These rules guided how we conducted the pre-registered report: Kopiske, K. K., Bruno, N., Hesse, C., Schenk, T., & Franz, V. H. (2016). The functional subdivision of the visual brain: Is there a real illusion effect on action? A multi-lab replication study. Cortex. (rules retrieved April, 29th 2013 from Cortex-Website).

Guidelines for reviewers

Registered Reports are a form of empirical article in which the methods and proposed analyses are pre-registered and reviewed prior to research being conducted. High quality protocols are then provisionally accepted for publication before data collection commences. This format of article is designed to reward best practice in adhering to the hypothetico-deductive model of the scientific method. It neutralises a number of questionable research practices, including low statistical power, selective reporting of results, and publication bias, while also allowing complete flexibility to conduct exploratory (unregistered) analyses and report serendipitous findings. (Chambers, 2013).

General reviewer guidelines can be found here: http://www.elsevier.com/reviewers/reviewer-guidelines

The review process for *Registered Reports* is divided into two stages. In Stage 1, reviewers assess study proposals **before** data is collected. In Stage 2, reviewers consider the full study, including results and interpretation.

Stage 1 manuscripts will include only an Introduction, Methods (including proposed analyses), and Pilot Data (where applicable). In considering papers at Stage 1, reviewers will be asked to assess:

- The significance of the research question(s)
- The logic, rationale, and plausibility of the proposed hypotheses
- The soundness and feasibility of the methodology and analysis pipeline (including statistical power analysis)
- Whether the clarity and degree of methodological detail would be sufficient to replicate exactly the proposed experimental procedures and analysis pipeline
- Whether the authors provide a sufficiently clear and detailed description of the methods to prevent undisclosed flexibility in the experimental procedures or analysis pipeline
- Whether the authors have considered sufficient outcome-neutral conditions (e.g. absence of floor or ceiling effects; positive controls) for ensuring that the results obtained are able to test the stated hypotheses

Following Stage 1 peer review, manuscripts will be accepted, offered the opportunity to revise, or rejected outright. Manuscripts that pass peer review will be issued an *in principle acceptance* (IPA), indicating that the article will be published pending successful completion of the study according to the pre-registered methods and analytic procedures, as well as a defensible and evidence-based interpretation of the results.

Following completion of the study, authors will complete the manuscript, including Results and Discussion sections. These Stage 2 manuscripts will more closely resemble a regular article format. The manuscript will then be returned to the reviewers, who will be asked to appraise:

- Whether the data are able to test the authors' proposed hypotheses by passing the approved outcome-neutral criteria (such as absence of floor and ceiling effects)
- Whether the Introduction, rationale and stated hypotheses are the same as the approved Stage 1 submission (required)
- Whether the authors adhered precisely to the registered experimental procedures
- Whether any unregistered *post hoc* analyses added by the authors are justified, methodologically sound, and informative
- Whether the authors' conclusions are justified given the data

Please note that editorial decisions will not be based on the perceived importance, novelty, or clarity of the results.

