Reporting Checklist for Nature Neuroscience

This checklist is used to ensure good reporting standards and to improve the reproducibility of published results. For more information, please read Reporting Life Sciences Research.

Please note that in the event of publication, it is mandatory that authors include all relevant methodological and statistical information in the manuscript.

Statistics reporting, by figure

- Please specify the following information for each panel reporting quantitative data, and where each item is reported (section, e.g. Results, & paragraph number).
- Each figure legend should ideally contain an exact sample size (n) for each experimental group/condition, where n is an exact number and not a range, a clear definition of how n is defined (for example x cells from x slices from x animals from x litters, collected over x days), a description of the statistical test used, the results of the tests, any descriptive statistics and clearly defined error bars if applicable.
- For any experiments using custom statistics, please indicate the test used and stats obtained for each experiment.
- Each figure legend should include a statement of how many times the experiment shown was replicated in the lab; the details of sample collection should be sufficiently clear so that the replicability of the experiment is obvious to the reader.
- For experiments reported in the text but not in the figures, please use the paragraph number instead of the figure number.

Note: Mean and standard deviation are not appropriate on small samples, and plotting independent data points is usually more informative. When technical replicates are reported, error and significance measures reflect the experimental variability and not the variability of the biological process; it is misleading not to state this clearly.

<table>
<thead>
<tr>
<th>TEST USED</th>
<th>n</th>
<th>DESCRIPTIVE STATS (AVERAGE, VARIANCE)</th>
<th>P VALUE</th>
<th>DEGREES OF FREEDOM &amp; F/T/Z/R/ETC VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIGURE NUMBER</td>
<td>WHICH TEST?</td>
<td>SECTION &amp; PARAGRAPH #</td>
<td>EXACT VALUE</td>
<td>DEFINED?</td>
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<tr>
<td>1a</td>
<td>one-way ANOVA</td>
<td>Fig. legend</td>
<td>9, 9, 10, 15</td>
<td>mice from at least 3 litters/group</td>
</tr>
<tr>
<td>results para 6</td>
<td>unpaired t-test</td>
<td>Results para 6</td>
<td>15</td>
<td>slices from 10 mice</td>
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<tr>
<td>TEST USED</td>
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<td>n</td>
<td>DESCRIPTIVE STATS (AVERAGE, VARIANCE)</td>
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<tr>
<td>Fig. legend</td>
<td>240</td>
<td>units from 7 mice</td>
<td>median, 25,75,10,90 percentiles</td>
<td>p = 3.09*10^-6</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>6</td>
<td>mice</td>
<td>mean ± SEM</td>
<td>p = 0.031</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>6</td>
<td>mice</td>
<td>mean ± SEM</td>
<td>p = 0.027</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>35 PY, 7 SC, 6 FS neurons</td>
<td>mean ± SEM</td>
<td></td>
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<td></td>
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<tr>
<td>Fig. legend</td>
<td>35 PY, 7 SC, 6 FS neurons</td>
<td>median, 25th and 75th percentile</td>
<td>p &lt; 0.001</td>
<td>F = 9.046 (for cell-type differences)</td>
</tr>
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<td>Fig. legend</td>
<td>35 PY, 7 SC, 6 FS neurons</td>
<td>median, 25th and 75th percentile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. legend</td>
<td>11 per cell-type different input compositions</td>
<td>all values</td>
<td>p &lt; 0.001</td>
<td>F = 15.8 (Friedmann statistic)</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>11 per cell-type different input compositions</td>
<td>all values</td>
<td></td>
<td></td>
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<tr>
<td>Fig. legend</td>
<td>10</td>
<td>units</td>
<td>mean ± SEM</td>
<td>p = 0.90</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>8</td>
<td>units</td>
<td>mean ± SEM</td>
<td>p = 0.0078</td>
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<tr>
<td>Fig. legend</td>
<td>5</td>
<td>units</td>
<td>mean ± SEM</td>
<td>p = 0.88</td>
</tr>
<tr>
<td>Fig. legend</td>
<td>10</td>
<td>mice</td>
<td>mean ± SEM</td>
<td>p = 0.0098</td>
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</table>

