

**TITLE: Concise guidelines and complementary checklists for improving research
reliability and reproducibility**

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15 **Abstract**

16 Checklists to improve research reliability and reproducibility have proliferated, but most remain
17 discipline-specific, narrow in scope, or lack context and learning opportunities. Here we present
18 “Concise guidelines for improving research reliability and reproducibility”: a one-page resource
19 that addresses all stages of the research lifecycle, is discipline-agnostic, and provides context for
20 each item, supported via hyperlinks by a public library of open-access resources. Licensed CC
21 BY-NC, the resource is designed for adaptation across disciplines and career stages, but is geared
22 towards researchers-in-training. We additionally provide a companion R package ('rrchecklist')
23 that generates fillable checklists, also customizable under a GPLv2 license.

24

25 **Keywords:** checklist, reproducibility, transparency, research reliability, credibility, replicability,
26 guidelines, R package

Introduction

Building literacy and skills to enhance research reliability and reproducibility is often hindered by a lack of institutional support or training, or otherwise takes second stage to maximizing the quantity and “novelty” of research outputs. The consequences of this have been repeatedly highlighted in the literature, across many, if not most scientific disciplines (Ioannidis 2024): a) insufficient documentation (studies lacking data, scripts, context, i.e. complex analytical processing decisions, etc.), resulting in an inability to identify questionable research practices and thus measure bias; b) inadequate study design, including insufficient replication or inappropriate statistical analyses limiting the reliability of conclusions; c) an overreliance on binary criteria (i.e. $P < 0.05$), combined with inadequate reporting of effect sizes, confidence intervals, and uncertainty around estimates; d) poor differentiation across the nexus of exploratory (hypothesis generating) and confirmatory (hypothesis testing) research, resulting in unreliable statistical interpretations; d) a body of literature that is severely biased and misrepresents the full scope of research being conducted.

The gaps

Among the myriad resources available to researchers to strengthen or evaluate the reliability and reproducibility of outputs, checklists have emerged as popular tools. Checklists have been developed across a range of applications (Wicherts et al. 2016; Aczel et al. 2019; Banzi et al. 2026), generally tailored to specific disciplines (Ekhtiari et al. 2025) and study designs (Sterne et al. 2019; Hopewell et al. 2025), or research life cycle phases such as preregistration (<https://www.cos.io/initiatives/prereg>) or archiving data (Jones and Grootveld 2017) and code (Australian Research Data Commons 2025). A few are more comprehensive and include interactive dashboards (e.g. Aczel et al. 2019). However, these checklists remain limited in

scope, prescriptive in nature, and oriented towards researchers who are either already well-versed in the reproducibility crisis and its causes, or are motivated to apply a checklist regardless of their level of understanding of the underlying issues. These characteristics make checklists less directly useful to researchers-in-training (including undergraduate and graduate students), who, in our experience, are keen to learn about the proximate and ultimate causes of the replicability crisis, and gain motivation to apply best practices when they see the extent of the problem. Thus, we note three shortfalls in the current landscape of checklists: a) to our knowledge, none are sufficiently discipline-agnostic (within the sciences); (b) none address the full research life cycle (including the step of evaluating existing research); and c) while they contribute to evaluating reporting, they fall short on supporting learning and critical interpretation.

The solution

To address these shortfalls, we present a resource, entitled “Concise Guidelines for Producing Reliable, Reproducible Research” (Figure 1), that attempts to fill the gap between checklists and the well-developed literature that underpins what these checklists are attempting to evaluate. We anticipate the resource being especially useful for graduate students and early career researchers (ECRs) more generally as it synthesizes common issues across the sciences and links out to core papers and resources through a shared public library (https://www.zotero.org/groups/6487727/concise_guidelines_for_reliable_research/library).

