In November 2015, representatives (mostly editors-in-chief) from more than 20 journals in ecology and evolution joined researchers and funding agency panelists to identify ways to improve transparency in these disciplines. This workshop (funded by the US National Science Foundation and by the Laura and John Arnold Foundation and hosted by the Center for Open Science) identified general principles and specific tools that journals can adopt to encourage greater transparency of the science they publish. Most of the ideas that emerged from the workshop rest within the recently developed Transparency and Openness Promotion (TOP) framework (https://cos.io/top/). At this time, TOP contains eight separate editorial guidelines for journals, each designed to be adoptable by any empirical discipline. Some of these general guidelines require additional discipline-specific explanations. Accordingly, the workshop produced content (posted below, https://osf.io/g65cb/) designed to help journals in ecology and evolution adopt TOP guidelines. This content is available for use by any journal. Both the general TOP guidelines (https://cos.io/top/) and the discipline-specific interpretations provided below are living documents that will be updated through formal review processes. Journals that adopt the TOP framework can choose to adopt any combination of the eight guidelines as well as the level of stringency (from 1, most lenient, to 3 most stringent) for each guideline adopted. Journals can also choose to award badges to acknowledge open practices (https://osf.io/tvyxz/) to individual papers to indicate that the paper conforms to one of three specific transparency standards.

A brief summary of the TOP guidelines is presented in Table 1 below, a more comprehensive summary is presented at the end of this document, and full details can be located at https://cos.io/top/.

Table 1. A list, with brief explanations, of each of eight the existing Transparency and Openness Promotion (TOP) guidelines (https://cos.io/top/).

|  |
| --- |
| TOP Guideline |
| 1. Citation standards (citation of data set etc.) |
| 2. Data transparency (data archiving) |
| 3. Analytic methods (code) transparency (code archiving) |
| 4. Research materials transparency (materials archiving) |
| 5. Design and analysis transparency (reporting of details of methods and results) |
| 6. Pre-registration of studies (registering study prior to initiation) |
| 7. Pre-registration of analysis plans (registering analysis plan prior to study initiation) |
| 8. Replication (a study designed to replicate a previously published study) |

The primary purpose of this document is to provide checklist questions that facilitate adoption of various TOP guidelines (please visit https://cos.io/top/) by journals in ecology and evolutionary biology. Individual checklist items can be adopted or developed as appropriate by each journal that chooses to do so. These are most likely to be effective and consistent across journals if they are synchronized with particular TOP guidelines (https://cos.io/top/). Checklists can be provided to authors, to reviewers, and/or to editors, but will probably be most useful when provided to all three groups.

Author checklists

The following checklists are designed to help authors maximize transparency of their work with the goal of facilitating scientific progress. Transparency includes making available data, computer code from data manipulations and analyses, and details of methods for other scientists to evaluate and replicate. All data analyses conducted as part of a study, not just those analyses with the most interesting results, should be reported. This includes the details of sample sizes and analysis design as well as complete sets of relevant output. In many cases, information can be posted in supplementary materials or online databases. Sharing this information is vital for many reasons. Not only does it promote appropriate interpretation of published results, it also facilitates future data syntheses and replications.

Individual checklist items can be adopted or developed as appropriate by each journal that chooses to do so. These are most likely to be effective and consistent across journals if they are synchronized with particular TOP guidelines. Many of these items provide discipline-specific guidance regarding individual TOP guidelines as suggested in the TOP documentation.

Author checklist questions can be used in multiple ways. Several approaches have been suggested to insure that guidelines are not overlooked or ignored by authors and reviewers while reducing the burden on reviewers and editors to check for compliance. Non-mutually exclusive options include:

a. Presenting checklists as a component of Instructions for Authors

b. Requesting that authors check each question and sign the checklist

c. Requesting that authors list the page number where each checklist item is reported

d. Requesting that authors copy and paste into the checklist the text in which each checklist item is reported

-If authors are asked to explicitly address checklist compliance, this can be required at the time of submission or at the time of invitation to revise and resubmit.

-Journals may opt to send authors’ responses to checklist questions to reviewers along with the manuscript.

