

Reporting Summary

Nature Research 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 Research 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 Neural data acquisition was done using a neural logger (Deuteron Technologies, SpikeLog-16). Video tracking was done using Neuralynx Cheetah (version 6.3.2). Spike sorting was done using Neuralynx SpikeSort3D (version 2.5.2.0).

Data analysis We used custom MATLAB code for data analysis. The code generated for the current study is available from the corresponding author on reasonable request. Analysis of local lattice domain structure was done using Ovito (version 3.4.3).

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 Research [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 list of figures that have associated raw data
- A description of any restrictions on data availability

The data generated and analyzed in the current study are available from the corresponding author on reasonable request. Source data are provided with this paper.

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](https://www.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	We analyzed a dataset of 125 neurons, recorded in the medial entorhinal cortex (MEC) of 4 bats. The activity of each neuron was recorded for 1-2 hours. No power analysis was used to pre-determine the sample size: neither for the number of animals nor for the number of neurons. The numbers of animals and neurons are typical for studies in this research field.
Data exclusions	The inclusion criteria for these cells were based on sufficient behavioral coverage, spike number, and firing stability (see Methods), and are standard for this research field. Exclusion criteria were not pre-determined.
Replication	The effects described were confirmed in multiple neurons recorded over multiple recordings-sessions in 4 animals. The findings reported in this paper were found in each of the 4 individual animals.
Randomization	Not relevant, as there was no randomized treatment of the animals: This study is based on observing the neural responses to the natural behavior of the animals.
Blinding	The investigators were not blinded to the animal identity. Analysis of neural and behavior data was conducted regardless of the identity of the animal from which the data were collected.

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
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

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

Animals and other organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research

Laboratory animals	Egyptian fruit bats (<i>Rousettus aegyptiacus</i>), wild-caught. Sex: male. Age: adult, 2-10 years of age (note: these bats live >20 years).
Wild animals	The bats in this study (4 male Egyptian fruit bats, <i>Rousettus aegyptiacus</i> , age: 2-10 years) were captured as adults in Israel, using butterfly nets. They were transported in a car to the Weizmann Institute, where they were quarantined and then joined a large bat colony at the Institute. After a few months in the lab, we ran the experiments described in this study. Following experiments, the bats were euthanized with Pental for purpose of brain histology.
Field-collected samples	The study did not involve samples collected from the field.
Ethics oversight	The experimental procedures described in this study were approved by the Institutional Animal Care and Use Committee (IACUC) of the Weizmann Institute of Science.

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