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Corresponding Author: Daphna Shohamy

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Supplementary Videos: 0

Reporting Checklist for Nature Neuroscience

This checklist is used to ensure good reporting standards and to improve the reproducibility of published results. For more information, please read Reporting Life Sciences Research.

Please note that in the event of publication, it is mandatory that authors include all relevant methodological and statistical information in the manuscript.

Statistics reporting, by figure

- Please specify the following information for each panel reporting quantitative data, and where each item is reported (section, e.g. Results, & paragraph number).
- Each figure legend should ideally contain an exact sample size (n) for each experimental group/condition, where n is an exact number and not a range, a clear definition of how n is defined (for example x cells from x slices from x animals from x litters, collected over x days), a description of the statistical test used, the results of the tests, any descriptive statistics and clearly defined error bars if applicable.
- For any experiments using custom statistics, please indicate the test used and stats obtained for each experiment.
- Each figure legend should include a statement of how many times the experiment shown was replicated in the lab; the details of sample collection should be sufficiently clear so that the replicability of the experiment is obvious to the reader.
- For experiments reported in the text but not in the figures, please use the paragraph number instead of the figure number.

Note: Mean and standard deviation are not appropriate on small samples, and plotting independent data points is usually more informative. When technical replicates are reported, error and significance measures reflect the experimental variability and not the variability of the biological process; it is misleading not to state this clearly.

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
example	1a	one-way ANOVA	Fig. legend	9, 9, 10, 15	mice from at least 3 litters/group	Methods para 8	error bars are mean +/- SEM	Fig. legend	p = 0.044	Fig. legend	F(3, 36) = 2.97	Fig. legend
example	results, para 6	unpaired t-test	Results para 6	15	slices from 10 mice	Results para 6	error bars are mean +/- SEM	Results para 6	p = 0.0006	Results para 6	t(28) = 2.808	Results para 6

		TEST USED		n			DESCRIPTIVE STATS (AVERAGE, VARIANCE)		P VALUE		DEGREES OF FREEDOM & F/t/z/R/ETC VALUE	
	FIGURE NUMBER	WHICH TEST?	SECTION & PARAGRAPH #	EXACT VALUE	DEFINED?	SECTION & PARAGRAPH #	REPORTED?	SECTION & PARAGRAPH #	EXACT VALUE	SECTION & PARAGRAPH #	VALUE	SECTION & PARAGRAPH #
+ -	2a	Multilevel linear regression, second-level one-tailed t-test	Fig. legend	18	Parkinson's disease patients who participated in the study.	Online Methods Behavioral analysis para 1, 2 ,3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend	p=0.0001	Fig. legend	t(14)=5.4	Fig. legend
+ -	2a	Multilevel linear regression, second level one-tailed t-test	Fig. legend	18	Parkinson's disease patients who participated in the study.	Online Methods Behavioral analysis para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend	p=0.0018	Fig. legend	t(14)=3.5	Fig. legend
+ -	3a	Multilevel linear regression, second level random effects one-sampled t-test	Online Methods, FMRI analysis, para 2	15	Parkinson's disease patients who participated in the study.	Online Methods, FMRI analysis, para 2	Statistical parametric maps of ROI activation for expected value	Fig. legend	Displayed at p=0.005 uncorrected, significant after small volume correction pFWE=0.03 (placebo) pFWE=0.002 (on drug) pFWE(off drug)=0.05	Fig. legend	t(14)=3.62 (off drug) t(14)=4.83 (placebo) t(14)=5.78 (on drug)	Fig. legend
+ -	3b	Multilevel linear regression, second level one-tailed t-test	Online Methods analysis of Parameter estimates, para 1	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of Parameter estimates , para 1	Average parameter estimate, error bars are within subject standard errors	Fig. legend	Learning from gains: p=0.009 (on>off drug) p=0.03 (placebo>off drug) p=0.30 (on>placebo) learning from losses: p=0.46 (on>off drug) p=0.11 (placebo>off drug) p=0.12 (on>placebo)	Results, para 3	Learning from gains: t(11)=2.8 (on>off drug) t(11)=2.0 (placebo>off drug) t(11)=0.52 (on>placebo) learning from losses: t(11)=0.1 (on>off drug) t(11=1.3 (placebo>off drug) t(11)=-1.22 (on>placebo)	Results para 3
+ -	4a	Multilevel linear regression, second level random effects, one-sampled t-test	Online Methods, FMRI analysis, para 2	15	Parkinson's disease patients who participated in the study.	Online Methods, FMRI analysis, para 2	Statistical parametric maps of ROI activation for prediction error	Fig. legend	Displayed at p=0.005 uncorrected, significant after small volume correction pFWE=0.009 (off drug) pFWE=0.03 (placebo)	Fig. legend	t(14)=5.26 (off drug) t(14)=4.5 (placebo) t(14)=3.6 (on drug)	Fig. legend

