

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
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ | 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
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | 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	Clampfit 10.6 and MiniAnalysis 6.03 were used for whole-cell patch-clamp data collection. ANY-maze(RRID: SCR_014289) was used for collecting the behavioral data. G*Power software was used for estimated the sample size.
Data analysis	Offline analysis of whole-cell patch-clamp data was performed using Clampfit 10.6 and MiniAnalysis 6.03. GraphPad 8.0 was used to plot and fit the data.

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 reported in this paper will be shared by the lead contact upon request.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender ☒ No relevant information was used in this article.

Population characteristics ☒ No relevant information was used in this article.

Recruitment ☒ No relevant information was used in this article.

Ethics oversight ☒ No relevant information was used in this article.

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](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 ☒ Before starting experiments, based on our previous behavioral studies, we estimated the sample size by using G*Power software. And the sample sizes are similar with previously published research in this area. We use as few animals as possible on the basis of reliable experimental data, which is in line with the "3R" principles of animal ethics.

Data exclusions ☒ Animals with correct virus injection and cannula placement were included in the analysis.

Replication ☒ All experiments were reported 2 or more times to ensure replicability. The behavioral results were obtained on at least 2 cohorts of mice.

Randomization ☒ Mice were randomized. We randomly tagged each mouse and then randomly assigned them to groups.

Blinding ☒ Blinding was performed in experiment and data analysis. The mechanical allodynia and CPP/CPA test were conducted in a double-blind manner. The experimenters were blinded to experimental groups. An evaluator blinded to the group assignments performed the assessment and analyzed the data.

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

Methods

n/a ☒ Involved in the study

☒ ☐ ChIP-seq

☒ ☐ Flow cytometry

☒ ☐ MRI-based neuroimaging

Animals and other research organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research, and [Sex and Gender in Research](#)

Laboratory animals	Experiments were performed on adult male C57BL/6J mice and male GAD67-GFP mice (8-12 weeks old).Adult male C57BL/6 mice were purchased from Shanghai SLAC. They were group-housed as required.
Wild animals	The study did not involve wild animals.
Reporting on sex	To rule out the effects of estrogen on the estrous cycle, we used male mice for this study.
Field-collected samples	No field-collected samples were used.
Ethics oversight	Mice were bred and maintained in the experimental animal center of Zhejiang University. The animal care and use committee of Zhejiang University approved all mouse protocols.

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