A. EVALUATING EXISTING RESEARCH

- Poor study design and selective reporting are common features that, along with inadequate statistical power and many forms of bias, decrease the reliability and replicability of much published research. A skeptical (but not cynical) reading of published research is therefore advisable.
- Be wary of studies that (i) are published in predatory journals; (ii) emphasize statistical over biological significance, or *P*-values over effect sizes; (iii) report results from analyses that were unplanned or not reproducible; (iv) draw causal inferences from non-experimental research without sufficient evidence; (v) reference primarily supportive works while downplaying/ignoring contrary findings; or (vi) fail to discuss study limitations or alternative interpretations of their findings. These points should also inform B-D.
- Distinguish exploratory (hypothesis generating) from confirmatory (hypothesis testing) research. Given its crucial role in generating hypotheses, exploratory research (ER) should be common and discoverable, but research culture favours confirmatory research (CR), causing much ER to be disguised as CR, raising the risks of hindsight bias and Hypothesizing After Results are Known (HARKing), and decreasing research reliability.
- Pilot studies often blend ER with CR, and commonly deviate from their intended use, reducing their reliability. It is advisable to interpret these carefully.
- *P*-values are most meaningful in pre-registered CR addressing plausible hypotheses, and least meaningful in ER disguised as CR.
- Consider conducting a systematic review of published research, including critically evaluating risk of bias following standardized protocols.

B. PLANNING YOUR RESEARCH

- Consider research partnerships from the outset: ideally, those who could benefit from or be impacted by the research would be directly involved through respectful collaboration.
- Specify whether the research is exploratory or confirmatory (or includes both), and provide rationale(s).
- Clearly define questions and/or hypotheses, and devise an appropriately designed observational or experimental study; unless subjects/units are randomly assigned to treatments, the study is observational or quasi-experimental. Exploratory and confirmatory studies can be either observational or experimental.

Figure 1: A screenshot showing the beginning portion of the 1-page guidelines document rendered to PDF from LaTeX. In the upper right is the link to the public Zotero library that hosts all the citations that are hyperlinked in the document (blue text). The document is also provided in Microsoft Word format, LaTeX, and Markdown, and the CC BY-NC license enables users to tailor and reformat as desired. The companion ‘rrchecklist’ R package, licensed GPLv2, provides users the option of creating more conventional checklists of action items based on these guidelines; one checklist for evaluating existing research and one for when conducting one’s own research.

The need for such a resource became clear to us through the work we have been engaged in over the past decade to enhance Open Science practices at the University of British Columbia’s Okanagan campus (Hanna et al. 2021) and beyond (Srivastava et al. 2025; <https://www.ciee-icee.ca/ldp.html>), and reflects discussions with graduate students and ECRs through teaching, supervision, and project collaboration. For instance, the guidelines directly address common points of confusion for many researchers, especially graduate students, such as the distinction between exploratory and confirmatory research, and the fact that both types of research can employ either observational or experimental study designs. We also sought and received valuable feedback from colleagues from an array of disciplines (economics, social sciences, statistics, ecology, neuroscience, metaresearch).

What it does

The resource adopts a full research lifecycle approach, starting with the evaluation of existing published research, thereby enabling identification of the best available evidence to inform a new research project. It then builds on this, mapping the concepts used in this evaluation to one's own study design considerations, through to one's own reporting of outcomes. We see this as an important feature; academia trains aspiring researchers well to be critical of others' works, but is less effective at encouraging the application of a similarly critical lens to one's own work. Another key feature of the resource is that it is prescriptive in what to consider, but not in how to consider it. For example, one should look for hallmarks of poor study design and selective reporting, and one should be able to distinguish between exploratory and confirmatory studies and appropriate reporting in each. But it is left to the researcher to gauge the contextual impact of the potential sources of bias, the quality or thoroughness of reporting, and the potential misapplication of methods or interpretations of the data. When partnered with the complementary checklist (from the 'rrchecklist' package) that identifies specific criteria to look for in evaluating study design, the resource provides valuable informational context. It encourages the user to recall their own foundational training around study design, interpretation, and reporting – thereby resurrecting considerations that are otherwise often abandoned in favour of convention, such as not considering statistical power, and emphasizing statistical significance over real world significance.

