

Sections of a Stage 1 Registered Report

Nature Ecology & Evolution

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Author information and affiliations, including email address for corresponding author.

Abstract

The abstract of your Stage 1 Registered Report protocol 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 will do, and broadly, what results would confirm or disconfirm your hypotheses. The abstract can be brief and will be slightly revised at Stage 2 submission to include the results.

Introduction

- The Introduction must include a review of the relevant literature that motivates the research question and a full description of the experimental aims (research questions) and hypotheses. Each research question must be motivated, explained and linked to specific hypotheses (predictions). The Introduction must contain a detailed description of these hypotheses:
 - Ensure that your predictions are defined precisely in terms of the specific independent and dependent variables.
 - Listing them as Hypothesis 1, Hypothesis 2 etc (with corresponding H0 in each case, as appropriate) is recommended.
 - The description of hypotheses must commit to interpretation of all potential data patterns (those that are predicted and those that would run counter to predictions). You cannot interpret lack of evidence (e.g. a $p > 0.05$ in a t-test) for the existence of an effect in null hypothesis significance testing as evidence for the absence of an effect. To be able to interpret data patterns other than the predicted effect or a significant difference in the opposite direction, you must commit to using Bayesian inferential methods or frequentist equivalence testing.
 - Where you describe your hypotheses, you must include a call-out to the **mandatory Design Table (Table 1)** – below.
- The only changes that will be allowed to your in-principle-accepted Stage 1 protocol when you resubmit at Stage 2 will be the tense of the sentences. In the Stage 1 protocol, describe the proposed research in the future tense to avoid confusion, e.g. with existing pilot data.
- If the evidence you will present is **correlational** or **cross-sectional**, you must ensure not to use causal language or language that implies causality.
- The Introduction (and the manuscript in its entirety) must **not include priority or novelty claims**.

Methods

Ethics information

- If your protocol describes research with **human participants**, the Methods section must start with a statement confirming that the research complies with all relevant ethical regulations; naming the board and institution that approved the study protocol; and confirming that informed consent will be obtained from all human participants. Information on participant compensation must also be included.
- If your manuscript reports the results of research with **non-human animals**, the Methods section starts with a statement confirming that the 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.

Pilot data

- You may include pilot data, for example to demonstrate the feasibility of your approach. Your pilot studies and results should be described briefly in the main manuscript and reported in full in Supplementary Information.
- Pilot data and custom analyses code should be made available and referred to in the Data Availability statement and Code availability statement. You may also include simulated data, for example to support your power analysis. This should also be made available.
- If you report analyses of pilot data using null hypothesis significance testing (either in the main text or in Supplementary Information), you must report statistics **in full**:
statistic(degrees of freedom) = value, p = value, effect size statistic = value, % Confidence Intervals = values

Design

- Your Methods section must include a description of experimental procedures in sufficient detail to allow another researcher to repeat the methodology exactly, without requiring further information other than that included in the protocol, your Supplementary Information file (if used) and, if applicable, the linked Code and Data (please refer to the **Code Availability** and **Data availability** statements below).
- Provide full descriptions of any outcome-neutral criteria and positive controls. These quality checks might include the absence of floor or ceiling effects in data distributions, positive controls, or other quality checks that are orthogonal to the experimental hypotheses.
- You must have a statement on **randomization** in the Methods, if applicable.
- For experimental studies, make it clear whether the design is within-subjects, between-subjects, mixed, or other.
- You must have a statement indicating whether **blinding** will be used in the Methods, if applicable. If there will be no blinding, this must be clearly stated in the manuscript, as follows: "Data collection and analysis will not be performed blind to the conditions of the experiments."

Sampling plan

- Studies involving Neyman-Pearson inference must include a statistical **power analysis**. Estimated effect sizes should be justified with reference to the existing literature. Since publication bias overinflates published estimates of effect size, power analysis must be based on the **lowest** available or meaningful estimate of the effect size. For frequentist analysis plans, the a priori power must be **0.95 or higher** for all proposed hypothesis tests.
- For studies involving Bayesian analyses with Bayes factors, the predictions of the theory must be specified so that a Bayes factor can be calculated. Authors should indicate what distribution will be used to represent the predictions of the theory and how its parameters will be specified. For inference by Bayes factors, authors must be able to guarantee data collection until the Bayes factor is at least 10 times in favour of the experimental hypothesis over the null hypothesis (or vice versa). Authors with resource limitations are permitted to specify a maximum feasible sample size at which data collection must cease regardless of the Bayes factor; however to be

eligible for advance acceptance this number must be sufficiently large that inconclusive results at this sample size would nevertheless be an important message for the field.

