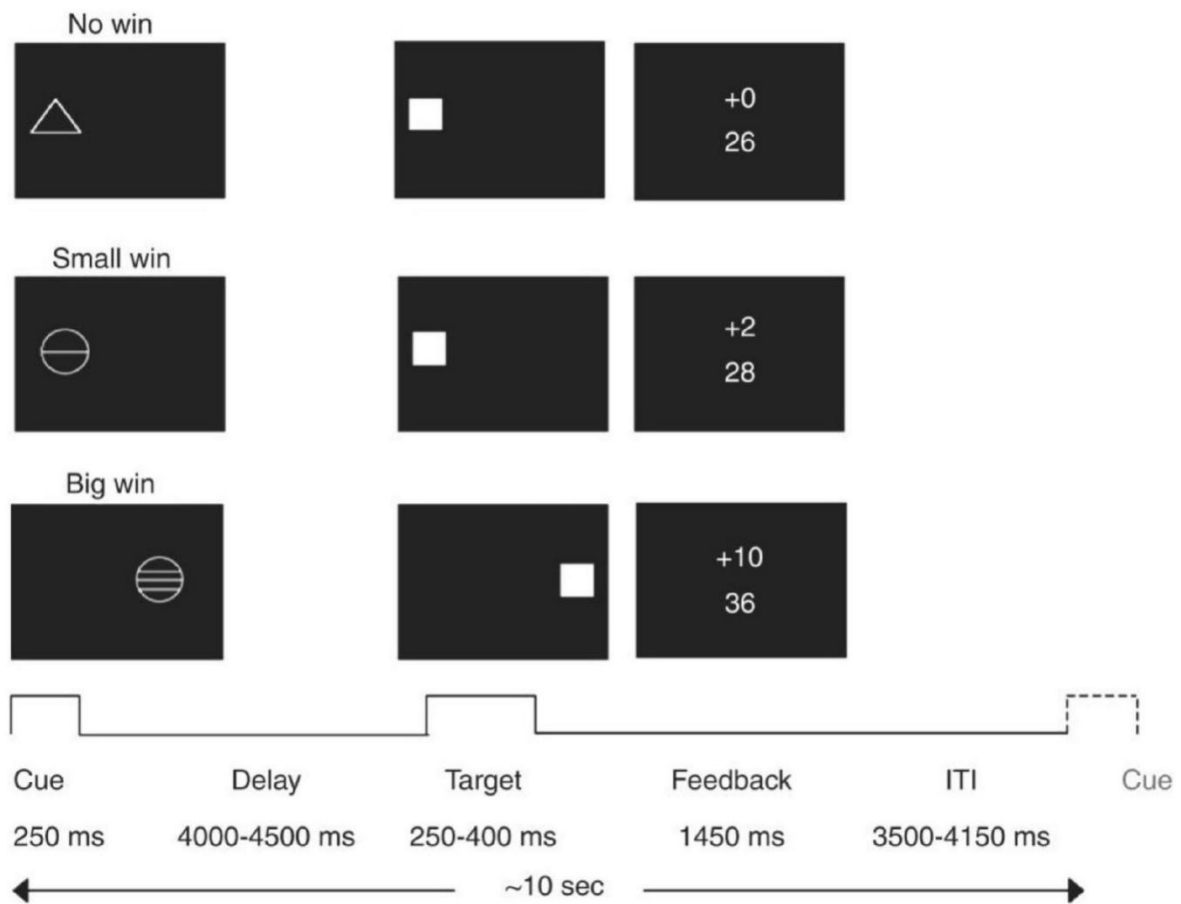authors and unedited

**Figure S1. The task design of the Monetary Incentive Delay (MID) Task.**

The figure of experimental paradigm was adapted from a previous publication (Jia, T., et al. Neurobehavioural characterisation and stratification of reinforcement-related behaviour. Nat Hum Behav 4, 544-558 (2020).).
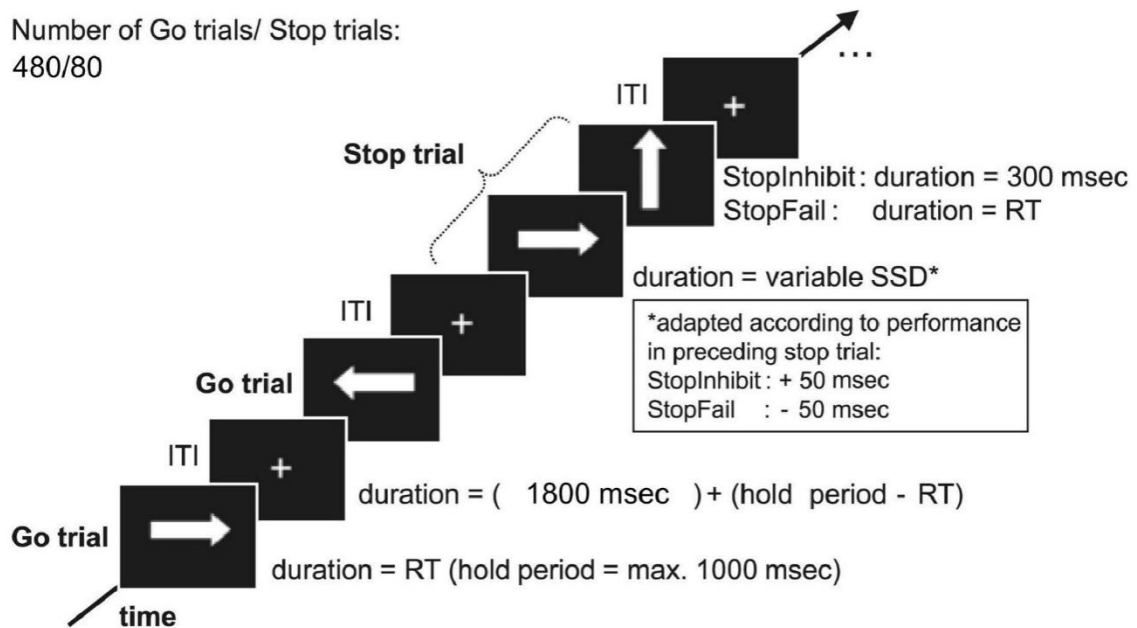
