

## 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 Retina ephys recordings: MC Rack version 4.6.2, MEA 1k Scope; Human psychophysics: MATLAB

Data analysis MATLAB

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](#)

Source data as peak spike rates, along with the relevant analysis scripts for calculating the modulation indices and for reproducing the figures is available on the public GitHub repository <https://github.com/saadidrees/saccadic-suppression>. The official release (v1.0) of the repository can be accessed through doi:10.5281/ZENODO.6399969. All other data are available upon reasonable request.

## 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     | <p>No sample size calculations were performed. For each ganglion cell recorded, responses were averaged in most cases 39 independent observations, for every condition that we tested. In some cases there were less observations. In any case, an effect in the responses was reported as significant only if the power of the statistical test was greater than 80% given the exact number of observations. This was done for all the ganglion cells which were used in different analysis of this paper. For analysis reporting average across cells, sample sizes are sufficient because under baseline conditions, their normalized responses are normally distributed (See the underlying histograms for each case). For all the data averaged data presented in the paper, corresponding underlying population data is also shown.</p> <p>For retina 2-photon calcium imaging, we averaged data from 931 ROIs obtained from 11 scan fields across 4 retinæ from 2 mice.</p> <p>In human psychophysics experiments, we 5 human subjects. These are generally accepted N numbers given the low variability observed and exhaustive experiments.</p>                                      |
| Data exclusions | No data excluded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Replication     | <p>In case of retina electrophysiology, to acquire data, the same experiments were repeated several times with different retinæ, different recording devices and different stimulating devices. In total we performed 47 independent experiments from mice retinæ and 12 independent experiments from pig retinæ. Each experiment, contained the basic paradigm described in this paper and therefore we could pool the cells recorded across these experiments. We did not find any differences in experiments using different recording or stimulating devices.</p> <p>In case of retina 2-photon calcium imaging, the same experiments were repeated several times using 4 retinæ from 2 mice. We did not find any differences across these experiments.</p> <p>In the case of human psychophysics, each subject was measured for multiple sessions and 5 subjects were measured. The same subjects performed multiple versions of the experiments to demonstrate robustness of the differential effects across versions. The number of sessions varied across experiments and subjects. In general, 3 sessions (60 minutes per session) of the experiment was repeated on 5 subjects.</p> |
| Randomization   | Trials (with different conditions) presented to retina in electrophysiology and imaging experiments were randomized to avoid adaptation to any condition. Trials presented to human subjects in psychophysics were randomized to avoid subjects remembering any order. Moreover, multiple background images were used for similar reasons.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Blinding        | Blinding was not required as conditions need not be tested on different groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 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                                           |
|-------------------------------------|-----------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Antibodies                             |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Eukaryotic cell lines                  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Palaeontology and archaeology          |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> Animals and other organisms |
| <input type="checkbox"/>            | <input checked="" type="checkbox"/> Human research participants |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Clinical data                          |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Dual use research of concern           |

### Methods

| n/a                                 | Involved in the study                           |
|-------------------------------------|-------------------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> ChIP-seq               |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> Flow cytometry         |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> MRI-based neuroimaging |

## Animals and other organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laboratory animals      | <p>We used retinæ extracted from PV-Cre x Thy-S-Y male and female mice 3-12 months old. Mice were housed on a 12/12 h light/dark cycle in ambient temperature, ranging between 20-22 °C, and humidity levels of approximately 40%. Mice were dark adapted for 4-16 h before experiments.</p> <p>We also used pig retinæ obtained from domestic female pigs after they had been sacrificed during independent studies at the Department of Experimental Surgery in our Medical Faculty. We have little information on the exact age of the pigs but we only used those retinæ for experiments which seemed healthy and showed light responses.</p> <p>Macaque ex vivo retina experiment was performed at Stanford University. Eyes were removed from a terminally anesthetized macaque rhesus monkey used by other laboratories in the course of their experiments, in accordance with the Institutional Animal Care and Use Committee guidelines of Stanford University</p> |
| Wild animals            | No wild animals were used in this study. We used retinæ from 6 domestic pigs which were bred for experiments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Field-collected samples | No field collected samples were used in this study.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Ethics oversight        | Animal use was in accordance with German and European regulations, and animal experiments were approved by the Regierungspräsidium Tübingen. Macaque ex vivo experiments were in accordance with the Institutional Animal Care and Use Committee guidelines of Stanford University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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

## Human research participants

Policy information about [studies involving human research participants](#)

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Population characteristics | We collected data from 5 healthy adult subjects (one female), aged 24-29 years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Recruitment                | Human subjects provided written, informed consent, and they were paid 10 Euros per session of 60 minutes each. The subjects were recruited through university mailing lists and social media related to psychophysical experiments at the university. The subjects were therefore primarily students. We did not exclude any specific populations otherwise. Given that students at an international university are representative of normal/healthy populations of their age group, the fact that most subjects were likely to be students is unlikely to affect our interpretations. In addition, the phenomena that we studied have been reported robustly previously in other studies, both for similar age groups as well as other older ones. |
| Ethics oversight           | Human experiments were approved by ethics committees at the Medical Faculty of Tübingen University, and they were in accordance with the Declaration of Helsinki.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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