Basic checklist for empirical studies:

|  |  |  |
| --- | --- | --- |
| Category | Description | Relevant TOP guideline or badge |
| **Introduction** |  |  |
| Study purpose | State the original purpose for which the study was conducted and data were gathered | TOP 5 |
| **Methods** |  |  |
| Meta-analysis | If study is a meta-analysis, comply with required components of meta-analysis checklist (see separate checklist) | TOP 5 |
| Context | If paper is reporting results from a portion of a larger study, include a statement about the broader scope of the larger study and, if appropriate, indicate other publications from this study | TOP 5 |
| Blinding | If possible, data recorders should be blind to the experimental treatment imposed on the subjects when gathering data. Also, report whether or not blinding was implemented. | TOP 5 |
| Location | For field studies, include specific location(s) (e.g., latitude and longitude, elevation, water depth) | TOP 5 |
| Timing of study | Report study start date, end date, duration, and justification for duration and end date | TOP 5 |
| Timing of sampling | Report timing (date, time of day if appropriate, etc.) and frequency of sampling, including storage duration for samples | TOP 5 |
| Study conditions | Describe environmental or other conditions that authors believe may be relevant to the study question and taxa (e.g., temperature, light:dark cycle, etc.) | TOP 5 |
| Subjects and treatments | Report methods used to choose subjects and to allocate subjects to treatments (e.g. randomized assignment), including organism taxon/taxa, source, and background (e.g., inbred lines, commercial seed, wild caught from X number of males and females and laboratory bred for Y generations, etc.) with institutional approvals as required and appropriate | TOP 5 |
| Design | Describe design of experiment or study, including complete treatment factors and interactions, design structure (e.g., factorial, blocked, nested, hierarchical), nature of experimental units and replicates | TOP 5 |
| Magnitude of treatment | Report both treatment and control values (with units and variation) for independent (explanatory/predictor) variables. | TOP 5 |
| Sample size determination | Report how sample size was decided upon or determined. If sample size not set prior to initiation of study, explain stopping rule for sampling | TOP 5 |
| Sample sizes | Report sample sizes for all data, including subsets of data (e.g., each treatment group, other subsets), and sample size used for all statistical analyses. Ideally also reported in results section. | TOP 5 |
| Analysis methods | Provide the precise details of data analysis (including information on computer software programs and packages, and annotated full code or set of commands) as supplementary materials with submission and archived on a permanently supported platform upon publication. | TOP 3 |
| Data | Post data upon which analyses are based as supplementary materials with submission and archived in a permanently supported, publicly accessible database upon publication | TOP 2 |
| Materials | Provide comprehensive materials as supplementary documentation with submission and archived on a permanently supported platform upon publication. These are materials that are excluded from the methods section but which might be important for interpreting results or later attempts to replicate the study. | TOP 4 |
| Voucher specimens | If relevant, possible and allowable, deposit voucher specimens of the studied taxon/taxa in an appropriate curated collection | TOP 5 |
| Replication | If study is a replication, identify it as such and identify differences in methods between this study and original | TOP 8 |
| Funding and conflicts of interest | Disclose all funding sources and potential conflicts of interest |  |
| Ethics and permit | Provide relevant details of ethical and other required permits if applicable (e.g., name of permit, permit number, etc.) |  |
| **Results** |  |  |
| Complete statistical reporting | List each statistical test and analysis conducted in sufficient detail such that they can be replicated and fully understood by those experienced in those methods  Fully report outcomes from each statistical analysis. For most analyses, this includes (but is not limited to) basic parameter estimates of central tendency (e.g., means) or other basic estimates (regression coefficients, correlation) and variability (e.g., standard deviation) or associated estimates of uncertainty (e.g., confidence/credible intervals)  Thorough and transparent reporting will involve additional information that differs depending on the type of analyses conducted.  For null hypothesis tests, this also should at minimum include test statistic, degrees of freedom, and p-value.  For Bayesian analyses, this also should at a minimum include information on choice of priors and MCMC (Markov chain Monte Carlo) settings (e.g. burn-in, the number of iterations, and thinning intervals).  For hierarchical and other more complex experimental designs, full information on the design and analysis, including identification of the appropriate level for tests (e.g. identifying the denominator used for split-plot experiments) and full reporting of outcomes (e.g. including blocking in the analysis if it was used in the design).  Relevant information will differ among other types of analyses but in all cases should include enough information to fully evaluate the design and analysis | TOP 5 |
| *post hoc* acknowledge-ment | When hypotheses were formulated after data analysis, this should be acknowledged | TOP 5 |
| **References** |  |  |
| Citation of archived data, code, and materials | Properly cite any archived data, code, or materials made available by others and used in this manuscript | TOP 1 |