In contrast with a recently published checklist (Banzi et al. 2026), our guidelines (i) deliberately emphasize the important role that exploratory research plays, (ii) underscore the distinction between it and confirmatory research at the outset, and (iii) revisit this distinction in the multiple stages of the research lifecycle where it has implications (e.g. for the interpretation of *P*-values). As mentioned above, the exploratory-confirmatory distinction is a common source

of confusion for researchers-in-training and ECRs, likely due in part to the emphasis that conventional training and instruction often places on hypothesis-driven (confirmatory) research (at the expense of instruction around exploratory research), and an unfounded favouring of confirmatory over exploratory research more generally (cf. Fife and Rodgers 2022).

Another example of a distinction that carries implications through multiple stages of the research lifecycle, and that is often a source of confusion, is that of observational versus experimental study designs. In the “Planning your research” section we describe what distinguishes experimental from observational research, then, in the “Reporting, interpreting, and communicating your research findings” section we highlight how experimental versus observational studies warrant different terminology when describing outcomes (e.g. “affect” versus “is associated with”). Highlighting such connections across stages of the research lifecycle provides an example of how our guidelines offer learning opportunities that other checklists tend to overlook.

In its treatment of study design and statistical concepts, the resource adopts a frequentist rather than Bayesian framework. We consider this more broadly accessible for many researchers, especially those at early career stages. We would welcome the development of a Bayesian version of the guidelines.

The resource also addresses ethical community engagement and encourages collaboration with those potentially impacted by the research (Hoekstra et al. 2020), highlighting the importance of adhering to community-specific protocols. Additionally, it addresses key aspects of research integrity and scholarly communication, ensuring due credit and maximizing discoverability, accessibility, and reach.

Our guidelines come with a companion R package (called “rrchecklist” for “reliable research” checklist (Pither 2026)) that provides fillable checklists in HTML or PDF formats. Together, these resources can enhance the ability of researchers to apply a critical lens to their interpretation of research outputs (their own and others), and to build literacy by linking to a concise library of foundational resources for deeper learning.

What it does not do

While the resource provides links to some key references that serve as foundations for the user to build on, it does not provide a comprehensive rationale or an extended list of references for any of its recommendations or statements. We provide a publicly-accessible Zotero library to serve as a starting point for further learning.

The resource does not provide introductory or background material on the reproducibility crisis, study design, or statistics. Rather, it (i) assumes the user has sufficient introductory knowledge of these topics such that most, if not all, of the terminology and statements are familiar to them, and (ii) provides links to external resources that provide relevant background material.

Conclusion

Both the guidelines document and the checklist R package are meant to be adapted and enhanced; despite our attempt to create a discipline-agnostic resource for the sciences, we recognize limitations resulting from our own experiences and anticipate that we have used language and references that will not resonate with all potential audiences. Releasing the guidelines document in multiple formats under CC BY-NC (Microsoft Word, PDF, Markdown, LaTeX), we hope it will generate discussion and modification, and be adopted and improved upon by many research labs and graduate programs. Further, the R ‘rrchecklist’ package is licensed GPLv2 to encourage similar customized adoption.

Supplemental Materials

All supplemental materials including the guidelines document (in various formats) are publicly available at this OSF archive: <https://doi.org/10.17605/OSF.IO/DQX8K>. The guidelines document is also appended here as Supplemental Materials SM1. The R package is available at <https://github.com/pitherj/rrchecklist>. Rendered PDF versions of the “Checklist for Evaluating Primary Research” and “Reliable Research Practices Checklist” (from the R package) are appended here as Supplemental Materials SM2 and SM3, respectively.

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Contributions

JP wrote the initial draft of the guidelines resource, and MV-D wrote the initial draft of the manuscript. Both authors helped with revisions on both documents. JP produced the ‘rrchecklist’ R package with assistance from Claude Code (Sonnet 4.6). JP used Claude Code (Sonnet 4.6) to translate a Word version of the guidelines document to LaTeX and Markdown versions.

