

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 <i>P</i> 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	All data were collected using Psychopy version 2020 and above. Experiments 1-3 were collected using the online platform Pavlovia due to the Covid-19 pandemic, whereas Experiment 4 was conducted in person after restrictions had been lifted.
Data analysis	Behavioral data were processed using Matlab (2019b and above). Processing of images was conducted using the SHINE toolbox for Matlab (http://www.mapageweb.umontreal.ca/gosselif/shine/). Psychometric functions were fit using psignifit version 4.0 in Matlab (https://github.com/wichmann-lab/psignifit). Bayesian observer-actor models were fit using the Late Bayesian Inference model code (https://jazlab.org/resources/). All statistical analyses were conducted using JASP version 0.15 and above. rCNN processing was conducted in a Python 3.6 environment using BLnet (https://github.com/cjspoerer/rcnn-sat); code for implementing this can be found at (https://osf.io/fx3n2/)

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 behavioral data, rCNN output, and memorability images used are available at (<https://osf.io/fx3n2/>). The Size/Clutter dataset images are available at (<https://konklab.fas.harvard.edu/#>). The LaMem dataset images are available at (<http://memorability.csail.mit.edu/>).

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	Data were collected with no specific design towards sex and gender, which additionally were not experimental covariates.
Reporting on race, ethnicity, or other socially relevant groupings	Race, ethnicity, or other socially relevant groupings were not used in this study
Population characteristics	Subjects were recruited from the undergraduate pool of students at GMU, ranging in age from 18-35 years old. All subjects were right-handed.
Recruitment	All subjects were recruited at GMU via an online system (SONA systems) for undergraduates to get credit for participating in research through Psychology courses.
Ethics oversight	The GMU Institutional Review Board approved this study

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

Behavioural & social sciences study design

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

Study description	The study is quantitative. We collected behavioral responses from 170 subjects across four experiments. All subjects viewed scene images on a screen and were asked to provide estimates of time (exps 1-4) or memory (exp 4)
Research sample	Data were randomly collected from the GMU undergraduate pool via the SONA recruiting system, which provides course credit to Psychology students taking classes through the department. Sample sizes were chosen on the basis of previous studies. Gender makeup was (59% female, 25% male, 16% not declared). Experiment 1 included 52 subjects (mean age = 20.5, SD = 5.6), Experiment 2 included 50 subjects (mean age = 21, SD = 4.8), Experiment 3 included 48 subjects (mean age = 20.3, SD = 2.5), and Experiment 4 included 21 subjects (mean age = 21.2, SD = 3.66). The rationale for this sample is that it is representative of undergraduates at GMU and commonly tested in Psychology experiments.
Sampling strategy	Data were sampled randomly. All experimental conditions were within-subject, so there was no stratifying of our sample into separate groups. The sample size was determined on the basis of previous experiments by our lab and other groups studying time perception effects in humans.
Data collection	Experiments 1-3 were conducted using the Pavlovia platform, and so each subject performed the task on their personal computer or workstation. Experiment 4 was conducted in person using a PC with a 1000Hz gaming keyboard and a 120Hz gaming monitor. No one was present for Experiment 4 except the participant and the researcher, who was not blind to the research design and hypothesis.
Timing	Experiments 1-3 were conducted in Spring of 2021. Experiment 4 was conducted in Fall of 2022 and Spring of 2023.
Data exclusions	For Experiment 3, we excluded subjects with a bisection point outside the range of tested intervals, or a CV of above 0.5. This was done to ensure that the data in Experiment 3 were accurate; a total of 20 subjects were removed using these criteria. For

Experiments 1, and 2, where single-trial data were analyzed, we excluded trials with reaction times that were below 100ms or above 1s. For Experiment 4, where again single trial data were modeled, we removed trials with reproduced estimates more than 3 standard deviations from the single-subject mean.

Non-participation

No subjects were removed for non-participation

Randomization

Subjects were not allocated in separate experimental groups. Each subject only participated in a single experiment.

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

Plants

Seed stocks

Report on the source of all seed stocks or other plant material used. If applicable, state the seed stock centre and catalogue number. If plant specimens were collected from the field, describe the collection location, date and sampling procedures.

Novel plant genotypes

Describe the methods by which all novel plant genotypes were produced. This includes those generated by transgenic approaches, gene editing, chemical/radiation-based mutagenesis and hybridization. For transgenic lines, describe the transformation method, the number of independent lines analyzed and the generation upon which experiments were performed. For gene-edited lines, describe the editor used, the endogenous sequence targeted for editing, the targeting guide RNA sequence (if applicable) and how the editor was applied.

Authentication

Describe any authentication procedures for each seed stock used or novel genotype generated. Describe any experiments used to assess the effect of a mutation and, where applicable, how potential secondary effects (e.g. second site T-DNA insertions, mosaicism, off-target gene editing) were examined.