Checklist for papers that are meta-analyses:

(these items primarily represent compliance with TOP 5)

As with the above general checklist, this checklist can be used in multiple ways.

The aim of this checklist is to make syntheses as transparent, repeatable, and unbiased as possible. These guidelines represent recommended best practices and establish a baseline for quality meta-analyses in ecology and evolutionary biology. This checklist is based heavily on the existing PRISMA recommendations: http://prisma-statement.org/.

|  |  |
| --- | --- |
| Category | Description |
| **Introduction** |  |
| Objectives/ research question(s) | Explicit statement of objectives, research questions and scope of study |
| **Methods** |  |
| Scope of study | Clearly identify scope of the study (dates, locations, taxa, type of data) |
| Information sources | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date(s) searched |
| Preregistered protocol | Indicate if a review protocol exists and where it can be accessed (optional) |
| Search criteria | Complete and explicit database search terms including all logical connectors and operators sufficient to exactly duplicate search. Also, indicate all other sources of data (e.g. literature cited sections of published reviews, personal unpublished data, collaborative group project data available from cited sources or online). |
| Study inclusion/ exclusion criteria | Document the specific criteria and methods for inclusion of studies at each stage of the selection process |
| Duplication of search and selection | State how searches were conducted and coded; did two independent observers conduct searches and code results (desirable if possible)? |
| Effect size measures | State and justify the measures of effect size used (e.g., Z-transform of correlation coefficient, standardized mean difference). If formulas for effect size and its sampling variance are not published elsewhere, provide sufficient information to calculate them and evaluate how they are used in analyses; describe their statistical properties and how the effect sizes were calculated or derived. |
| Data extraction process | Describe how data were obtained from published or unpublished sources (e.g. figures digitized using cited software, correspondence with authors), and whether two or more independent observers duplicated data extraction |
| Data collection and processing | List and explain what data were collected even if they were not included in the final analysis (e.g. taxa, latitude/longitude, biomass) and any assumptions, simplifications or transformations made |
| Assessment of biases | Describe whether potential biases were assessed and if so, how this was done (e.g. publication bias, missing data or selective reporting within studies). Assessment could be formal quantitative analysis or narrative. |
| Weighting | Describe methods of weighting studies (e.g. inverse variance weighting) or statistical justification for not weighting |
| Analysis | Delineate general approach to synthesis used (fixed-effect model, random-effects model or hierarchical/multilevel models), specific details of analyses (e.g., model used in meta-regressions with complete description of covariates, including methods used for calculating random effect variance), and assessment of assumptions of the analyses. Describe model selection if appropriate, and also types of analysis for publication bias and missing data, if applicable. Identify software used for all analyses |
| Code | Describe full model specification and provide code or fully specify choices if software package with GUI is used (with citation) |
| Non-independence among study outcomes | Discuss possible sources of non-independence within and among studies and how they were handled (e.g., phylogenetic, time series, multiple analyses of the same database, same control group for multiple comparisons). |
| Other aspects of analyses | Describe how missing data were handled, full description of imputation methods if used, sensitivity analysis if used, etc. |
| **Results** |  |
| Results of study selection process | Provide numbers of studies screened and selected/excluded at each stage (with brief explanation, e.g., ‘wrong field’, ‘non-experimental’) and number of studies/cases included in final analysis, using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-like flowchart (www.prisma-statement.org) |
| Quantitative synthesis results | Summarize and synthesize results across studies, including central tendencies, regression coefficients and heterogeneity as appropriate, specifying confidence/credible intervals (e.g. 95%, 99%) around means and how they were calculated, number of studies included for each meta-analysis or component (e.g. subgroups), evaluation of heterogeneity with statistics reported (e.g. Q, I2), results of sensitivity or other analyses (e.g., excluding a study with a large effect size) or other analyses (e.g., analysis for detecting publication bias and/or correcting for publication bias. |
| Qualitative synthesis results | Summarize and synthesize results across studies; for systematic reviews without meta-analyses, present full categorization and evaluation of the literature and identify areas in which information (original research or published outcomes) is missing |
| **Discussion** |  |
| Main findings | Evaluate and interpret the strength of evidence for the outcomes tested, including heterogeneity and contribution of covariates |
| Possible biases | Evaluate and interpret potential sources and consequences of bias (e.g. publication bias, research bias in choice of systems studied) |

