The title encapsulates the main findings in <100 characters including spaces and without punctuation

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# Abstract

**The abstract of your manuscript should not exceed 150 words and should not contain any references. It should start with a sentence that introduces the general topic and its significance for a broad audience. It should then describe the specific question(s) your research addresses, what you did and what you found. It should end with a statement that encapsulates the significance of your findings for a broad audience. The abstract should NOT contain any priority/novelty claims (except in the case of genetic discovery). Statements such as "This is the first demonstration..."; "We propose a novel model..." should be removed or reworded. The abstract also does NOT use causal language if the evidence is correlational/cross-sectional and it does NOT interpret absence of evidence as evidence of absence (in the case of null results).**

# Main

The Introduction, Results & Discussion together should not exceed **5,000** words. (There is no limit on the Methods section, although ideally it should not exceed 3,000 words.)

The Introduction should not include any subheadings.

It is Nature Human Behaviour policy not to include **priority claims** in manuscripts (except in the case of genetic discovery). Priority is established by virtue of publication. Please ensure that your manuscript does not include any priority claims (e.g., "This is the first demonstration..."; "We propose a novel model...").

If the evidence you present is **correlational** or **cross-sectional**, you must ensure not to use causal language or language that implies causality – all statements on your results must be about associations.

Your manuscript should NOT **recycle text** from your own or others’ previous publications without proper acknowledgment and citation of the original work. Note that text recycling from the authors’ own work is a form of plagiarism and must be avoided (see our policy here: https://www.nature.com/authors/policies/plagiarism.html). When reusing text verbatim, you must clearly indicate this in your manuscript and identify the original source. If the portion of reused text exceeds 80 words, you must seek permission from the publisher of the original work to reproduce the text.

**References** in Nature Human Behaviour appear as superscript Arabic numerals, in order of mention. The reference list mentions references in the numerical order in which they are mentioned in the main text, including the summary paragraph. If a reference is cited more than once, the same number is used throughout the text and the reference receives a single entry in the reference list. Example references formatted according to our housestyle are provided in the Reference list 1,2,3,4.

Only articles that have been published or accepted by a named publication or recognized preprint server should be in the numbered reference list. If a manuscript is under consideration or not yet submitted, it should be mentioned in the main text only in parentheses, as follows: (Up to five author names, et al., unpublished manuscript). Published conference abstracts, numbered patents and research datasets that have been assigned a digital object identifier may be included in the reference list. Grant details and acknowledgments are not permitted as numbered references.

**Footnotes/endnotes** are not permitted. Either incorporate them in the main text or consider eliminating them.

Do not use **boldface** for any reason except titles/section headings/the first paragraph.

Do not use *italics* for any other function, except for Latin terms (e.g., a priori) or gene symbols/functionally defined locus symbols.

# Results

The results section can have subheadings.

**Frequentist inferential statistics** should be reported in full wherever they occur (main text, Figure captions, Tables) as follows: statistic(degrees of freedom) = value, p = value, effect size statistic = value, % Confidence Intervals = values

P values reported should be **exact**. Do not report ‘ns’ – give the exact value. The smallest P value that should be reported is P <0.001, except in studies of genetic associations.

All statements or interpretations of the results should be supported by appropriate, fully reported statistics. This extends to comparisons of relationships between variables – for example, interpretations pertaining to difference of differences are also supported by appropriate statistics (see Gelman, A. & Stern, H. [The difference between “significant” and “not significant” is not itself statistically significant](http://www.stat.columbia.edu/~gelman/research/published/signif4.pdf). Am. Stat. 60, 328–331 (2006)).

If your manuscript reports **null results**, it must also provide statistical evidence that your study is sufficiently powered to detect the smallest theoretically or pragmatically meaningful effect.

If you wish to interpret theoretically a null finding, you must use appropriate statistical tests (e.g., Bayes Factors or equivalence tests). Support for the null hypothesis over the alternative hypothesis cannot be inferred through a null finding using NHST – if you wish to interpret theoretically the null finding, you must use appropriate statistical tests (Bayes Factors or equivalence tests).

You should not interpret absence of evidence as **evidence of absence** (in the case of null results). There is no statistical test that can demonstrate absence of an effect. Statements such as ‘There is no difference between x and y.’ or ‘X does not affect Y.’ must be revised to read ‘We found [no/little] credible evidence of a difference between x and y.’ or ‘We found [no/little] credible evidence that X affects Y.’ Interpretations of support for the null hypothesis must always be cautious and within the bounds of the evidence provided through Bayes Factors or equivalence tests.

