

Reporting Summary

Nature Research 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 Research policies, see [Authors & Referees](#) 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

Android app for data collection works on Android versions 8.1-9. Study 1 used Tobii Pro Lab software version 1.130.

Data analysis

Gaze estimation was done using TF2 with Keras and Scikit Learn (Python 3).
<https://github.com/tensorflow/tensorflow>
<https://scikit-learn.org>
 Further data analysis used Python 3 and colab notebooks.

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/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [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 list of figures that have associated raw data
- A description of any restrictions on data availability

Gaze estimates (inferred x- and y- locations on screen) for the studies are available from the corresponding author [V.N.] upon reasonable request. To protect study participant privacy and consent, the captured full face image data are not publicly available. The source data underlying Figs 1, 2e-f, 3b-e, 4, 5b-e, 6a, 7b-c, 8b-c, 8e-f, 9, Table 1 and Supplementary Figs 2, 3, 4, 5b-c, 6, 7, 8b-c, 9b-c, Supplementary Table 1 are provided as a Source Data file.

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)

Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	The studies in this manuscript are quantitative, and involved eye tracking as participants viewed stimuli on their phones.
Research sample	Similar to previous eye tracking studies in the literature, the sample was representative and spanned ages 18-55, including males and females with normal or corrected vision (no glasses). As described in the Methods section, participants were recruited from the local population in San Francisco Bay area and New York City.
Sampling strategy	Previous eye tracking studies have used a sample size of 2-30 participants. Examples below: [1] Najemnik, Jiri, and Wilson S. Geisler. "Optimal eye movement strategies in visual search." <i>Nature</i> 434.7031 (2005): 387-391. [2] Shimojo, Shinsuke, et al. "Gaze bias both reflects and influences preference." <i>Nature neuroscience</i> 6.12 (2003): 1317-1322. Consistent with previous eye tracking studies, we used 23-37 participants per study. As shown in the results section, we were able to achieve statistically significant results and test our hypotheses using this sample size.
Data collection	Data for all studies were collected using a custom-built Android app which ran on a Pixel 2 XL smartphone. In study 1, for comparison against state-of-the-art mobile eye tracker, data was also collected using Tobii Glasses Pro 2. For each study, data was collected in indoor settings with 5-6 participants seated in a conference room and a researcher providing instructions at the beginning. Researcher was blind to the experimental conditions and was not informed about the study hypothesis.
Timing	Each study had a different timing. Study 1: August 1, 14; Sep 6, 9 2019 Study 2: May 3-13, 2019 Study 3: July 23-24, 2019 Study 4: July 15-16, 2019
Data exclusions	As is common practice with eye tracking studies, we removed participants with high calibration error of over 2 degree viewing angle, as otherwise, the data is too noisy to make robust inferences on where the participant is looking. This translates to removing participants whose gaze error > 1cm (at a viewing distance of ~30cm from the screen). Around 4-8 participants were removed across the studies. Details of the exact number of participants removed are available in the Methods section.
Non-participation	No participants dropped out or declined participation.
Randomization	Participants were not allocated into experimental groups. Studies had a within-subject design, and each participant performed tasks under all experimental conditions, in randomized order.

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
<input checked="" type="checkbox"/>	<input 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

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

Human research participants

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

Population characteristics

See above.

Recruitment

Participants were randomly selected from a pool of user study volunteers who signed up through the Google User Experience Research portal. To minimize self-selection bias, we selected a sample that was representative and diverse and spanned a wide age range (18-55), gender (both males and females), diverse professions.

Ethics oversight

This work has been performed in accordance with relevant guidelines and regulations, and approved by Google AI principles team. The data has been collected with participants' consent in accordance with the Google Privacy and Legal Policy. We added this to the manuscript.

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