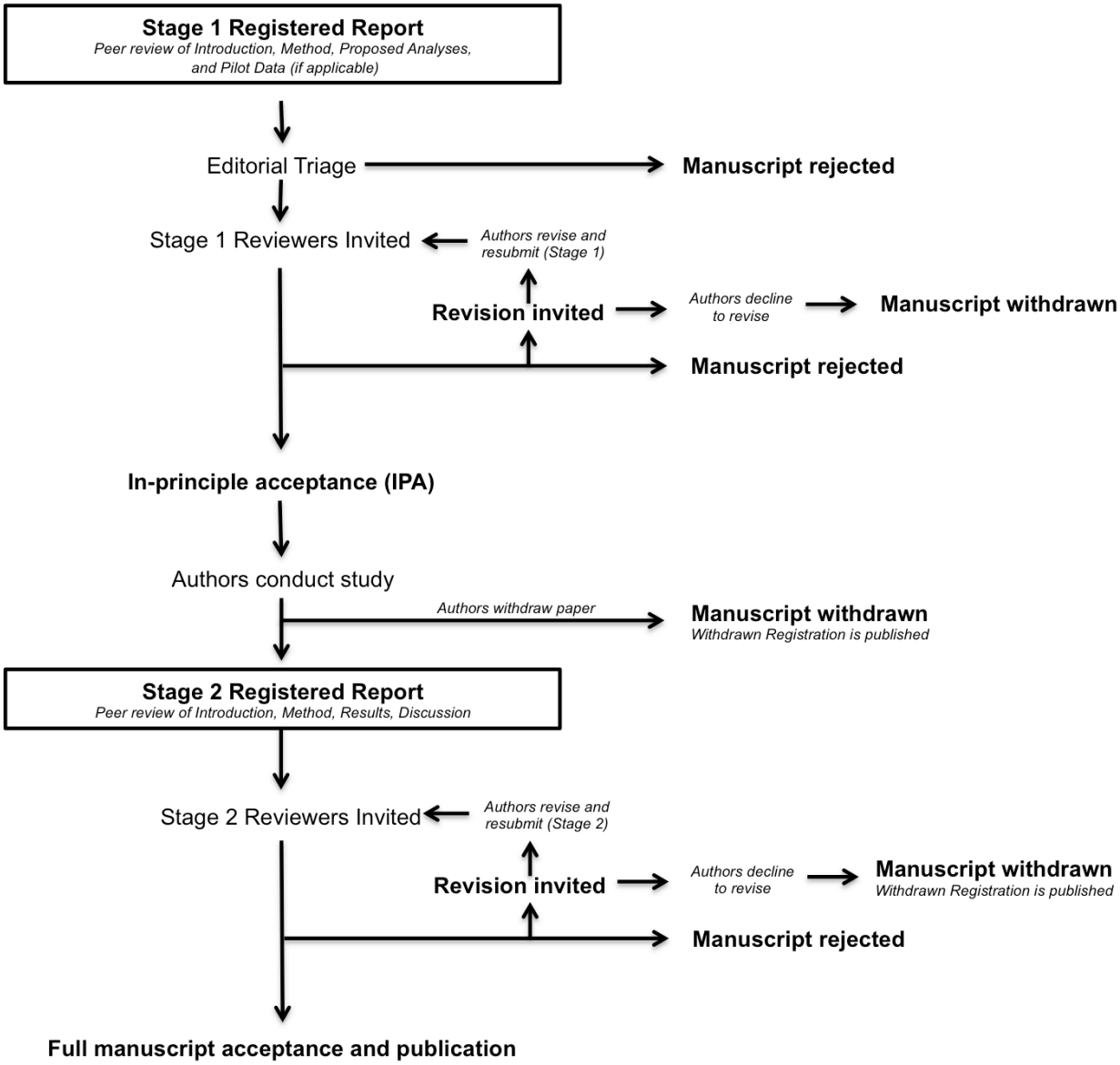
Guidelines for authors

Registered Reports are a form of empirical article in which the methods and proposed analyses are pre-registered and reviewed prior to research being conducted.

The cornerstone of this article format is that a significant part of the manuscript will be assessed prior to data collection. Initial submissions will include a description of the key research question and background literature, hypotheses, experimental procedures, analysis pipeline, a statistical power analysis (or Bayesian equivalent), and pilot data (where applicable).

Initial submissions will be triaged by an editorial team for scientific significance. Those that pass triage will then be sent for in-depth peer review (Stage 1). Following review, the article will then be either rejected or accepted in principle for publication. Following in principle acceptance (IPA), the authors will then proceed to conduct the study, adhering exactly to the peer-reviewed procedures. When the study is complete the authors will submit their finalised manuscript for re-review (Stage 2) and will upload their raw data and laboratory log to a free and publicly accessible file-sharing service. Pending quality checks and a sensible interpretation of the findings, the manuscript will be published regardless of the results.

The review process for *Registered Reports*



Stage 1: Initial manuscript submission and review

Due to the high volume of submissions, the editorial team will select only the most scientifically promising manuscripts for in-depth peer review. Stage 1 submissions should include the manuscript (details below) and a brief cover letter. Authors are welcome to submit presubmission enquires for advice on the likely suitability of a study as a *Registered Report*. However, please note that the editorial board will not agree to send manuscripts for in-depth review until a complete Stage 1 submission has been considered.