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A. EVALUATING EXISTING RESEARCH

- **Poor study design** and **selective reporting** are common features that, along with inadequate **statistical power** and **many forms of bias**, **decrease the reliability and replicability of much published research**. A skeptical (but not cynical) reading of published research is therefore advisable.
- Be wary of studies that (i) are published in **predatory journals**; (ii) **emphasize statistical over scientific significance**, or **P-values over effect sizes**; (iii) report results from analyses that were unplanned or not reproducible; (iv) draw causal inferences from non-experimental research **without sufficient evidence**; (v) **reference primarily supportive works while downplaying/ignoring contrary findings**; or (vi) fail to discuss study limitations or alternative interpretations of their findings. These points should also inform B-D.
- **Distinguish exploratory (hypothesis generating) from confirmatory (hypothesis testing) research**. Given its crucial role in generating hypotheses, exploratory research (ER) should be common and discoverable, but **research culture favours confirmatory research (CR)**, causing much ER to be disguised as CR, raising the risks of **hindsight bias** and **Hypothesizing After Results are Known (HARKing)**, and **decreasing research reliability**.
- **Pilot studies** often blend ER with CR, and commonly **deviate from their intended use**, reducing their reliability. It is advisable to interpret these carefully.
- **P-values are most meaningful in pre-registered CR addressing plausible hypotheses, and least meaningful in ER disguised as CR**.
- Consider conducting a **systematic review** of published research, including critically evaluating risk of bias following standardized **protocols**.

B. PLANNING YOUR RESEARCH

- **Consider research partnerships from the outset**: ideally, those who could benefit from or be impacted by the research would be directly involved through respectful collaboration.
- Specify whether the research is exploratory or confirmatory (or includes both), and provide rationale(s).
- Clearly define questions and/or hypotheses, and devise an appropriately designed observational or experimental study; **unless subjects/units are randomly assigned to treatments, the study is observational or quasi-experimental**. Exploratory and confirmatory studies can be either observational or experimental.
- Ethical and/or logistical constraints often necessitate observational or **quasi-experimental designs**, in which case **causal inference is more challenging (compared to experiments) but possible**, requiring **careful pre-planning, and meeting myriad criteria and assumptions**.
- For experimental studies, ensure **proper controls and randomization, and implement blinding where possible**.
- For all studies, define the target population, **scope of inference**, dependent & independent variables, units of observation, and replication (sample sizes).
- Describe study materials and procedures in detail.
- Choose statistical methods **best suited to addressing the question(s) / hypotheses**; new methods are rarely required.
- Multiple alternative data pre-processing and/or analysis methods **may legitimately be suitable**, so **consider evaluating the robustness of the findings to these varied protocols** (i.e. a form of “multiverse” or **sensitivity analysis**).
- Plan to **accommodate non-Gaussian error distributions, multivariate responses** and/or **hierarchical/non-independent sampling designs** where appropriate.
- Specify **how model assumptions will be checked and violations dealt with**.
- For CR, clearly define what would constitute a **meaningful effect size**, and **specify what will constitute evidence (i) consistent with and (ii) contrary to each hypothesis**.
- For CR, consider **prospective power analyses** that employ the planned statistical methods and plausible effect sizes.
- Especially when power is limited, acknowledge uncertainty and **focus on sound study design and data useability**.
- For CR, plan to **adjust P-values for multiple testing** when appropriate.
- For ER, justify sample sizes based on feasibility, resource constraints, or desired precision.
- Especially for CR, strongly consider **detailing your study design and analysis plan in a preregistration**, which can help improve research reliability. Preregistrations shift effort appropriately towards the planning stage, where it has the greatest benefit. Deviations from preregistrations are **absolutely okay if transparently reported** (see section C).
- Have your research plan reviewed by both subject matter experts and others (possibly as a **registered report**).
- Foster a **peer community** that values providing and receiving constructive criticism.
- Complete ethics approvals and initiate a **data management plan** prior to any data collection, ensuring ongoing respect for and adherence to community-specific engagement protocols, data sovereignty policies, and data management procedures, as per **FAIR** and **CARE** guidelines.
- Plan to use **version-controlled reporting systems** if possible.
- Keep track of all contributors and their contributions from the outset; consider using **Dragon Kill Points**, or the **MeRIT** or **CRedit** frameworks for reporting contributions to project outputs.
- Encourage all contributors to acquire an **ORCID** to facilitate discoverability and accurate attribution.