**Marginally significant** statistical results can be mentioned as such, but should not be discussed as theoretically informative for the hypotheses tested.

Indicate whether the **data met the assumptions** of the statistical tests used, including whether normality and equal variances were formally tested. If not, please show data distribution (individual data points) and include the following statement: "Data distribution was assumed to be normal but this was not formally tested.”

Specify whether tests were **one- or two-tailed**, and justify the use of one-tailed tests.

# Discussion

Subheadings are NOT permitted.

Make sure to include a transparent discussion of **limitations**.

# Methods

The Methods section appears at the end of the main text (i.e., after the results have been presented and discussed).

The Methods section can have further subheadings (up to two levels of embedding).

# If your manuscript reports the results of research with human participants, the Methods section starts with a statement confirming that our research complies with all relevant ethical regulations; naming the board and institution that approved the study protocol; and confirming that informed consent was obtained from all human participants. Information on participant compensation is also included.

If your manuscript reports the results of research with **non-human animals**, the Methods section starts with a statement confirming that our research complies with all relevant ethical regulations; naming the board and institution that approved the study protocol; and confirming that the ARRIVE guidelines were used to report the research.

If your manuscript reports the results of a **clinical trial**, the Methods section includes the trial registration number from ClinicalTrials.gov or an equivalent agency.

If our manuscript reports the results of a **Phase 2 or 3 randomized controlled trial**, you should also attach the CONSORT checklist with your submission.

# For human studies, indicate the sex, number and age of participants in every study.

The methods must include a statement indicating how the **sample sizes** were chosen. If a power analysis was used, provide the details of this analysis. If you did not use a power analysis, the following is sufficient: "No statistical methods were used to pre-determine sample sizes but our sample sizes are [similar to/larger than] those reported in previous publications (ref x,y,z)."

# You must have a statement on randomization in the Methods if applicable. Indicate whether the data collection was randomized or appropriately blocked, how subjects/samples were assigned to the various experimental groups and whether there was any randomization in the organization of the experimental conditions or stimulus presentations.

# You must have a statement indicating whether blinding was used in the Methods if applicable. If there was no blinding, this must be clearly stated in the manuscript, as follows: "Data collection and analysis were not performed blind to the conditions of the experiments.”

# Disclose whether any subjects or data points were excluded from the analyses for any reason and note the rationale for the exclusions.

If any of your studies was **pre-registered**, please provide a link to the pre-registration in the Methods section and state the date of pre-registration. You must disclose all deviations from the pre-registered protocol and explain the rationale for deviation (e.g., flaw, suboptimality, or reviewer/editorial request). In cases of deviation in your analysis plan, the originally planned analyses must be reported in Supplementary Information.

# Protocol registration (Registered Reports only)

Provide a protocol registration statement for your Stage 1 in-principle accepted protocol, under the heading ‘Protocol registration’. This statement must take the following form:

The Stage 1 protocol for this Registered Report was accepted in principle on [DATE]. The protocol, as accepted by the journal, can be found at [URL].

# Data availability

This section should inform readers about the availability of the data used to support the conclusions of your study. This information includes accession codes to public repositories (data banks for protein, DNA or RNA sequences, microarray, proteomics data etc…), references to source data published alongside the paper, unique identifiers such as URLs to data repository entries, or data set DOIs, and any other statement about data availability. *Nature Human Behaviour* strongly supports **public availability** of data. Please place the data used in your paper into a public data repository, or alternatively, present the data as Supplementary Information. If data can only be shared on request, please explain why in your Data Availability Statement, and also in the correspondence with your editor. Please note that for the following data types, deposition in a public repository is mandatory: genetic polymorphisms, linked genotype and phenotype data, DNA and RNA sequences and sequencing data.

# Code availability

If you used any custom code, please include a separate “Code availability” statement on the availability of your analysis routines/code. We strongly encourage you to provide the code used for the analysis/modelling in your paper as a separate SI file titled “Supplementary Software”, and include a call-out to it in your Methods section. If possible, please also provide a link (e.g. GitHub) to a live version of your code so that readers can track its updates. At a minimum, you should include the following statement: “Custom code that supports the findings of this study is available from the corresponding author upon request.”