Referee/editor checklist

Note the checklists below are identical to the author checklists included above, except that the referee checklists include a column in which referees assess compliance with each item.

Individual questions can be adopted as appropriate for the journal in questions.

Referee and editor checklist questions can be used in multiple ways. Non-mutually exclusive options include:

a. Presenting them as a component of orientation materials for new editors

b. Providing a link to the checklist to reviewers to consult if they so choose

c. Requesting that reviewers use the checklist as a guide during their review process

d. Requesting that reviewers assess compliance of authors with the checklist

e. Providing the reviewers with the authors’ completed checklist to allow reviewers to assess author compliance

Basic checklist for empirical studies (with compliance assessment options):

|  |  |  |  |
| --- | --- | --- | --- |
| Category | Description | Referee assessment of compliance | Relevant TOP guideline or badge |
| **Introduction** |  |  |  |
| Study purpose | State the original purpose for which the study was conducted and data were gathered | yes / no / incomplete / not applicable | TOP 5 |
| **Methods** |  |  |  |
| Meta-analysis | If study is a meta-analysis, comply with required components of meta-analysis checklist (see separate checklist) | yes / no / incomplete / not applicable | TOP 5 |
| Context | If paper is reporting results from a portion of a larger study, include a statement about the broader scope of the larger study and, if appropriate, indicate other publications from this study | yes / no / incomplete / not applicable | TOP 5 |
| Blinding | If possible, data recorders should be blind to the experimental treatment imposed on the subjects when gathering data. Also, report whether or not blinding was implemented. | yes / no / not reported / not applicable | TOP 5 |
| Location | For field studies, include specific location(s) (e.g., latitude and longitude, elevation, water depth) | yes / no / incomplete / not applicable | TOP 5 |
| Timing of study | Report study start date, end date, duration, and justification for duration and end date | yes / no / incomplete / not applicable | TOP 5 |
| Timing of sampling | Report timing (date, time of day if appropriate, etc.) and frequency of sampling, including storage duration for samples | yes / no / incomplete / not applicable | TOP 5 |
| Study conditions | Describe environmental or other conditions that authors believe may be relevant to the study question and taxa (e.g., temperature, light:dark cycle, etc.) | yes / no / incomplete / not applicable | TOP 5 |
| Subjects and treatments | Report methods used to choose subjects and to allocate subjects to treatments (e.g. randomized assignment), including organism taxon/taxa, source, and background (e.g., inbred lines, commercial seed, wild caught from X number of males and females and laboratory bred for Y generations, etc.) with institutional approvals as required and appropriate | yes / no / incomplete / not applicable | TOP 5 |
| Design | Describe design of experiment or study, including complete treatment factors and interactions, design structure (e.g., factorial, blocked, nested, hierarchical), nature of experimental units and replicates | yes / no / incomplete / not applicable | TOP 5 |
| Magnitude of treatment | Report both treatment and control values (with units and variation) for independent (explanatory/predictor) variables. | yes / no / incomplete / not applicable | TOP 5 |
| Sample size determination | Report how sample size was decided upon or determined. If sample size not set prior to initiation of study, explain stopping rule for sampling | yes / no / incomplete / not applicable | TOP 5 |