+ -	4b	Multilevel linear regression, second level one-tailed t-test	Online Methods analysis of Parameter estimates, para 1	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of Parameter estimates, para 1	Average parameter estimate, error bars are within subject standard errors	Fig. legend	Learning from gains: p= 0.03 (off>on) p=0.025 (off>placebo) p= 0.41 (placebo>on) learning from losses: p= 0.42 (off>on) p=0.09 (off>placebo) p= 0.07 (placebo>on)	Results, para 4	Learning from gains: t(11)=2.06 (off>on) t(11)=2.13 (placebo>off) t(11)=0.22 (placebo>on) learning from losses: t(11)= 0.19 (off>on) t(11)=-1.38 (off >placebo) t(11)=-1.53 (placebo>on)	Results, para 4
+ -	Results para 1	Multilevel linear regression, second level one-tailed t-test	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2a	p=0.01	Results para 1	t(14)=1.8	Results para 1
+ -	Results para 1	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2a	p=0.019	Results para 1	t(14)=2.3	Results para 1
+ -	Results para 1	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2a	p=0.42	Results para 1	t(14)=-0.2	Results para 1
+ -	Results para 2	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2 a	p=0.04	Results para 2	t(11)=1.9	Results para 2
+ -	Results para 2	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2 a	p=0.49	Results para 2	t(14)=0	Results para 2
+ -	Results para 2	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Behavioral analysis , para 1, 2, 3	18	Parkinson's disease patients who participated in the study.	Online Methods, Behavioral analysis , para 1, 2, 3	Average % of optimal choices, error bars are within subject standard errors	Fig. legend 2 a	p=0.3	Results para 2	t(14)=-0.53	Results para 2
+ -	Results para 4	Two-tailed, paired t-test	Results para 4	15	Parkinson's disease patients who participated in the study.	Results para 4	averages of RL model derived learning rates	Results para 4	p=0.01	Results para 4	t(14)=2.6	Results para 4

+ -	Results para 4	two-tailed, paired t-test	Results para 4	15	Parkinson's disease patients who participated in the study	Results para 4	averages of RL model derived learning rates	Results para 4	p=0.16	Results para 4	t(14)=1.5	Results para 4
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 3b	p=0.009	Results para 5	t(11)=2.8	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 3b	p=0.03	Results para 5	t(11)=2.0	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 3b	p=0.30	Results para 5	t(11)=0.52	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 3b	p=0.46	Results para 5	t(11)=0.1	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 3b	p=0.11	Results para 5	t(11)=1.3	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 4b	p=0.03	Results para 5	t(11)=2.06	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 4b	p=0.025	Results para 5	t(11)=2.13	Results para 5

