

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 (<i>n</i>) 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. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> 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 <i>d</i> , Pearson's <i>r</i>), 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 | Detailed procedures for data collection are provided within the main text of the manuscript. In brief, behavioral data were recorded with either Med Associates hardware and software (i.e. VideoFreeze) or with a real-time version of the behavioral tracking software, ezTrack (github.com/DeniseCaiLab, realtime_dev branch). Miniscope data were acquired with Miniscope acquisition software (github.com/Aharoni-Lab/Miniscope-DAQ-QT-Software) and hardware (github.com/Aharoni-Lab/Miniscope-v4). Light-sheet images were acquired using a LaVision UltraMicroscope II and associated software. All histological verification of virus/fiber placement were conducted using a Leica DM6 epifluorescent microscope, with the exception of amygdala terminals, which were imaged using a confocal microscope (Leica LSM 780). |
| Data analysis | Detailed procedures for data analysis are provided within the main text of the manuscript. For analysis of freezing and motion in conditioning chambers, Med Associates Video Freeze software was used when no fibers/cables were attached to the mice. For measuring freezing and motion in chambers when cables were attached to the animals, as well as position in the light-dark test, we used our previously published open-source software, ezTrack (github.com/deniseailab/eztrack). Miniscope data were processed using our previously published open-source software, minian (github.com/deniseailab/minian). Light-sheet data were processed using a mixture of ClearMap 2 software (https://github.com/ClearAnatomics/ClearMap) and custom scripts. Analysis of calcium imaging data was performed with custom Python and R scripts. All data and statistical analyses are available at github.com/ZachPenn/Nature_2026 . |

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 in this manuscript will become publicly available at the time of publication at github.com/ZachPenn/2026_Nature. Raw data (e.g., unprocessed calcium imaging videos) will be made available upon 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

Reporting on race, ethnicity, or other socially relevant groupings

Population characteristics

Recruitment

Ethics oversight

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

Data exclusions

Replication

Randomization

Blinding

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

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	All mice were bred on a C57BL/6J genetic background and were approximately 2-6 months old at the start of testing. C57BL/6J were obtained from Jackson Laboratories for whole-brain immediate early gene imaging as well as pan-neuronal and axon terminal silencing (Jackson Laboratories, #000664). GAD2-IRES-Cre mice (Jackson Laboratories, #028867) were bred in-house for all other experiments.
Wild animals	n/a
Reporting on sex	The number of male and female mice used in each experiment are provided in the figure captions. Experiments using GAD2-IRES-Cre mice possessed an approximately equal number of male and female mice. Experiments using C57BL/6J mice used exclusively males. Notably, we have previously shown that the behaviors under study are not different between sexes (Pennington et al., Cell Reports, 2026). After observing no effects of sex when inhibiting GABAergic AHN neurons during Stressor 1 (during the stressor or after), as well as observing no differences in AHN calcium imaging responses between males and females, we combined males and females for all reported analyses in the manuscript.
Field-collected samples	n/a
Ethics oversight	All experimental procedures were approved by the Icahn School of Medicine at Mount Sinai's IACUC.

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