The cover letter should include:

- A brief scientific case for consideration. Authors are encouraged to refer to the likely *replication value* of the research (Nosek et al., 2012). High-value replication studies are welcome and will be treated with equal priority to novel studies.
- A statement confirming that all necessary support (e.g. funding, facilities) and approvals (e.g. ethics) are in place for the proposed research. Note that manuscripts will be considered only for studies that are able to commence immediately.
- An anticipated timeline for completing the study if the initial submission is accepted.
- A statement confirming that the authors agree to share their raw data and laboratory log for all published results.
- A statement confirming that if the authors later withdraw their paper, they agree to the Journal publishing a short summary of the pre-registered study under a section *Withdrawn Registrations*.

Manuscript preparation guidelines – Stage 1

For general guidelines for manuscript preparation see:
http://www.elsevier.com/journals/cortex/0010-9452/guide-for-authors

Initial Stage 1 submissions should include the following sections:

- Introduction
  - A review of the relevant literature that motivates the research question and a full description of the experimental aims and hypotheses. Please note that following IPA, the Introduction section cannot be altered (see below).
- Methods
  - Full description of proposed sample characteristics, including criteria for subject inclusion and exclusion, and detailed description of procedures for defining outliers. Procedures for objectively defining exclusion criteria due to technical errors (e.g. defining what counts as 'excessive' head movement during fMRI) or for any other reasons must be documented, including details of how and under what conditions subjects would be replaced.
  - A description of experimental procedures in sufficient detail to allow another researcher to repeat the methodology exactly, without requiring further information. These procedures must be adhered to exactly in the subsequent experiments or any Stage 2 manuscript will be summarily rejected. Please note that reviewers at Stage 1 will be asked to specifically consider whether the stated experimental procedures contain sufficient detail to prevent undisclosed procedural flexibility.
  - Proposed analysis pipeline, including all preprocessing steps, and a precise description of all planned analyses, including appropriate correction for multiple comparisons. Any covariates or regressors must be stated. Consistent with the guidelines of Simmons et al. (2011), proposed analyses involving covariates must be reported with and without the covariate(s) included. Neuroimaging studies must document in advance, and in precise detail, the complete analysis pipeline from raw data onwards. Where analysis decisions are contingent on the outcome of prior analyses, these contingencies must be specified and adhered to. Only pre-planned analyses can be reported in the main

Results section of Stage 2 submissions. However, unplanned *post hoc* analyses will be admissible in a separate section of the Results (see below).

- Studies involving Neyman-Pearson inference must include a statistical power analysis. Estimated effect sizes should be justified with reference to the existing literature. To account for existing publication bias, which leads to overestimation of true effect sizes (Hedges and Vevea, 1996; Lane and Dunlap, 1978), power analysis must be based on the *lowest* available or meaningful estimate of the effect size. The *a priori* power ($1 - \beta$) must be 0.9 or higher for all proposed statistical tests. In the case of highly uncertain effect sizes, a variable sample size and interim data analysis will be permissible but with inspection points stated in advance, appropriate Type I error correction for 'peeking' employed (Strube, 2006), and a final stopping rule for data collection outlined.
- For studies involving 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 example, will you use a uniform up to some specified maximum, or a normal/half-normal to represent a likely effect size (Dienes, 2011), or a JZS/Cauchy with a specified scaling constant (Rouder et al., 2009)? The parameters need not be stated in advance, but where unstated, authors must indicate what aspect of data will be used to set those parameters. For inference by Bayes factors, authors should guarantee testing participants until the Bayes factor is either more than 3 and less than 0.33 to ensure clear conclusions. When using Bayes factors, adjustments for multiple comparisons are not required. For advice on Bayes factors, prospective authors are invited to contact the editorial board: cortex@ed.ac.uk
- Full descriptions must be provided of any outcome-neutral criteria that are required for successful testing of the stated hypotheses. Such 'reality checks' might include the absence of floor or ceiling effects, or positive controls. Please note that reviewers will be asked to judge whether the manuscript includes sufficient specification of reality checks.
- Timeline for completion of the study and proposed resubmission date if registration review is successful. Extensions to this deadline can be negotiated with the action editor.
- Any description of prospective methods or analysis plans should be written in future tense.