Nature Neuroscience: doi:10.1038/nn.4447
<table>
<thead>
<tr>
<th>Sup. Fig.</th>
<th>Test</th>
<th>Group Details</th>
<th>N</th>
<th>Type</th>
<th>Method</th>
<th>Statistic</th>
<th>p</th>
<th>H</th>
<th>Statistic</th>
</tr>
</thead>
</table>
| 3f       | paired Wilcoxon signed rank test | 6 mice | mean ± SEM | Fig. legend | 1.3 mm: p = 0.0313  
1.6 mm: p = 0.0313  
1.9 mm: p = 0.0938  
2.2 mm: p = 0.0313 | Fig. legend | Sum of signed ranks: 1.3 mm: 21  
1.6 mm: 21  
1.9 mm: 17  
2.2 mm: 21 |
| 3f       | one sample t-test against 0 | 6 mice | mean ± SEM | Fig. legend | 1.3 mm: t = 1.516  
1.6 mm: t = 1.982  
1.9 mm: t = 2.590  
2.2 mm: t = 3.103 |
| 8e       | Kruskal-Wallis | 163 PY, 111 SC, 27 FS neurons | median, 25,75,10,90 percentiles | Fig. legend | p < 0.0001  
H=36.30 |
| 8e       | post-hoc Dunn’s test | 163 PY, 111 SC, 27 FS neurons | median, 25,75,10,90 percentiles | Fig. legend | PY-SC: p = 0.0283  
PY-FS: p = 0.0001  
SC-FS: p < 0.0001  
Rank sum differences: PY-SC: -27.80  
PY-FS: 84.19  
SC-FS: -112.0 |
| 9c       | Kruskal-Wallis | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | p = 0.289  
H = 2.481 |
| 9c       | post-hoc Dunn’s test | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | PY-SC: p = 0.505  
PY-FS: p = 0.997  
SC-FS: p > 0.999  
Rank sum differences: PY-SC: 7.986  
PY-FS: 5.998  
SC-FS: -1.988 |
| 9d       | Kruskal-Wallis | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | p = 0.0007  
H = 14.66 |
| 9d       | post-hoc Dunn’s test | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | PY-SC: p = 0.074  
PY-FS: p = 0.020  
SC-FS: p = 0.0004  
Rank sum differences: PY-SC: -13.01  
PY-FS: 16.78  
SC-FS: 29.80 |
| 9e       | Kruskal-Wallis | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | p = 0.0002  
H = 17.03 |
| 9e       | post-hoc Dunn’s test | 35 PY, 7 SC, 6 FS neurons | mean ± SEM | Fig. legend | PY-SC: p = 0.0009  
PY-FS: p = 0.034  
SC-FS: p > 0.999  
Rank sum differences: PY-SC: 22.94  
PY-FS: 15.68  
SC-FS: -5.26 |
| 11c      | Friedmann's multiple comparison test | 11 per cell-type different input compositions | all values | Fig. legend | p = 0.0001  
F = 15.8 (Friedmann statistic) |
| 11c      | post-hoc Dunn’s test | 11 per cell-type different input compositions | all values | Fig. legend | PY-SC: p = 0.0110  
PY-FS: p = 0.0004  
SC-FS: p > 0.9999  
Rank sum differences: PY-SC: 13  
PY-FS: 17  
SC-FS: 4 |
| 11d      | Friedmann's multiple comparison test | 11 per cell-type different input compositions | all values | Fig. legend | p < 0.0001  
F = 16.8 (Friedmann statistic) |
### Representative figures

1. Are any representative images shown (including Western blots and immunohistochemistry/staining) in the paper?

   If so, what figure(s)?