| Sample sizes | Report sample sizes for all data, including subsets of data (e.g., each treatment group, other subsets), and sample size used for all statistical analyses. Ideally also reported in results section. | yes / no / incomplete / not applicable | TOP 5 |
| Analysis methods | Provide the precise details of data analysis (including information on computer software programs and packages, and annotated full code or set of commands) as supplementary materials with submission and archived on a permanently supported platform upon publication | yes / no / incomplete / not applicable | TOP 3 |
| Data | Post data upon which analyses are based as supplementary materials with submission and archived in a permanently supported, publicly accessible database upon publication | yes / no / incomplete / not applicable | TOP 2 |
| Materials | Provide comprehensive materials as supplementary documentation with submission and archived on a permanently supported platform upon publication. These are materials that are excluded from the methods section but which might be important for interpreting results or later attempts to replicate the study. | yes / no / incomplete / not applicable | TOP 4 |
| Voucher specimen | If relevant, possible and allowable, deposit voucher specimens of the studied taxon/taxa in an appropriate curated collection | yes / no / incomplete / not applicable | TOP 5 |
| Replication | If study is a replication, identify it as such and identify differences in methods between this study and original | yes / no / incomplete / not applicable | TOP 8 |
| Funding and conflicts of interest | Disclose all funding sources and potential conflicts of interest | yes / no / incomplete |  |
| Ethics and permit | Provide relevant details of ethical and other required permits if applicable (e.g., name of permit, permit number, etc.) | yes / no / incomplete / not applicable |  |
| **Results** |  |  |  |
| Complete statistical reporting | List each statistical test and analysis conducted in sufficient detail such that they can be replicated and fully understood by those experienced in those methods  Fully report outcomes from each statistical analysis. For most analyses, this includes (but is not limited to) basic parameter estimates of central tendency (e.g., means) or other basic estimates (regression coefficients, correlation) and variability (e.g., standard deviation) or associated estimates of uncertainty (e.g., confidence/credible intervals)  Thorough and transparent reporting will involve additional information that differs depending on the type of analyses conducted.  For null hypothesis tests, this also should at minimum include test statistic, degrees of freedom, and p-value.  For Bayesian analyses, this also should at a minimum include information on choice of priors and MCMC (Markov chain Monte Carlo) settings (e.g. burn-in, the number of iterations, and thinning intervals).  For hierarchical and other more complex experimental designs, full information on the design and analysis, including identification of the appropriate level for tests (e.g. identifying the denominator used for split-plot experiments) and full reporting of outcomes (e.g. including blocking in the analysis if it was used in the design).  Relevant information will differ among other types of analyses but in all cases should include enough information to fully evaluate the design and analysis | yes / no / incomplete / not applicable | TOP 5 |
| *post hoc* acknowledge-ment | When hypotheses were formulated after data analysis, this should be acknowledged | yes / no / unclear / not applicable | TOP 5 |
| **References** |  |  |  |
| Citation of archived data, code, and materials | Properly cite any archived data, code, or materials made available by others and used in this manuscript | yes / no / incomplete / not applicable | TOP 1 |

Checklist for papers that are meta-analyses (with compliance assessment options):

This checklist is based heavily on the existing PRISMA recommendations: http://prisma-statement.org/.