- Pilot Data
  - Optional. Can be included to establish reality checks, effect size estimations, feasibility, or proof of principle. Any pilot experiments will be published with the final version of the manuscript and will be clearly distinguished from data obtained for the main experiment(s).

Stage 1 submissions that are judged by the editorial board to be of sufficient quality and scientific significance will be sent for peer review. In considering papers at the registration stage, reviewers will be asked to assess:

- The significance of the research question(s)
- The logic, rationale, and plausibility of the proposed hypotheses
- The soundness and feasibility of the methodology and analysis pipeline (including statistical power analysis)
- Whether the clarity and degree of methodological detail would be sufficient to replicate exactly the proposed experimental procedures and analysis pipeline
- Whether the authors provide a sufficiently clear and detailed description of the methods to prevent undisclosed flexibility in the experimental procedures or analysis pipeline
- Whether the authors have considered sufficient outcome-neutral conditions (e.g. absence of floor or ceiling effects; positive controls) for ensuring that the results obtained are able to test the stated hypotheses

Following Stage 1 peer review, manuscripts will be rejected outright, offered the opportunity to revise, or accepted. Manuscripts that pass peer review will be issued an *in principle acceptance* (IPA), indicating that the article will be published pending successful completion of the study according to the exact methods and analytic procedures outlined, as well as a defensible and evidence-bound interpretation of the results.

Please note that any deviation from the stated experimental procedures, regardless of how minor it may seem to the authors, could lead to rejection of the manuscript. In cases where the pre-registered protocol is altered after IPA due to unforeseen circumstances (e.g. change of equipment or unanticipated technical error), the authors must consult the editorial board immediately for advice, and prior to the completion of data collection. Minor changes to the protocol may be permitted according to editorial discretion. In such cases, IPA would be preserved and the deviation reported in the Stage 2 submission. If the authors wish to alter the experimental procedures more substantially following IPA but still wish to publish their article as a Registered Report then the manuscript must be withdrawn and resubmitted as a new Stage 1 submission. Note that registered analyses must be undertaken, but additional unregistered analyses can also be included in a final manuscript (see below).

Stage 2: Full manuscript review

Once the study is complete, authors prepare and resubmit their manuscript for full review, with the following additions:

- Submission of raw data and laboratory log
    - Raw data must be made freely available in a public repository with a link to the archive provided within the Stage 2 manuscript. Authors are invited to use the Cortex Dataverse resource (http://thedata.harvard.edu/dvn/dv/cortex) but the final decision about which archive to use rests with the authors. Data files should be appropriately time stamped to show that data was collected *after* IPA and not before. Other than pre-registered and approved pilot data, no data acquired *prior* to the date of IPA is admissible in the Stage 2 submission. Raw data must be accompanied by guidance notes, where required, to assist other scientists in replicating the analysis pipeline. Authors are also encouraged to upload any relevant analysis scripts and other experimental materials that would assist in replication (e.g. stimuli & presentation code).
    - Any supplementary figures, tables, or other text (such as supplementary methods) can either be included as standard supplementary information that accompanies the paper, or they can be archived together with the data. Please note that the raw data itself should be archived (see above) rather than submitted to the journal as supplementary material.
    - The authors must collectively certify in the resubmission Cover Letter that all non-pilot data was collected after the date of IPA. A basic laboratory log must also be provided outlining the range of dates during which data collection took place. This log should be uploaded to the same public archive as the data, with a link provided to the log in the resubmission Cover Letter.
- Background, Rationale and Methods
    - Apart from minor stylistic revisions, **the Introduction cannot be altered from the approved Stage 1 submission, and the stated hypotheses cannot be amended or appended**. At Stage 2, any description of the rationale or proposed methodology that was written in future tense within the Stage 1 manuscript should be changed to past tense. Any textual changes to the Introduction or Methods must be clearly marked in the Stage 2 submission. Depending on the timeframe of data collection, new relevant literature may have appeared between Stage 1 and Stage 2. Any such literature should be covered in the Discussion.
- Results & Discussion
    - These will be similar to standard *Research Reports* but with added requirements. The outcome of all registered analyses must be reported in the manuscript, except in rare

instances where a registered and approved analysis is subsequently shown to be logically flawed or unfounded. In such cases, the authors, reviewers, and editor must agree that a collective error of judgment was made and that the analysis is inappropriate. In such cases the analysis would still be mentioned in the Methods but omitted with justification from the Results.

