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 experiment was controlled using Presentation software (Neurobehavioral Systems, Berkeley, CA, USA). We used Research Central Software Suite (Blackrock Neurotech) to configure hardware settings on the NeuroPort system, to visualize continuous signals and spikes in real time and to save experimental data.
Data analysis	We imported data to Matlab using the NPMK toolbox (Blackrock Neurotech, https://github.com/BlackrockNeurotech/NPMK). We analyzed all data using custom-written MATLAB R2020b (MathWorks, Natick, MA, USA) scripts and the EEGLAB toolbox (https://sccn.ucsd.edu/eeglab/index.php).

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 datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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 and gender were not i considered in the design of this study. The research did not involve inquiries about participants' gender identities, with sex being determined solely on biological criteria. One male and two female patients were included, all of whom consented to share their individual-level data. Our decision not to conduct sex- and gender-based analysis was driven by the specific nature of our study, which neither hypothesized sex or gender effects nor possessed a sufficiently large sample size for such an analysis.
Reporting on race, ethnicity, or other socially relevant groupings	There was not any socially relevant grouping of the patients and factors such as race, and ethnicity were not considered or asked.
Population characteristics	The study cohort consisted of three patients: patient 1, a 24-year-old male; patient 2, a 54-year-old woman; and patient 3, a 58-year-old woman. Patients had undergone the placement of intracranial depth electrodes as part of their presurgical evaluation for drug-resistant focal epilepsy. Patient 2 was also diagnosed with Neurofibromatosis type 1, although she did not have any intracranial tumors related to this condition. At the age of 34, she experienced a left occipital intracranial hemorrhage, which was attributed to venous sinus thrombosis.
Recruitment	We included patients with Utah arrays in adjacent areas, ensuring no bias that could affect the results. These arrays were placed in the occipital cortex, with no additional incisions made for the study's purposes.
Ethics oversight	Ethics Committee Research UZ / KU Leuven (EC Research)

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	Statistics were conducted within subjects, not across subjects. The trial number was determined based on the performance of each individual patient.
Data exclusions	No data exclusion
Replication	For all patients, we have recordings from at least one session on a different day than the one reported in the manuscript, ensuring reproducibility. Furthermore, except for array 3, which is located in a different anatomical area compared to the other arrays, we also observe similar results across patients.
Randomization	Randomization is not applicable to this study as it involves only three subjects, and our reporting focuses on each subject individually.
Blinding	Blinding was not applicable to this study because both the recordings and the analysis necessitated the investigator's awareness of the conducted experiments and the presented stimuli.

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

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration	*Provide the trial registration number from ClinicalTrials.gov or an equivalent agency.*
Study protocol	s53126
Data collection	All data were collected and stored at the University Hospital UZ Leuven.
Outcomes	Not applicable, as our study's results represent an interim report of a translational research project associated with the protocol. Our findings do not pertain to the clinical trial on epilepsy within the same protocol.