nature portfolio

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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	The parameters of the LED panel stimulation were controlled by an Arduino Uno microcontroller and Arduino IDE software (version 1.8.19).
Data analysis	Data was analyzed using FreeSurfer software suite (version 6.0), Brainstorm toolbox (version 3.240328), SPM12 extension, and MATLAB (R2022a).

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

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to sensitive patient information.

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	Sex is reported in the manuscript. Sex- and gender-based analysis was not conducted as it was not relevant to our study.
Reporting on race, ethnicity, or other socially relevant groupings	Information on race, ethnicity, or other socially relevant groupings was not collected as it was not relevant to our study.
Population characteristics	Age is reported in the manuscript. All participants suffer from treatment-resistant epilepsy.
Recruitment	Participants were recruited from a clinical population of patients with treatment-resistant epilepsy who underwent implantation of intracranial electrodes in the scope of their clinical evaluation. Thus, the participants were selected based on medical necessity rather than random sampling. As these are individuals with severe, treatment-resistant epilepsy, they may differ in terms of brain structure and/or function from the general population or individuals with Alzheimer's disease (AD). To address potential differences, we assessed hippocampal integrity of our participants, as many epilepsy patients exhibit hippocampal atrophy and pathology similar to that seen in AD. Furthermore, to control for interictal activity present in the signal of these participants, we included a control stimulation condition with a random frequency pattern.
Ethics oversight	Medical Ethics Committee of Gent University Hospital

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	No sample-size calculation was performed. We think our sample size is sufficient for several reasons. Firstly, research involving intracranial recordings often relies on smaller sample sizes due to the difficulty of recruiting these patients. Few similar studies have been previously published on a few-subjects only basis or on comparable sample size. Next, our analysis is based on within-subject comparisons, reducing some variability of the data.
Data exclusions	Data from all subjects that took part in the study are reported.
Replication	Light stimulation parameters and conditions were kept constant across participants and the effect of stimulation was observed across participants. Our results were compared to existing studies.
Randomization	Participants were not allocated into groups.
Blinding	Blinding was not relevant to our study.

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	n/a
Novel plant genotypes	n/a
Authentication	n/a