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☐ Initial submission ☒ Revised version ☐ Final submission

Life Sciences Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted life science papers and provides structure for consistency and transparency in reporting. Every life science submission will use this form; some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on the points included in this form, see Reporting Life Sciences Research. For further information on Nature Research policies, including our data availability policy, see Authors & Referees and the Editorial Policy Checklist.

Experimental design

1. Sample size

Describe how sample size was determined.

Sample sizes were chose to be consistent with previous studies.

2. Data exclusions

Describe any data exclusions.

Auditory and ipsilateral stimuli were administered but omitted from the primary analysis because their responses were primarily related to stimulus-provoked movement, see figure S1h.

Animals which did not show reduced neural activity following pharmacological infusion were not analyzed.

Data taken during periods of behavioral transitioning were omitted from analysis.

For infusion experiments all data taken after any aberrant neural activity or CBV were omitted from analysis.

Three animals were omitted from the comparison of the infusion ROI to the rest of the window (S10) since their windows were mostly spanned by the radius of the CBV ROI.

3. Replication

Describe whether the experimental findings were reliably reproduced.

All animals showed similar hemodynamic response function dynamics.

All animals showed a low agreement between the predicted and measured CBV during periods of rest.

All animals with reduced MUA following pharmacological infusions showed a substantial continuing CBV oscillation within the region of interest

4. Randomization

Describe how samples/organisms/participants were allocated into experimental groups.

Infusion orders were counter-balanced so all mice received all treatments in alternating orders to mitigate effects of imaging sessions on one treatment, therefore no randomization was performed.

5. Blinding

Describe whether the investigators were blinded to group allocation during data collection and/or analysis.

Experimenters were not blinded to cranial nerve transection experiments.

No blinding took place during pharmacological infusion experiments since the experimental design was a crossed-over, so that animals received both a treatment and control infusion in a counterbalanced order. Analysis of the data was performed using an automated analysis script with minimal experimenter input.

Note: all studies involving animals and/or human research participants must disclose whether blinding and randomization were used.

6. Statistical parameters

For all figures and tables that use statistical methods, confirm that the following items are present in relevant figure legends (or in the Methods section if additional space is needed).

n/a	Confirmed
☐	☒ The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement (animals, litters, cultures, etc.)
☐	☒ A description of how samples were collected, noting whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒ A statement indicating how many times each experiment was replicated
☐	☒ The statistical test(s) used and whether they are one- or two-sided (note: only common tests should be described solely by name; more complex techniques should be described in the Methods section)
☐	☒ A description of any assumptions or corrections, such as an adjustment for multiple comparisons
☐	☒ The test results (e.g. *P* values) given as exact values whenever possible and with confidence intervals noted
☐	☒ A clear description of statistics including central tendency (e.g. median, mean) and variation (e.g. standard deviation, interquartile range)
☐	☒ Clearly defined error bars

See the web collection on statistics for biologists for further resources and guidance.

Software

Policy information about availability of computer code

7. Software

Describe the software used to analyze the data in this study.	Custom code written in MATLAB 2015a was used to analyze the data and is available for download.

For manuscripts utilizing custom algorithms or software that are central to the paper but not yet described in the published literature, software must be made available to editors and reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). *Nature Methods* guidance for providing algorithms and software for publication provides further information on this topic.

Materials and reagents

Policy information about availability of materials

8. Materials availability

Indicate whether there are restrictions on availability of unique materials or if these materials are only available for distribution by a for-profit company.	N/A

9. Antibodies

Describe the antibodies used and how they were validated for use in the system under study (i.e. assay and species).	N/A

10. Eukaryotic cell lines

a. State the source of each eukaryotic cell line used.	N/A
b. Describe the method of cell line authentication used.	N/A
c. Report whether the cell lines were tested for mycoplasma contamination.	N/A
d. If any of the cell lines used are listed in the database of commonly misidentified cell lines maintained by ICLAC, provide a scientific rationale for their use.	N/A

Animals and human research participants

Policy information about studies involving animals; when reporting animal research, follow the ARRIVE guidelines

11. Description of research animals

Provide details on animals and/or animal-derived materials used in the study.	Mice were male C57-BJ6 acquired from Jackson Laboratory and were used between the ages of 3-8 months

Policy information about studies involving human research participants

12. Description of human research participants

Describe the covariate-relevant population characteristics of the human research participants.	N/A