nature portfolio

Corresponding author(s): Ying Shen

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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	Patch clamp data were obtained using Clampex10.0 with Axon MultiClamp 700B amplifier (Molecular Devices, CA).
Data analysis	Data were analyzed using Igor Pro 6.0 (Wavemetrics, Lake Oswego, OR), Graphpad Prism 8.0 (Graphad Software, San Diego, CA), SPSS 17.0 (IBM, Chicago, IL), MatLab, Rx64 4.0.0., Fiji (NIH), InperPlot (Inper), InperCode (Inper), and the Allen Mouse Common Coordinate Framework.

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 relevant data supporting the present study have been provided in the main text, main figures, supplementary figures, and supplementary tables.

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	All experiments were performed in age-matched male mice, which is written in the Method/Animal section. Also, we indicated that only male mice were used in our work "...neurons in the cerebellar nuclei (CN) of male mice". The reason is that the menstruation in female mice influenced behavioral tests lasted several days.
Reporting on race, ethnicity, or other socially relevant groupings	N/A
Population characteristics	N/A
Recruitment	N/A
Ethics oversight	The current study was approved by the Animal Care and Use Committee at Zhejiang University School of Medicine.

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 statistical methods were used to pre-determine sample sizes, which were based on our previous studies.
Data exclusions	No data were excluded except unstable electrophysiological recordings (>~15% variance in series resistance, input resistance, or holding current).
Replication	To perform statistical analysis, at least 5 independent neurons, tissue samples, or mice were included in the analyses.
Randomization	Male mice were used in all experiments and were selected based purely on availability.
Blinding	During neuronal counting, two investigators independently counted neurons for each slice section.

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

Antibodies

Antibodies used	he antibody against GABA (#A2052; RRID: AB_477652) was from Sigma (St. Louis, MO). The antibody against SMI32 (#SMI-32R-100; RRID: AB_509997) was from Covance (Princeton, CT). Alexa Fluor-conjugated secondary antibodies, Goat anti-mouse Alexa Flour 488

(#A32723), Goat anti-rabbit Alexa Flour 488 (#A32721), and Goat anti-mouse Alexa Flour 647 (#A32733) were from Invitrogen (Carlsbad, CA).

Validation

The antibody against GABA (#A2052; RRID: AB_477652) was from Sigma (St. Louis, MO). The antibody against SMI32 (#SMI-32R-100; RRID: AB_509997) was from Covance (Princeton, CT). Alexa Fluor-conjugated secondary antibodies, Goat anti-mouse Alexa Flour 488 (#A32723), Goat anti-rabbit Alexa Flour 488 (#A32721), and Goat anti-mouse Alexa Flour 647 (#A32733) were from Invitrogen (Carlsbad, CA).

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	Original Ai9 (No. 007909), Ai14 (No. 007914), vGat-ires-Cre (No. 028862), and vGluT2-ires-Cre (No. 016963) were obtained from the Jackson Laboratory (Bar Harbor, ME).
Wild animals	C57BL/6J mice were obtained from Laboratory Animal Center of Academy of Medical Sciences.
Reporting on sex	All experiments were performed in age-matched male mice for comparing specific behaviors. The reason is that the menstruation in female mice influenced behavioral tests lasted several days.
Field-collected samples	The study did not involve samples collected from the field.
Ethics oversight	The current study was approved by the Animal Care and Use Committee at Zhejiang University School of Medicine.

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

Plants

Seed stocks	N/A
Novel plant genotypes	N/A
Authentication	N/A