   - Fig. 1c,d,g,i
   - Fig. 2a,c-f
   - Fig. 3a
   - Supplementary Fig. 1b-g
   - Supplementary Fig. 2a,b
   - Supplementary Fig. 3a,b,d,e
   - Supplementary Fig. 4a,b
   - Supplementary Fig. 5
   - Supplementary Fig. 6b,c
   - Supplementary Fig. 7a
   - Supplementary Fig. 8a-c
   - Supplementary Fig. 9a

2. For each representative image, is there a clear statement of how many times this experiment was successfully repeated and a discussion of any limitations in repeatability?

   If so, where is this reported (section, paragraph #)?

   All representative images/graphs are displayed together with an analysis of the complete population. The number of repetitions is stated in the respective figure legends.
Statistics and general methods

1. Is there a justification of the sample size?
   If so, how was it justified?
   Where (section, paragraph #)?
   Even if no sample size calculation was performed, authors should report why the sample size is adequate to measure their effect size.
   No statistical methods were used to predetermine sample sizes. However, sample sizes were estimated on the basis of methodically comparable, previous experiments in the laboratory and are similar to those generally employed in the field. This statement is provided in the online methods, "Statistics" section.

2. Are statistical tests justified as appropriate for every figure?
   Where (section, paragraph #)?
   a. If there is a section summarizing the statistical methods in the methods, is the statistical test for each experiment clearly defined?
      Yes. Statistical methods are summarized in the online methods, "Statistics" section. The statistical test for each experiment is stated in the respective figure legends.
   b. Do the data meet the assumptions of the specific statistical test you chose (e.g. normality for a parametric test)?
      Yes, see online methods, "Statistics" section
   c. Is there any estimate of variance within each group of data?
      Is the variance similar between groups that are being statistically compared?
      Yes, variances were calculated; Whenever variances were different, adequate tests were applied. See online methods, "Statistics" section
   d. Are tests specified as one- or two-sided?
      Two-sided
   e. Are there adjustments for multiple comparisons?
      Yes, see online methods, "Statistics" section

3. To promote transparency, Nature Neuroscience has stopped allowing bar graphs to report statistics in the papers it publishes. If you have bar graphs in your paper, please make sure to switch them to dot-plots (with central and dispersion statistics displayed) or to box-and-whisker plots to show data distributions.
   Whenever possible, underlying data-points along with mean or median values are displayed. Otherwise a box-and-whisker plot with its elements defined in the figure legend is used.

4. Are criteria for excluding data points reported?
   Was this criterion established prior to data collection?
   Where is this described (section, paragraph #)?
   Yes, see online methods. Exclusion criteria are reported in the section describing the respective experiment.

5. Define the method of randomization used to assign subjects (or samples) to the experimental groups and to collect and process data.
   If no randomization was used, state so.
   Where does this appear (section, paragraph #)?
   Randomization procedures were not relevant to this study as there are no comparisons between different experimental conditions. See online methods, "Statistics" section.
6. Is a statement of the extent to which investigator knew the group allocation during the experiment and in assessing outcome included? If no blinding was done, state so. Where (section, paragraph #)?

Blinding procedures were not relevant to this study as there are no comparisons between different experimental conditions. See online methods, "Statistics" section

7. For experiments in live vertebrates, is a statement of compliance with ethical guidelines/regulations included? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

8. Is the species of the animals used reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

9. Is the strain of the animals (including background strains of KO/transgenic animals used) reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

10. Is the sex of the animals/subjects used reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

11. Is the age of the animals/subjects reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

12. For animals housed in a vivarium, is the light/dark cycle reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

13. For animals housed in a vivarium, is the housing group (i.e. number of animals per cage) reported? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

14. For behavioral experiments, is the time of day reported (e.g. light or dark cycle)? Where (section, paragraph #)?

Yes, see Methods, section "Animals"

15. Is the previous history of the animals/subjects (e.g. prior drug administration, surgery, behavioral testing) reported? Where (section, paragraph #)?