|  |  |  |
| --- | --- | --- |
| Category | Description |  |
| **Introduction** |  |  |
| Objectives/ research question(s) | Explicit statement of objectives, research questions and scope of study | yes / absent /  insufficient |
| **Methods** |  |  |
| Scope of study | Clearly identify scope of the study (dates, locations, taxa, type of data) | yes / absent /  insufficient |
| Information sources | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date(s) searched | yes / absent /  insufficient |
| Preregistered protocol | Indicate if a review protocol exists and where it can be accessed (optional) | protocol exists / protocol does not exist / not stated |
| Search criteria | Complete and explicit database search terms including all logical connectors and operators sufficient to exactly duplicate search. Also, indicate all other sources of data (e.g. literature cited sections of published reviews, personal unpublished data, collaborative group project data available from cited sources or online). | yes / absent /  insufficient |
| Study inclusion/ exclusion criteria | Document the specific criteria and methods for inclusion of studies at each stage of the selection process | yes / absent /  insufficient |
| Duplication of search and extraction | State how searches were conducted and coded; did two independent observers conduct searches and code results (desirable if possible)? | duplicated / not duplicated /  not stated |
| Effect size measures | State and justify the measures of effect size used (e.g., Z-transform of correlation coefficient, standardized mean difference). If formulas for effect size and its sampling variance are not published elsewhere, provide sufficient information to calculate them and evaluate how they are used in analyses; describe their statistical properties and how the effect sizes were calculated or derived. | yes / absent /  insufficient |
| Data extraction process | Describe how data were obtained from published or unpublished sources (e.g. figures digitized using cited software, correspondence with authors), and whether two or more independent observers duplicated data extraction | yes / absent /  insufficient |
| Data collection and processing | List and explain what data were collected even if they were not included in the final analysis (e.g. taxa, latitude/longitude, biomass) and any assumptions, simplifications or transformations made | yes / absent /  insufficient |
| Assessment of biases | Describe whether potential biases were assessed and if so, how this was done (e.g. publication bias, missing data or selective reporting within studies). Assessment could be formal quantitative analysis or narrative. | yes / absent /  insufficient |
| Weighting | Describe methods of weighting studies (e.g. inverse variance weighting) or statistical justification for not weighting | yes / absent /  insufficient |
| Analysis | Delineate general approach to synthesis used (fixed-effect model, random-effects model or hierarchical/multilevel models), specific details of analyses (e.g., model used in meta-regressions with complete description of covariates, including methods used for calculating random effect variance), and assessment of assumptions of the analyses. Describe model selection if appropriate, and also types of analysis for publication bias and missing data, if applicable. Identify software used for all analyses | yes / absent /  insufficient |
| Code | Describe full model specification and provide code or fully specify choices if software package with GUI is used (with citation) | yes / absent /  insufficient |
| Non-independence among study outcomes | Discuss possible sources of non-independence within and among studies and how they were handled (e.g., phylogenetic, time series, multiple analyses of the same database, same control group for multiple comparisons). | yes / absent /  insufficient |
| Other aspects of analyses | Describe how missing data were handled, full description of imputation methods if used, sensitivity analysis if used, etc. | yes / absent /  insufficient |
| **Results** |  |  |
| Results of study selection process | Provide numbers of studies screened and selected/excluded at each stage (with brief explanation, e.g., ‘wrong field’, ‘non-experimental’) and number of studies/cases included in final analysis, using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-like flowchart (www.prisma-statement.org) | yes / absent /  insufficient |
| Quantitative synthesis results | Summarize and synthesize results across studies, including central tendencies, regression coefficients and heterogeneity as appropriate, specifying confidence/credible intervals (e.g. 95%, 99%) around means and how they were calculated, number of studies included for each meta-analysis or component (e.g. subgroups), evaluation of heterogeneity with statistics reported (e.g. Q, I2), results of sensitivity or other analyses (e.g., excluding a study with a large effect size) or other analyses (e.g., analysis for detecting publication bias and/or correcting for publication bias. | yes / absent /  insufficient |
| Qualitative synthesis results | Summarize and synthesize results across studies; for systematic reviews without meta-analyses, present full categorization and evaluation of the literature and identify areas in which information (original research or published outcomes) is missing | yes / absent /  insufficient |
| **Discussion** |  |  |
| Main findings | Evaluate and interpret the strength of evidence for the outcomes tested, including heterogeneity and contribution of covariates | yes / absent /  insufficient |
| Possible biases | Evaluate and interpret potential sources and consequences of bias (e.g. publication bias, research bias in choice of systems studied) | yes / absent /  insufficient |

TOP guidelines summary

(Guidelines for **T**ransparency and **O**penness **P**romotion in journal policies and practices)

For the complete TOP guidelines, visit https://cos.io/top/. Detailed wording that can be adopted by journals and funders is available via the TOP website.