**Figure S2. The task design of the stop signal Task (SST).**

The figure of experimental paradigm was adapted from a previous publication (Jia, T., et al. Neurobehavioural characterisation and stratification of reinforcement-related behaviour. Nat Hum Behav 4, 544-558 (2020).)..
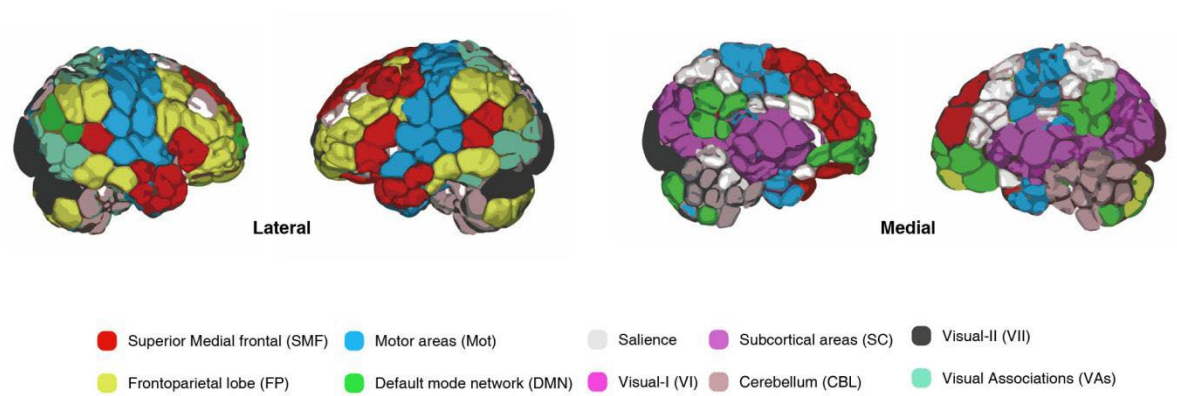
**Figure S3. Ten large-scale canonical networks for anatomical interpretation.**