# References

1. Rosenzweig, C. et al. Attributing physical and biological impacts to anthropogenic climate change. Nature **453,** 353–357 (2008).
2. Jones, R. A. L. Soft Machines: Materials and Life (Oxford Univ. Press, 2004).
3. Hao, Z., AghaKouchak, A., Nakhjiri, N. & Farahmand, A. Global Integrated Drought Monitoring and Prediction System (GIDMaPS) data sets. figshare <http://dx.doi.org/10.6084/m9.figshare.853801> (2014).
4. VanderWeele, T. J., Mathur, M. B. & Chen, Y. Outcome-wide longitudinal designs for causal inference: a new template for empirical studies. Preprint at *arXiv* <http://arxiv.org/abs/1810.10164> (2019).
5. No unpublished manuscript (i.e., a manuscript that is in preparation, submitted, under review, or under revision) should be included in the reference list. Only mention such work parenthetically in the main text. No main argument or conclusion can rely on an unpublished manuscript.

# Acknowledgements

Please ensure that you acknowledge all funding sources that supported the work reported in your manuscript and provide grant or contribution numbers in an Acknowledgments section after the references. Indicate what role the funder(s) had in the conceptualization, design, data collection, analysis, decision to publish, or preparation of the manuscript. If any of this information could be perceived as a competing interest, ensure that it is also included in your competing interests statement. If the funder(s) had no role, please include the following statement: “The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript.” If no specific funding supported the work, include the following statement: “The authors received no specific funding for this work.” Keep other acknowledgements brief and do not include thanks to anonymous referees or editors, or effusive comments.

# Author contributions

We require authors to include an author contributions statement of their individual contributions to the paper -- such as experimental work, project planning, data analysis, etc. The statement should be short, and refer to authors by their initials. For details please see the Authorship section of our joint Nature Research Editorial policies at http://www.nature.com/authors/editorial\_policies/authorship.html

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# Figure Legends

**Figure 1. Guidelines for the preparation of figure captions.** Figure captions should be concise and no longer than 350 words. Begin with a brief title and then describe what is presented in the figure and detail all relevant statistical information. See guidelines above for the reporting of statistical tests. The number of participants/observations in each figure (panel) should be specified. Figure legends should all be included at the very end of the manuscript (right before any Tables).

**Figure 2.** **Example figure legend**. (A) Reinforcement learning is significantly negatively correlated with SNR (Pearson’s *r* = −0.28; *P* = 0.003; *n* = 108). (B) Choice kernel is significantly positively correlated with SNR (Pearson’s *r* = 0.22; *P* = 0.03; *n* = 108). (C) Reinforcement learning is significantly negatively correlated with choice kernel (Pearson *r* = −0.46; *P* < 0.001; *n* = 108).

**Figure 3. Guidelines for the preparation of Figures.** You must follow the guidelines detailed in the following document to prepare your figures for final submission: <https://www.nature.com/documents/NRJs-guide-to-preparing-final-artwork.pdf>.There is a limit of **eight** display items in Articles, Resources, and Registered Reports (a combination of Figures and Tables). Move any non-essential figures to the SI. **Remove all figures from the main manuscript file and upload them as individual files, one figure per file (i.e., do not upload individual figure panels separately).** All text figures, including supplementary figures, should be cited in the text in numerical order. Graph axes should start at zero and not be altered in scale to exaggerate effects. A ‘discontinuity’ can be used for the y axis if absolutely necessary due to sizing constraints, but the break must be visually evident and should not impinge on any data points. All relevant figures must have defined error bars. All bar graphs should be converted to a dot-plot format or to a box-and-whisker format to show data distribution. All box-plot elements (center line, limits, whiskers, points) should be defined.

# Tables

**Table 1. Brief title at the top of the Table**

|  |  |  |
| --- | --- | --- |
| **Guideline** | **Yes** | **No** |
| If your Table reports the results of statistical models, full statistical details should be reported (including exact p values and confidence intervals). Do not use asterisks to denote different levels of statistical significance. Statistical tests/models must be reported in full, wherever they occur. |  |  |
| No images/figures should be included in Tables – if a Table has visual elements, please convert it to a Figure. |  |  |
| There is a limit of 4 display elements (a combination of Figures and Tables) in Letters. Please move any non-essential Tables to the SIa. |  |  |
| Tables should appear in their order of mention (both here and in the SI). |  |  |

aNotes on Tables are permitted and should appear at the bottom of the Table (while Table titles should appear at the top).