Not applicable

a. If multiple behavioral tests were conducted in the same group of animals, is this reported? Where (section, paragraph #)?

Not applicable

16. If any animals/subjects were excluded from analysis, is this reported? Where (section, paragraph #)?

Not applicable
a. How were the criteria for exclusion defined?
   Where is this described (section, paragraph #)?
   Not applicable

b. Specify reasons for any discrepancy between the number of animals at the beginning and end of the study.
   Where is this described (section, paragraph #)?
   Not applicable

Reagents

1. Have antibodies been validated for use in the system under study (assay and species)?
   Yes
   a. Is antibody catalog number given?
      Where does this appear (section, paragraph #)?
      Yes, see online methods, sections "Quantification of MEC retrogradely labeled cells" and "Neuronal identification and antibody staining"
   b. Where were the validation data reported (citation, supplementary information, Antibodypedia)?
      Where does this appear (section, paragraph #)?
      For references see online methods

2. Cell line identity
   a. Are any cell lines used in this paper listed in the database of commonly misidentified cell lines maintained by ICLAC and NCBI Biosample?
      Where (section, paragraph #)?
      Not applicable
   b. If yes, include in the Methods section a scientific justification of their use--indicate here in which section and paragraph the justification can be found.
      Not applicable
   c. For each cell line, include in the Methods section a statement that specifies:
      - the source of the cell lines
      - have the cell lines been authenticated? If so, by which method?
      - have the cell lines been tested for mycoplasma contamination?
      Where (section, paragraph #)?
      Not applicable
Data availability

Provide a Data availability statement in the Methods section under "Data availability", which should include, where applicable:

- Accession codes for deposited data
- Other unique identifiers (such as DOIs and hyperlinks for any other datasets)
- At a minimum, a statement confirming that all relevant data are available from the authors
- Formal citations of datasets that are assigned DOIs
- A statement regarding data available in the manuscript as source data
- A statement regarding data available with restrictions

See our data availability and data citations policy page for more information.

Data deposition in a public repository is mandatory for:

a. Protein, DNA and RNA sequences
b. Macromolecular structures
c. Crystallographic data for small molecules
d. Microarray data

Deposition is strongly recommended for many other datasets for which structured public repositories exist; more details on our data policy are available here. We encourage the provision of other source data in supplementary information or in unstructured repositories such as Figshare and Dryad.

We encourage publication of Data Descriptors (see Scientific Data) to maximize data reuse.

Where is the Data Availability statement provided (section, paragraph #)?

The electrophysiological profiles of all whole-cell recorded neurons in MEC that receive monosynaptic input from MSDB as well as the raw data underlying these profiles are available from figshare. All other data that support the findings of this study are available from the corresponding author upon request. This statement is provided in the online methods, section "Data and code availability".

Computer code/software

Any custom algorithm/software that is central to the methods must be supplied by the authors in a usable and readable form for readers at the time of publication. However, referees may ask for this information at any time during the review process.

1. Identify all custom software or scripts that were required to conduct the study and where in the procedures each was used.

The computational models for pyramidal cells, stellate cells and fast-spiking interneurons were used for predicting synaptic integrative properties of these MEC cell-types. Custom written MATLAB code was used for data analysis.

2. If computer code was used to generate results that are central to the paper's conclusions, include a statement in the Methods section under "Code availability" to indicate whether and how the code can be accessed. Include version information as necessary and any restrictions on availability.

The computational model is available from modelDB (https://senselab.med.yale.edu/modeldb/). All routines for data analysis are available from the corresponding author upon request. This statement is provided in the online methods, section "Data and code availability".

