

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- ☐ ☒ The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- ☒ ☐ A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- ☐ ☒ The statistical test(s) used AND whether they are one- or two-sided
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- ☐ ☒ A description of all covariates tested
- ☐ ☒ A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- ☐ ☒ A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- ☐ ☒ For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- ☐ ☒ For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- ☒ ☐ For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- ☐ ☒ Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection All Unity task code and instructions to reproduce the behavioral experiment are available at <https://github.com/cstarkweather>

Data analysis All MATLAB code used for data analysis and computational modeling is available at <https://github.com/cstarkweather>.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

All data presented in the main results have been submitted through Dryad and have now been submitted for publication on Dryad (<https://doi.org/10.5061/dryad.kh18932k7>).

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender	Patient sex is reported in Extended Data Table 1.
Reporting on race, ethnicity, or other socially relevant groupings	n/a
Population characteristics	Patient age, clinical indication, and presence of psychiatric symptoms are reported in Extended Data Table 1.
Recruitment	Methods: Participants. Patient were asked for voluntary participation in videogame task during their hospital stay, and those that wished to participate were included.
Ethics oversight	Methods: Participants. Approval for the study was granted by the institutional review boards of the UCSF, UC Berkeley and WUSTL. Written informed consent was obtained by all subjects prior to testing.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☒ Life sciences ☐ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	Sample size was not predetermined. Data were obtained from all patients that had orbitofrontal electrodes placed UCSF between 6/2023 and 10/2024; and at WashU in the fall of 2024.
Data exclusions	No patients were excluded. Electrodes were excluded based on anatomic location, see Methods: Electrode localization.
Replication	Data were analyzed across patient cohorts (Extended Data Figure 3e-f, specific analyses comparing epilepsy patients to psychiatric patients) to ensure the Main Results presented in Figure 2 (anatomic functional gradient) reported here was replicated across cohorts and across individual subjects. Furthermore, individual subject data are shown elsewhere throughout the manuscript where possible, such as transition dynamics across individual subjects scaling with conflict (Figure 6e); behavioral reaction time and conflict (Figure 1g); decoding across subjects (Figure 5c).
Randomization	No randomization was performed, and no group allocation was performed. The same behavioral task and same recordings were conducted in all 6 subjects.
Blinding	No randomization was performed. The same behavioral task and same recordings were conducted in all 6 subjects.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☐	☒ MRI-based neuroimaging

Plants

Seed stocks	Report on the source of all seed stocks or other plant material used. If applicable, state the seed stock centre and catalogue number. If plant specimens were collected from the field, describe the collection location, date and sampling procedures.
Novel plant genotypes	Describe the methods by which all novel plant genotypes were produced. This includes those generated by transgenic approaches, gene editing, chemical/radiation-based mutagenesis and hybridization. For transgenic lines, describe the transformation method, the number of independent lines analyzed and the generation upon which experiments were performed. For gene-edited lines, describe the editor used, the endogenous sequence targeted for editing, the targeting guide RNA sequence (if applicable) and how the editor was applied.
Authentication	Describe any authentication procedures for each seed stock used or novel genotype generated. Describe any experiments used to assess the effect of a mutation and, where applicable, how potential secondary effects (e.g. second site T-DNA insertions, mosaicism, off-target gene editing) were examined.

Magnetic resonance imaging

Experimental design

Design type	Structural T1-weighted MRI was obtained in each patient (n = 6) to localize electrodes
Design specifications	1 MRI per subject
Behavioral performance measures	No behavioral variables were recorded. Anatomic labels were generated for electrode localization only (see Methods: Electrode Localization)

Acquisition

Imaging type(s)	Structural MRI
Field strength	3T
Sequence & imaging parameters	T1 weighted MRI, including MPRAGE
Area of acquisition	Whole brain
Diffusion MRI	☐ Used ☐ Not used

Preprocessing

Preprocessing software	Structural MRI data was processed in Freesurfer. All parameters were predetermined by clinical need (standard T1 structural scan)
Normalization	n/a
Normalization template	none. patient space only was used (see Methods: Electrode Localization)
Noise and artifact removal	n/a
Volume censoring	n/a

Statistical modeling & inference

Model type and settings	No statistical analysis was performed on MRI. MRI was used purely for electrode localization (structural MRI)
Effect(s) tested	n/a
Specify type of analysis:	☐ Whole brain ☐ ROI-based ☐ Both
Statistic type for inference	Specify voxel-wise or cluster-wise and report all relevant parameters for cluster-wise methods.
(See Eklund et al. 2016)	
Correction	Describe the type of correction and how it is obtained for multiple comparisons (e.g. FWE, FDR, permutation or Monte Carlo).

Models & analysis

n/a	Involvement in the study
☒	☐ Functional and/or effective connectivity
☒	☐ Graph analysis
☒	☐ Multivariate modeling or predictive analysis