1. Citation standards (to recognize and credit data, code, and materials as original intellectual contributions)

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Journal describes citation of data or other archived materials in guidelines to authors with clear rules and examples. | Article provides appropriate citation for data and materials used, consistent with journal's author guidelines. | Article is not published until appropriate citation for data and materials is provided that follows journal's author guidelines. |

**Notes from TTEE working group**: These standards facilitate citing data, code, and materials made available by others.

2. Data transparency

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Article states whether data are available and, if so, where to access them. | Data must be posted to a trusted repository. Exceptions must be identified at article submission. | Data must be posted to a trusted repository, and reported analyses will be reproduced independently before publication. |

3. Analytic methods (code) transparency

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Article states whether code are available and, if so, where to access them. | Code must be posted to a trusted repository. Exceptions must be identified at article submission. | Code must be posted to a trusted repository, and reported analyses will be reproduced independently before publication. |

4. Research materials transparency

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Article states whether materials are available and, if so, where to access them. | Materials must be posted to a trusted repository. Exceptions must be identified at article submission. | Materials must be posted to a trusted repository, and reported analyses will be reproduced independently before publication. |

**Notes from TTEE working group**: ‘Research materials’ is a broad category. Because materials differ dramatically among and even within sub-disciplines, we cannot provide a representative list of examples. It may be useful to think of all the information that would be needed to replicate the original study with as close as possible a match in materials and methods.

5. Design and analysis transparency

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Journal articulates design transparency standards. | Journal requires adherence to design transparency standards for review and publication. | Journal requires and enforces adherence to design transparency standards for review and publication. |

6. Pre-registration of studies

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Journal encourages preregistration of studies and provides link in article to preregistration if it exists. | Journal encourages reregistration of studies and provides link in article and certification of meeting preregistration badge requirements. | Journal requires preregistration of studies and provides link and badge in article to meeting requirements. |

**Notes from TTEE working group**: The use of the word ‘encourages’ is not meant to imply that journals will accept articles based only on pre-registration status. Journals will presumably evaluate articles based on factors such as the quality of the data and the importance of the study question.

7. Pre-registration of analysis plans

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Journal encourages pre-analysis plans and provides link in article to registered analysis plan if it exists. | Journal encourages pre-analysis plans and provides link in article and certification of meeting registered analysis plan badge requirements. | Journal requires preregistration of studies with analysis plans and provides link and badge in article to meeting requirements. |

**Notes from TTEE working group**: The use of the word ‘encourages’ is not meant to imply that journals will accept articles based only on pre-registration status. Journals will presumably evaluate articles based on factors such as the quality of the data and the importance of the study question.

8. Replication

|  |  |  |
| --- | --- | --- |
| Level 1 | Level 2 | Level 3 |
| Journal encourages submission of replication studies. | Journal encourages submission of replication studies and conducts blind review of results. | Journal uses Registered Reports as a submission option for replication studies with peer review before observing the study outcomes. |

**Notes from TTEE working group**: The TOP guidelines do not explicitly define ‘replication’, but the implicit definition that can be drawn from the TOP guidelines is simply ‘research that deliberately attempts to replicate a previously published result’. The TOP committee did not further constrain this definition because the committee recognized that replication can mean different things in different disciplines. The TTEE workshop did not produce a narrower definition for ecology and evolution, and so we retain the broad definition of replication implied by the original TOP guideline.

The use of the word ‘encourages’ is not meant to imply that journals will accept articles simply because they are replication. Journals will presumably evaluate articles based on factors such as the quality of the data and the importance of the study question.

Badges summary

Journals can also choose to award ‘badges to acknowledge open practices’ to individual papers to indicate that the paper conforms to a specific transparency standard. Badges are typically displayed on the first page of a paper. The Open Science Framework (OSF) currently supports badges for three transparency standards. For complete details on badges, consult: https://osf.io/tvyxz/wiki/1.%20View%20the%20Badges/

1. Open Data and 2. Open Materials.

The Open Data badge is earned for making publicly available the digitally-shareable data necessary to reproduce the reported results

The Open Materials badge is earned by making publicly available the components of the research methodology needed to reproduce the reported procedure and analysis.

3. The Preregistered/Preregistered+ Analysis Plan badges are earned for preregistering research.

The Preregistered badge is earned for having a preregistered design.

The Preregistered + Analysis Plan badge is earned for having a preregistered research design and an analysis plan for the research and reporting results according to that plan. An analysis plan includes specification of the variables and the analyses that will be conducted.

Badge eligibility does not restrict authors from reporting results of additional (not preregistered) analyses. Results from preregistered analyses must be distinguished explicitly from additional results in the report.