The figure of shen-268 template was adapted from a previous publication (Greene, A.S., Gao, S., Scheinost, D. & Constable, R.T. Task-induced brain state manipulation improves prediction of individual traits. Nature communications 9, 2807 (2018)).
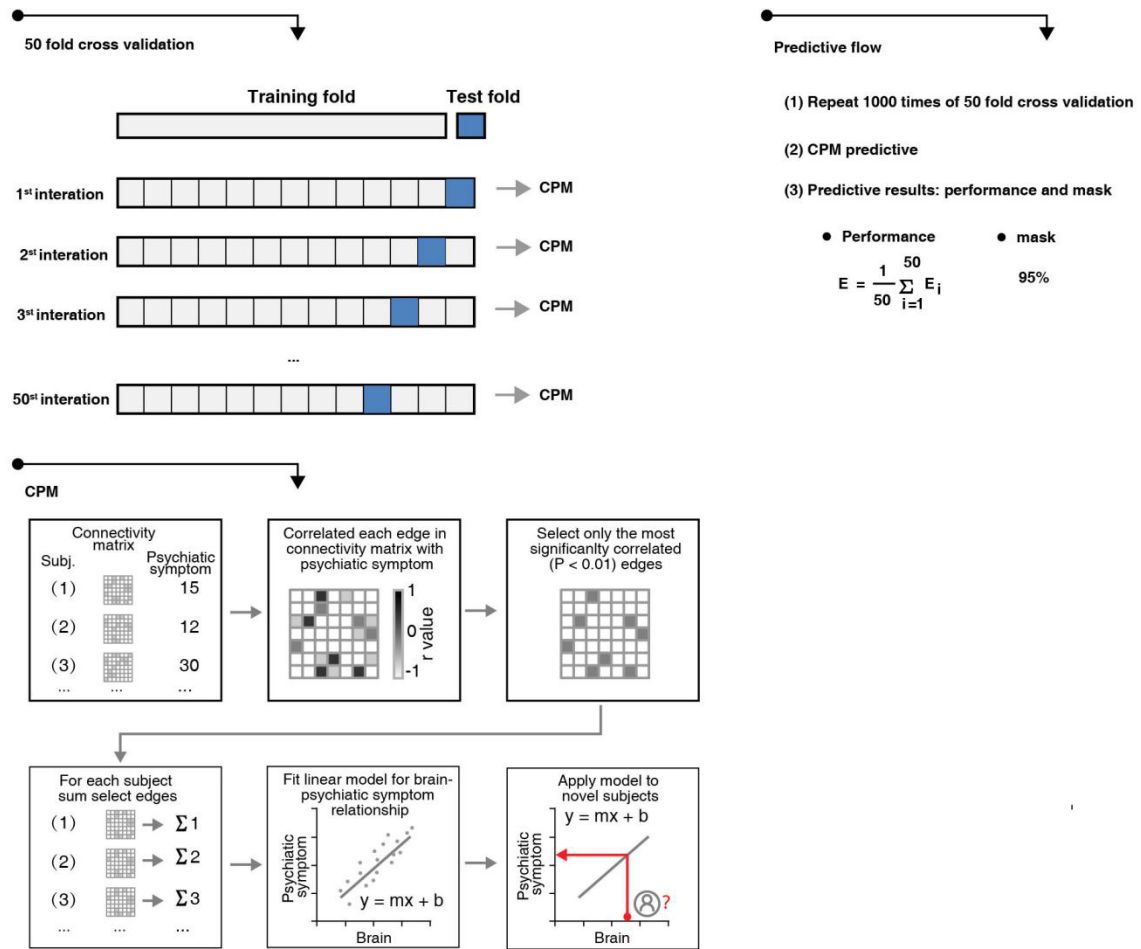
**Connective predictive model (CPM)**

50 fold cross validation

Training fold | Test fold

1st interation → CPM

2st interation → CPM

3st interation → CPM

...

50st interation → CPM

**Predictive flow**

(1) Repeat 1000 times of 50 fold cross validation

(2) CPM predictive

(3) Predictive results: performance and mask

- Performance
- mask

$$E = \frac{1}{50} \sum_{i=1}^{50} E_i$$

95%

**CPM**

Connectivity matrix

Subj. | Psychiatic symptom
(1) | 15
(2) | 12
(3) | 30
... | ...

Correlated each edge in connectivity matrix with psychiatic symptom

1
0
-1
r value

Select only the most significanlty correlated (P < 0.01) edges

For each subject sum select edges

(1) → Σ1
(2) → Σ2
(3) → Σ3
... | ...

Fit linear model for brain-psychiatic symptom relationship

Psychiatic symptom

$y = mx + b$

Brain

Apply model to novel subjects

$y = mx + b$

Psychiatic symptom

Brain

?