+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 4b	p=0.015	Results para 5	t(11)=2.58	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 4b	p=0.42	Results para 5	t(11)=0.19	Results para 5
+ -	Results para 5	Multilevel linear regression, second level one-tailed t-tests	Online Methods, Analysis of parameter estimates	15	Parkinson's disease patients who participated in the study.	Online Methods, Analysis of parameter estimates	Parameter estimate, error bars are within subject standard errors	Fig. legend 4b	p=0.09	Results para 5	t(11)=-1.38	Results para 5
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.04	Results para 6	t(14)=2.14	Results para 6
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.12	Results para 6	t(14)=1.63	Results para 6
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.83	Results para 6	t(14)=-0.21	Results para 6
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.27	Results para 6	t(14)=1.14	Results para 6
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.65	Results para 6	t(14)=0.45	Results para 6
+ -	Results para 6	Two-tailed, paired t-test	Supplement	15	Parkinson's disease patients who participated in the study.	Supplement para 19	Parameter estimate, error bars are within subject standard errors	Suppl. Fig. 8	p=0.42	Results para 6	t(14)=-0.82	Results para 6
+ -	Suppl.Fig 2	Partial-correlation, one-tailed t-test	Supplment para 3	18	Parkinson's disease patients who participated in the study.	Supplment para 3	UPDRS III motor score	Suppl. Fig 2	p=0.01	Supplment para 3	r=0.59	Supplment para 3
+ -	Suppl.Fig 2	Partial-correlation, one-tailed t-test	Supplment para 3	18	Parkinson's disease patients who participated in the study.	Supplment para 3	Slopes for learning from gains	Suppl. Fig 2	p=0.08	Supplment para 3	r=0.34	Supplment para 3

+ -	Suppl. Fig. 3	Multilevel linear regression, second level one-tailed t-tests	Supplement para 7	18	Parkinson's disease patients who participated in the study.	Supplement para 7	Average reaction times in seconds, error bars are within subject standard errors	Supp. Fig. legend 3	p=0.000023 p=0.5	Supplement para 7	t(14)=-6.1 t(14)=-0.64	Supplement para 7
+ -	Suppl. Fig. 4	Multilevel linear regression, second level one-tailed t-tests	Supplement para 8	15	Parkinson's disease patients who participated in the study.	Supplement para 8	Average % of optimal choices, error bars are within subject standard errors	Supp. Fig. legend 4	p=0.045 p=0.015	Supplement para 8	t(11)=1.8 t(11)=2.3	Supplement para 8
+ -	Suppl. Fig. 6	Multilevel linear regression, second level random effects, paired t-test	Supplement para 14	15	Parkinson's disease patients who participated in the study.	Supplement para 14	Statistical parametric maps showing whole brain activations for prediction error	Supp. Fig. legend 6	p=0.05 uncorrected	Supplement para 14		Supplement para 14
+ -	Suppl. Fig. 7a	Two-tailed, paired t-test	Supplement para 17	15	Parkinson's disease patients who participated in the study.	Supplement para 17	Parameter estimate, error bars are within subject standard errors	Supp. Fig. legend 7a	learning from gains: p=0.009 (on>off) p=0.03 (placebo>off) p=0.3 (on>placebo) learning from losses: p=0.55 (on>off) p=0.63 (placebo>off) p=0.84 (on >placebo)	Supplement para 17	learning from gains: t(14)=2.9 (on>off) t(14)=2.38 (placebo>off) t(14)=1.05 (on>placebo) learning from losses: t(14)=-0.61 (on>off) t(14)=-0.20 (placebo>off) t(14)=-0.47 (on>placebo)	Supplement para 17
+ -	Suppl. Fig. 7b	Two-tailed, paired t-test	Supplement para 18	15	Parkinson's disease patients who participated in the study.	Supplement para 18	Parameter estimate, error bars are within subject standard errors	Supp. Fig. legend 7b	learning from gains: p=0.06 (on<off) p=0.03 (placebo<off) p=0.53 (on>placebo) learning from losses: p=0.32 (on<off) p=0.02 (placebo<off) p=0.44 (placebo>on)	Supplement para 18	learning from gains: t(14)=1.97 (on<off) t(14)=2.27 (placebo<off) t(14)=0.63 (on>placebo) learning from losses: t(14)=-1.02 (on<off) t(14)=-2.83 (placebo<off) t(14)=0.78 (placebo>on)	Supplement para 18
+ -	Suppl. Fig. 8	Two-tailed, paired t-test	Supplment para 19	15	Parkinson's disease patients who participated in the study.	Supplment para 19	Parameter estimate, error bars are within subject standard errors	Supp. Fig. legend 8	p=0.27 p=0.12 (on>off) p=0.65 p=0.04 (placebo>off) p=0.42 p=0.83 (on>placebo)	Supplment para 19	t(14)=1.14 t(14)=-1.63 (on>off) t(14)=0.45 t(14)=-2.14 (placebo>off) t(14)=0.82 t(14)=0.21 (on>placebo	Supplment para 19