- It is reasonable that authors may wish to include additional analyses that were not included in the registered submission. For instance, a new analytic approach might become available between IPA and full review, or a particularly interesting and unexpected finding may emerge. Such analyses are admissible but must be clearly justified in the text, appropriately caveated, and reported in a separate section of the Results titled "*Post hoc analyses*". Authors should be careful not to base their conclusions entirely on the outcome of statistically significant *post hoc* analyses.
- Authors will be required to report exact *p* values and effect sizes for all inferential tests using the Neyman-Pearson approach.

The resubmission will ideally be considered by the same reviewers as in the *registration* stage, but could also be assessed by fresh reviewers. In considering papers at Stage 2, reviewers will be asked to decide:

- Whether the data are able to test the authors' proposed hypotheses by passing the approved outcome-neutral criteria (such as absence of floor and ceiling effects)
- Whether the Introduction, rationale and stated hypotheses are the same as the approved Stage 1 submission (required)
- Whether the authors adhered precisely to the registered experimental procedures
- Whether any unregistered *post hoc* analyses added by the authors are justified, methodologically sound, and informative
- Whether the authors' conclusions are justified given the data

Crucially, reviewers will be informed that editorial decisions will not be based on the perceived importance, novelty or clarity of the results. Thus while reviewers are free to enter such comments on the record, they will not influence editorial decisions.

Manuscript withdrawal and *Withdrawn Registrations*

It is possible that authors with IPA may wish to withdraw their manuscripts following or during data collection. Possible reasons could include technical error or an inability to complete the study due to other unforeseen circumstances. In all such cases, manuscripts can of course be withdrawn. However, the journal will publicly record each case in a section called *Withdrawn Registrations*. This section will include the authors, proposed title, the abstract from the approved Stage 1 submission, and brief reason(s) for the failure to complete the study. Partial withdrawals are not possible; i.e. authors cannot publish part of a registered study by selectively withdrawing one of the planned experiments. Such cases must lead to withdrawal of the entire paper.

Incremental Registrations

Authors have the option to add experiments to approved submissions. In such cases the approved manuscript will be considered accepted for publication, and authors will be able to propose additional experiments for Stage 1 consideration. Where these experiments would extend the approved submission (as opposed to being part of new submissions), the editorial team will seek to fast-track the review process. This option may be particularly appropriate where an initial experiment reveals a major serendipitous finding that warrants follow-up within the same paper. In cases where an incremented submission is rejected (at either Stage 1 or 2), authors will retain the option of publishing the most recently approved version of the manuscript. For further advice on specific scenarios for incremental registration, authors are invited to contact the editorial board (cortex@ed.ac.uk).

References

Chambers CD. Registered Reports: a new publishing initiative at Cortex. *Cortex*, 49(3): 609–610, 2013.

Dienes Z. Bayesian Versus Orthodox Statistics: Which Side Are You On? *Perspectives on Psychology Science*, 6(3): 274–290, 2011.

Hedges LV & Vevea, JL. Estimating effect size under publication bias: Small sample properties and robustness of a random effects selection model. *Journal of Educational and Behavioral Statistics,* 21(4): 299–332, 1996.

Lane DM & Dunlap WP. Estimating effect size: Bias resulting from the significance criterion in editorial decisions. *British Journal of Mathematical and Statistical Psychology*, 31(2): 107–112, 1978.

Nosek BA, Spies JR, & Motyl M. Scientific utopia: II. Restructuring incentives and practices to promote truth over publishability. *Perspectives on Psychological Science,* 7(6): 615–631, 2012.

Rouder J, Speckman PL, Sun D, Morey RD (2009). Bayesian *t* tests for accepting and rejecting the null hypothesis. *Psychonomic Bulletin & Review*, 16(2): 225–237, 2009.

Simmons JP, Nelson LD, and Simonsohn U. False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, 22(11): 1359–1366, 2011.

Strube MJ. SNOOP: A program for demonstrating the consequences of premature and repeated null hypothesis testing. *Behavior Research Methods*, 38(1): 24–27, 2006. Software available from http://www.artsci.wustl.edu/~socpsy/Snoop.7z