Human subjects
1. Which IRB approved the protocol?
   Where is this stated (section, paragraph #)?
   Not applicable

2. Is demographic information on all subjects provided?
   Where (section, paragraph #)?
   Not applicable

3. Is the number of human subjects, their age and sex clearly defined?
   Where (section, paragraph #)?
   Not applicable

4. Are the inclusion and exclusion criteria (if any) clearly specified?
   Where (section, paragraph #)?
   Not applicable

5. How well were the groups matched?
   Where is this information described (section, paragraph #)?
   Not applicable

6. Is a statement included confirming that informed consent was obtained from all subjects?
   Where (section, paragraph #)?
   Not applicable

7. For publication of patient photos, is a statement included confirming that consent to publish was obtained?
   Where (section, paragraph #)?
   Not applicable

### fMRI studies

For papers reporting functional imaging (fMRI) results please ensure that these minimal reporting guidelines are met and that all this information is clearly provided in the methods:

1. Were any subjects scanned but then rejected for the analysis after the data was collected?
   Not applicable

   a. If yes, is the number rejected and reasons for rejection described?
   Where (section, paragraph #)?
   Not applicable

2. Is the number of blocks, trials or experimental units per session and/or subjects specified?
   Where (section, paragraph #)?
   Not applicable

3. Is the length of each trial and interval between trials specified?
   Not applicable

4. Is a blocked, event-related, or mixed design being used? If applicable, please specify the block length or how the event-related or mixed design was optimized.
   Not applicable
5. Is the task design clearly described?  
   Where (section, paragraph #)?  
   Not applicable

6. How was behavioral performance measured?  
   Not applicable

7. Is an ANOVA or factorial design being used?  
   Not applicable

8. For data acquisition, is a whole brain scan used?  
   If not, state area of acquisition.  
   Not applicable

   a. How was this region determined?  
      Not applicable

9. Is the field strength (in Tesla) of the MRI system stated?  
   Not applicable

   a. Is the pulse sequence type (gradient/spin echo, EPI/spiral) stated?  
      Not applicable

   b. Are the field-of-view, matrix size, slice thickness, and TE/TR/flip angle clearly stated?  
      Not applicable

10. Are the software and specific parameters (model/functions, smoothing kernel size if applicable, etc.) used for data processing and pre-processing clearly stated?  
    Not applicable

11. Is the coordinate space for the anatomical/functional imaging data clearly defined as subject/native space or standardized stereotaxic space, e.g., original Talairach, MNI305, ICBM152, etc? Where (section, paragraph #)?  
    Not applicable

12. If there was data normalization/standardization to a specific space template, are the type of transformation (linear vs. nonlinear) used and image types being transformed clearly described? Where (section, paragraph #)?  
    Not applicable

13. How were anatomical locations determined, e.g., via an automated labeling algorithm (AAL), standardized coordinate database (Talairach daemon), probabilistic atlases, etc.?  
    Not applicable

14. Were any additional regressors (behavioral covariates, motion etc) used?  
    Not applicable

15. Is the contrast construction clearly defined?  
    Not applicable

16. Is a mixed/random effects or fixed inference used?  
    Not applicable

   a. If fixed effects inference used, is this justified?  
      Not applicable

17. Were repeated measures used (multiple measurements per subject)?  
    Not applicable
a. If so, are the method to account for within subject correlation and the assumptions made about variance clearly stated?

Not applicable

18. If the threshold used for inference and visualization in figures varies, is this clearly stated?

Not applicable

19. Are statistical inferences corrected for multiple comparisons?

Not applicable

a. If not, is this labeled as uncorrected?

Not applicable

20. Are the results based on an ROI (region of interest) analysis?

Not applicable

a. If so, is the rationale clearly described?

Not applicable

b. How were the ROI’s defined (functional vs anatomical localization)?

Not applicable

21. Is there correction for multiple comparisons within each voxel?

Not applicable

22. For cluster-wise significance, is the cluster-defining threshold and the corrected significance level defined?

Not applicable

Additional comments

Additional Comments