Representative figures

1. Are any representative images shown (including Western blots and immunohistochemistry/staining) in the paper?

   If so, what figure(s)?

   No

2. For each representative image, is there a clear statement of how many times this experiment was successfully repeated and a discussion of any limitations in repeatability?

   If so, where is this reported (section, paragraph #)?

   No

Statistics and general methods

1. Is there a justification of the sample size?

   If so, how was it justified?

   Where (section, paragraph #)?

   Even if no sample size calculation was performed, authors should report why the sample size is adequate to measure their effect size.

   Review of fMRI studies suggests that the current norm for human fMRI sample size is between 15 and 20 subjects. We therefore recruited 21 subjects and employed a within-subjects design to minimize variance due to individual differences.

2. Are statistical tests justified as appropriate for every figure?

   Where (section, paragraph #)?

   Figures 2, 3 and 4.

   a. If there is a section summarizing the statistical methods in the methods, is the statistical test for each experiment clearly defined?

      Yes, online methods behavioral analysis, FMRI analysis and analysis of parameter estimates sections, paragraph 11, 12, 13, 14, 15, 16, 21, 22, 23, 24.

   b. Do the data meet the assumptions of the specific statistical test you chose (e.g. normality for a parametric test)?

      Where is this described (section, paragraph #)?

      Yes, online methods, behavioral analysis section, paragraph 15.

   c. Is there any estimate of variance within each group of data?

      Is the variance similar between groups that are being statistically compared?

      Where is this described (section, paragraph #)?

      Not applicable due to within-subjects design.

   d. Are tests specified as one- or two-sided?

      Tests are specified as one- or two-sided at the appropriate place in online methods, and main text.

   e. Are there adjustments for multiple comparisons?

      Not applicable

3. Are criteria for excluding data points reported?

   Was this criterion established prior to data collection?

   Where is this described (section, paragraph #)?

   No data points were excluded

4. Define the method of randomization used to assign subjects (or samples) to the experimental groups and to collect and process data. If no randomization was used, state so. Where does this appear (section, paragraph #)?	Not applicable due to within-subject design
5. Is a statement of the extent to which investigator knew the group allocation during the experiment and in assessing outcome included? If no blinding was done, state so. Where (section, paragraph #)?	No blinding was done
6. For experiments in live vertebrates, is a statement of compliance with ethical guidelines/regulations included? Where (section, paragraph #)?	Not applicable
7. Is the species of the animals used reported? Where (section, paragraph #)?	Not applicable
8. Is the strain of the animals (including background strains of KO/ transgenic animals used) reported? Where (section, paragraph #)?	Not applicable
9. Is the sex of the animals/subjects used reported? Where (section, paragraph #)?	Online methods, participants section, paragraph 1
10. Is the age of the animals/subjects reported? Where (section, paragraph #)?	No, the average age of the patient group was 67 years.
11. For animals housed in a vivarium, is the light/dark cycle reported? Where (section, paragraph #)?	Not applicable
12. For animals housed in a vivarium, is the housing group (i.e. number of animals per cage) reported? Where (section, paragraph #)?	Not applicable
13. For behavioral experiments, is the time of day reported (e.g. light or dark cycle)? Where (section, paragraph #)?	The time of drug and placebo administration, and the length of scan sessions and breaks are reported in online methods, experimental design and placebo and drug administration sections, paragraphs 4 and 5.
14. Is the previous history of the animals/subjects (e.g. prior drug administration, surgery, behavioral testing) reported? Where (section, paragraph #)?	No

a. If multiple behavioral tests were conducted in the same group of animals, is this reported?