- Regardless of sampling method, you must list all criteria for **data inclusion** and/or **data exclusion** and how this affects your sampling strategy. This includes a full description of proposed sample characteristics. Procedures for objectively defining exclusion criteria due to technical errors or for any other reasons must be specified, including details of how and under what conditions data would be replaced. These details must be summarized in the mandatory **Design table** (Table 1).

Analysis Plan

- Your proposed analysis pipeline must include all pre-processing steps, and a precise description of all planned analyses (including appropriate correction for multiple comparisons if applicable). Any covariates or regressors must be stated. Where analysis decisions are contingent on the outcome of prior analyses, these contingencies must be specified and adhered to.
- Do not include exploratory analyses in the Stage 1 protocol. These should be reported in the Stage 2 manuscript, under the heading **Exploratory Analyses**.
- **Should you need to deviate in any way from the description of your work in the Methods after acceptance in principle, you must seek editorial feedback first (before implementing these changes).**

Timeline for completion of the study

Timeline for completion of the study and proposed resubmission date if Stage 1 review is successful. Extensions to this deadline can be negotiated with the handling editor.

Data availability

For Registered Reports, public sharing of data and materials upon acceptance for publication of the Stage 2 manuscript is mandatory. Please include a statement committing to sharing your raw data and materials on acceptance of your Stage 2 manuscript. Please deposit any pilot data that you may have already collected. Pilot data should be made accessible for peer-review, but can be placed under embargo until Stage 2 acceptance.

Code availability

For Registered Reports, public sharing of all code upon acceptance for publication of the Stage 2 manuscript is mandatory. Please include a statement committing to sharing all code on acceptance of your Stage 2 manuscript. The Code availability statement must be included separately from the Data availability statement. Please provide a link (e.g. GitHub, osf) to a live version of your code. Code used to simulate data, conduct power analyses, and analyse pilot data should be made accessible in the same location. The code must be made available for peer-review, but can be placed under public embargo until Stage 2 acceptance.

Results

Do **not** include a **Results** section.

Discussion

Do **not** include a **Discussion** section.

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) have/had no role, please include the following statement: **“The funders have/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 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 (see the CRediT taxonomy for relevant contributor roles: <https://casrai.org/credit/>). 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

Competing interests

We ask authors to declare both financial and non-financial competing interests. For more details, see <https://www.nature.com/authors/policies/competing.html>. If you have no financial or non-financial competing interests, please state so: “The authors declare no competing interests.”

Supplementary information

Please report pilot data in detail here and include any other material that provides background information.

Figures

You are encouraged to include Figures in the text or at the end of the protocol. Keep in mind that a total of 6 display elements (i.e., combination of Tables and Figures) is permitted in the final, Stage 2, submission. Figures/Tables that are not essential should be included in your Supplementary Information file.

Figure Legends

Figure 1. Guidelines for the preparation of figure captions. Figure captions should be concise. Begin with a brief title and then describe what is presented in the figure and detail all relevant statistical information. If you show pilot data, list the N of each plot and report full statistics.

Table 1. Design Table

You must include this mandatory **Design table**. The columns are prescribed; the number of rows will depend on the number of research questions you will address in your Registered Report.

- Ensure that there is an **exact** correspondence between each scientific hypothesis and each statistical test. For example, it is not appropriate to write: Condition A will affect performance differently from Condition B. Instead, you must define the performance measure (e.g. Reaction Time) and the predicted direction of the difference. This would translate to, e.g.: Reaction times will be significantly higher in Condition A than Condition B.
- If your analysis strategy will depend on the results (e.g. normal vs. non-normal distribution) then specify the contingencies for making different choices, i.e. IF-THEN statements.
- You cannot interpret lack of evidence for the existence of an effect in NHST (e.g. a $p > 0.05$ in a t-test) as evidence for the absence of an effect. To be able to interpret null results, you must commit to using Bayes Factors or equivalence testing.

Question	Hypothesis	Sampling plan (e.g. power analysis)	Analysis Plan	Interpretation given to different outcomes