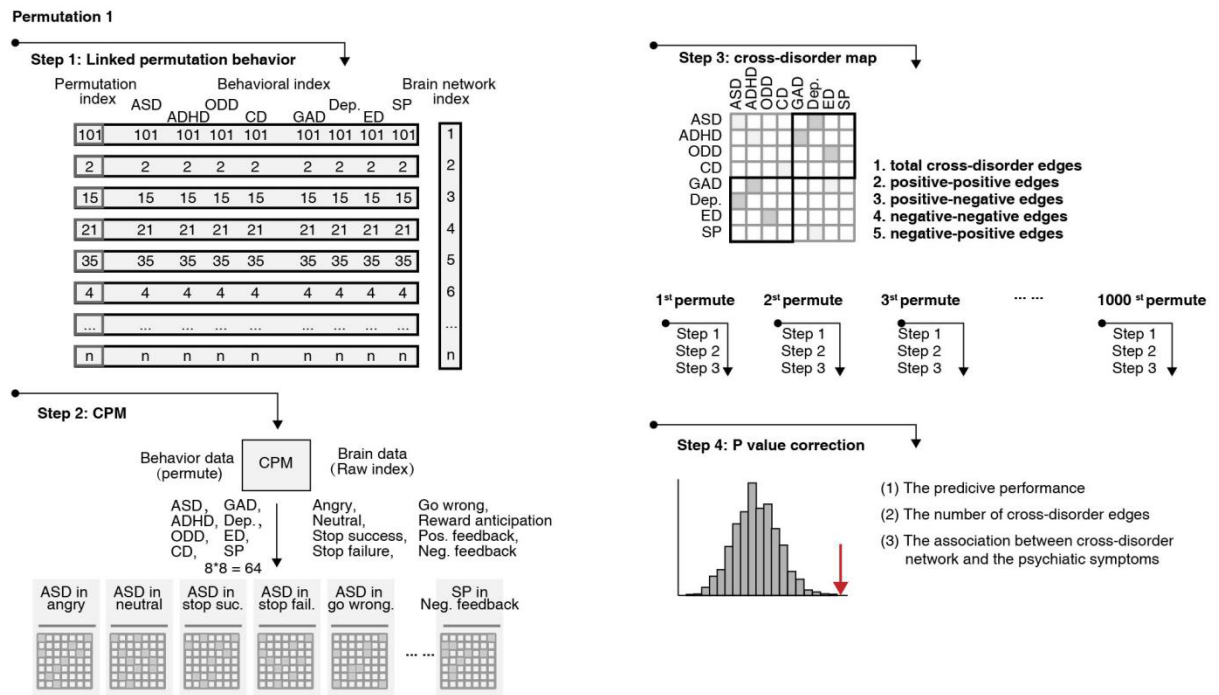**Figure S4. The analysis flow of the connectome-based predictive model (CPM).**

**Figure S5. The analysis flow of the permutation analysis.**

ADHD, attention deficit/hyperactivity disorder; ASD, autism spectrum disorder; CD, conduct disorder; ODD, oppositional defiant disorder; Pos. Feedback, positive feedback; Neg. Feedback, negative feedback.
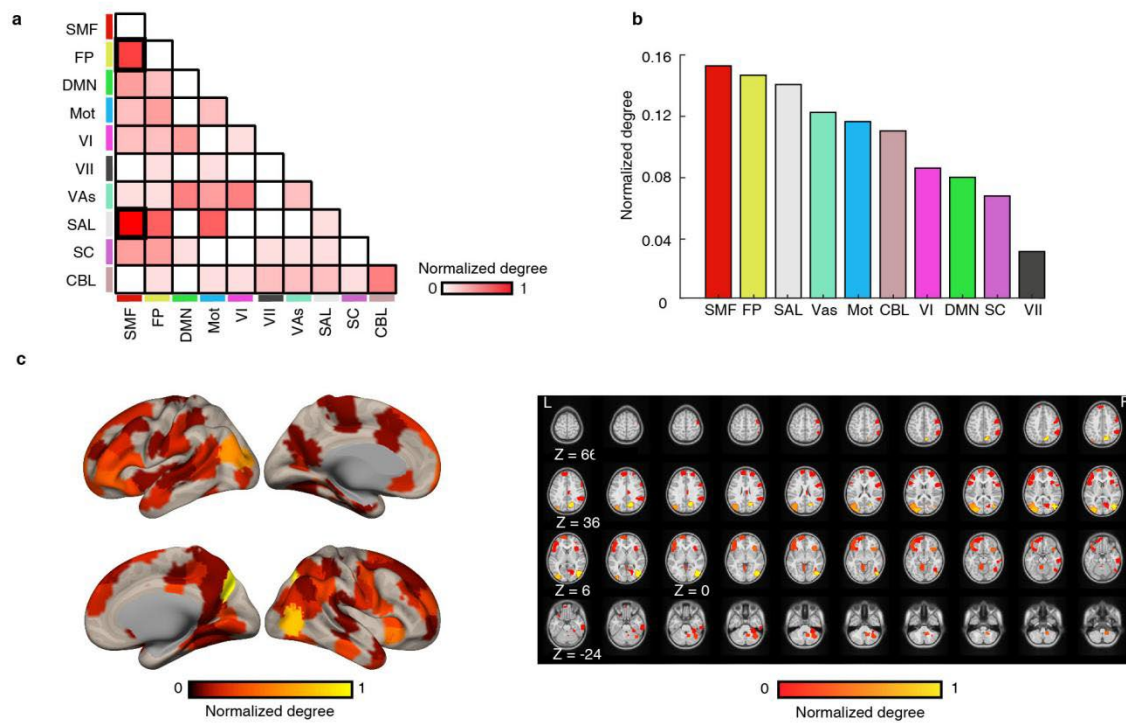
**Figure S6. The network-level and regional normalised degrees of the *NP* factor.** a. The normalised network degrees of the *NP* factor between and within the ten large-scale networks. **b.** The summed normalised network degrees of the *NP* factor for the ten large-scale networks. **c.** The normalised regional degrees of the *NP* factor.