Where (section, paragraph #)?

Yes, online methods, behavioral task section, paragraph 7, online supplemental information, effects of treatment on clinical symptoms, paragraph 1, table 1

15. If any animals/subjects were excluded from analysis, is this reported?

Where (section, paragraph #)?

Yes, online methods, participants section, paragraph 3

a. How were the criteria for exclusion defined?

Where is this described (section, paragraph #)?

Anxiety reported by the patient, abnormally fast response times (3 standard deviations below the group average), poor imaging quality assessed by in house software identifying spikes and high movement time points. Described in online methods, participants section and FMRI analysis sections, paragraphs 3 and 17

b. Specify reasons for any discrepancy between the number of animals at the beginning and end of the study.

Where is this described (section, paragraph #)?

(1) Extreme anxiety related to scanning, (2) abnormally fast response times (3 standard deviations below group average) suggesting a failure to follow task instructions, (3) poor imaging quality, described in online methods, participants section and FMRI analysis sections, paragraphs 3 and 17

Reagents

1. Have antibodies been validated for use in the system under study (assay and species)?

Not applicable

a. Is antibody catalog number given?

Where does this appear (section, paragraph #)?

Not applicable

b. Where were the validation data reported (citation, supplementary information, Antibodypedia)?

Where does this appear (section, paragraph #)?

Not applicable

2. If cell lines were used to reflect the properties of a particular tissue or disease state, is their source identified?

Where (section, paragraph #)?

Not applicable

a. Were they recently authenticated?

Where is this information reported (section, paragraph #)?

Not applicable

Data deposition

Data deposition in a public repository is mandatory for:

a. Protein, DNA and RNA sequences
b. Macromolecular structures
c. Crystallographic data for small molecules
d. Microarray data

Deposition is strongly recommended for many other datasets for which structured public repositories exist; more details on our data policy are available here. We encourage the provision of other source data in supplementary information or in unstructured repositories such as Figshare and Dryad.

1. Are accession codes for deposit dates provided? Where (section, paragraph #)?	Not applicable

Computer code/software

Any custom algorithm/software that is central to the methods must be supplied by the authors in a usable and readable form for readers at the time of publication. However, referees may ask for this information at any time during the review process.

1. Identify all custom software or scripts that were required to conduct the study and where in the procedures each was used.	In house custom fMRI quality screening software was used to identify spikes and high movement time points and to correct them by interpolation of adjacent time points.
2. Is computer source code/software provided with the paper or deposited in a public repository? Indicate in what form this is provided or how it can be obtained.	No

Human subjects

1. Which IRB approved the protocol? Where is this stated (section, paragraph #)?	The Columbia University Internal Review Board approved the protocol, reported in online methods, participants section, paragraph 1.
2. Is demographic information on all subjects provided? Where (section, paragraph #)?	Online methods, section participants, paragraph 1
3. Is the number of human subjects, their age and sex clearly defined? Where (section, paragraph #)?	Online methods, participants section, paragraph 1
4. Are the inclusion and exclusion criteria (if any) clearly specified? Where (section, paragraph #)?	Online methods, participants section, paragraphs 1 and 2
5. How well were the groups matched? Where is this information described (section, paragraph #)?	Not applicable due to within subjects design

6. Is a statement included confirming that informed consent was obtained from all subjects? Where (section, paragraph #)?	Yes, online methods, participants section, paragraph 1
7. For publication of patient photos, is a statement included confirming that consent to publish was obtained? Where (section, paragraph #)?	No patient photos for publication were obtained

fMRI studies

For papers reporting functional imaging (fMRI) results please ensure that these minimal reporting guidelines are met and that all this information is clearly provided in the methods:

1. Were any subjects scanned but then rejected for the analysis after the data was collected?	Yes
a. If yes, is the number rejected and reasons for rejection described? Where (section, paragraph #)?	Six patients were excluded from behavioral and/or fMRI data analysis. The reasons are described in the online methods, participants section, paragraph 3.
2. Is the number of blocks, trials or experimental units per session and/or subjects specified? Where (section, paragraph #)?	Yes, online methods, experimental design, placebo and drug administration, behavioral task sections, paragraphs 4, 5, 6, and 7
3. Is the length of each trial and interval between trials specified?	Yes, online methods, behavioral task section, paragraph 8
4. Is a blocked, event-related, or mixed design being used? If applicable, please specify the block length or how the event-related or mixed design was optimized.	An event-related design was used. ITIs and ISIs were jittered by drawing from an exponential distribution in order to optimize the design.
5. Is the task design clearly described? Where (section, paragraph #)?	Yes, online methods, behavioral task section, paragraph 7
6. How was behavioral performance measured?	Performance was assessed by % correct choices and reaction times.
7. Is an ANOVA or factorial design being used?	Factorial design
8. For data acquisition, is a whole brain scan used? If not, state area of acquisition.	Yes
a. How was this region determined?	Not applicable

9. Is the field strength (in Tesla) of the MRI system stated?	Yes, online methods, image acquisition section, paragraph 16
a. Is the pulse sequence type (gradient/spin echo, EPI/spiral) stated?	Yes, gradient/spin echo
b. Are the field-of-view, matrix size, slice thickness, and TE/TR/ flip angle clearly stated?	Yes, online methods, image acquisition section, paragraph 16
10. Are the software and specific parameters (model/functions, smoothing kernel size if applicable, etc.) used for data processing and pre-processing clearly stated?	Yes, online methods, image acquisition and FMRI analysis sections, paragraphs 16, 17 and 18
11. Is the coordinate space for the anatomical/functional imaging data clearly defined as subject/native space or standardized stereotaxic space, e.g., original Talairach, MNI305, ICBM152, etc? Where (section, paragraph #)?	Yes, brain coordinates are defined by the MNI space, reported in online methods, FMRI analysis section, paragraph 18.
12. If there was data normalization/standardization to a specific space template, are the type of transformation (linear vs. nonlinear) used and image types being transformed clearly described? Where (section, paragraph #)?	Preprocessing and normalization of images is described in the online methods, FMRI analysis section, paragraph 18.
13. How were anatomical locations determined, e.g., via an automated labeling algorithm (AAL), standardized coordinate database (Talairach daemon), probabilistic atlases, etc.?	Anatomical locations were defined via automated labeling algorithm (AAL).
14. Were any additional regressors (behavioral covariates, motion etc) used?	Realignment parameters were included as covariates into the general linear models to control for motion artifacts.
15. Is the contrast construction clearly defined?	Yes, online methods, FMRI analysis section, paragraphs 19 and 20.
16. Is a mixed/random effects or fixed inference used?	Random effects inferences were used
a. If fixed effects inference used, is this justified?	Not applicable
17. Were repeated measures used (multiple measurements per subject)?	Yes
a. If so, are the method to account for within subject correlation and the assumptions made about variance clearly stated?	Online methods, behavioral data analysis, paragraph 15 about partial correlations of placebo and drug effects across patients controlling for off drug effects on learning or motor symptoms, respectively.
18. If the threshold used for inference and visualization in figures varies, is this clearly stated?	Yes
19. Are statistical inferences corrected for multiple comparisons?	No
a. If not, is this labeled as uncorrected?	Yes

20. Are the results based on an ROI (region of interest) analysis?	Yes
a. If so, is the rationale clearly described?	Main text paragraphs 4 and 5.
b. How were the ROI's defined (functional vs anatomical localization)?	ROIs were defined functionally, a-priori from independent fMRI studies, described in online methods, Regions of interest section, paragraph 23.
21. Is there correction for multiple comparisons within each voxel?	Small volume correction for ROIs was applied using family wise error correction (P<0.05) on the peak level.
22. For cluster-wise significance, is the cluster-defining threshold and the corrected significance level defined?	No

Additional comments

Additional Comments	