C. CONDUCTING YOUR RESEARCH

- Careful planning (part B) helps make the “conducting research” stage smoother.
- Document procedures transparently, detailing all deviations from planned protocols. Data quality control and updates to data management plans are ongoing responsibilities.

D. REPORTING, INTERPRETING, AND COMMUNICATING YOUR RESEARCH FINDINGS

- Transparently report all evaluations of **model assumptions**, and remedies to violations, as per analysis plans.
- **Prioritize reporting and interpreting effect sizes, their uncertainty (e.g. confidence intervals), and their real-world relevance**.
- When appropriate, report effect sizes alongside **P-values**.
- **Absence of evidence (i.e. a statistically non-significant result) is not necessarily evidence of absence**.
- Statistical significance does not necessarily imply scientific relevance.
- Do not imply causation with words like “cause” or “affect” unless appropriately justified (e.g. from experimental results); consider whether “is associated with” is more suitable.
- Use effective visualizations: **reveal, don’t conceal data**.
- Clearly report sample sizes for all treatments, each analysis, and in each relevant figure and table.
- Maximize the **accessibility and inclusivity of outputs**.
- There should be no surprise analyses: **each analysis should be linked to a pre-specified question/hypothesis**.
- Adding unplanned exploratory analyses to planned confirmatory analyses is sometimes warranted, but these tend to **yield inflated false positive rates** due to **researcher degrees of freedom**, so label them clearly as exploratory; only planned confirmatory analyses retain the intended statistical meaning.
- Interpret findings objectively and discuss alternative interpretations where appropriate.
- Avoid using **persuasive language**, overselling, or over-generalizing your findings.
- Do not extrapolate findings beyond the target population without sufficient justification.
- Speculation can be valuable when labeled clearly as such.
- Evaluate your draft manuscript against points in section “A” above.

E. ENHANCING THE REPLICABILITY, DISCOVERABILITY, ACCESSIBILITY, AND REACH OF YOUR RESEARCH

- Ensure **data** and **executable analysis code** are as open as possible and as closed as necessary according to **FAIR** and **CARE** guidelines or data access and sharing agreements, archived with appropriate metadata, and shared to facilitate independent replication.
- Publish Open Access and/or a **preprint**, and follow **best practices to maximize discoverability when writing your title, abstract, and keywords**.

These are guidelines not requirements: every step taken towards more reliable, reproducible research is valuable and should be celebrated.

Checklist for Evaluating Primary Research

Your Name

2026-08-07

Evaluation Information

Manuscript/Study Title: *[Enter title]*

Citation/DOI: *[Enter citation or DOI]*

Evaluator: Your Name

Date: 2026-08-07

Instructions: Use this checklist to systematically evaluate primary research publications. Check off items as you assess them. Add notes to document your evaluation and identify strengths or concerns.

Study Rationale and Planning

- ☐ Objectively establishes the state of knowledge through unbiased literature assessment
- ☐ Articulates research questions (exploratory) and/or hypotheses (confirmatory)
- ☐ Specifies whether study is exploratory (ER), confirmatory (CR), or includes both, and provides rationale(s)
- ☐ Articulates how each question/hypothesis will be evaluated
- ☐ Defines target population(s), scope of inference, and units of observation
- ☐ Identifies others who could be impacted by the research (if applicable)
- ☐ Specifies whether study is experimental, quasi-experimental, or observational
- ☐ If observational or quasi-experimental, study describes how sampling bias was minimized
- ☐ If experimental, study employs proper controls, randomization, and blinding (where appropriate)
- ☐ If confirmatory, study explicitly considers statistical power
- ☐ If confirmatory, study defines what would constitute a meaningful effect size
- ☐ If confirmatory, study details what would constitute evidence (i) consistent with and (ii) contrary to each distinct hypothesis
- ☐ If observational or quasi-experimental, study describes and rationalizes all dependent and independent variables
- ☐ If experimental, study describes and rationalizes all interventions/treatments
- ☐ Describes study materials and procedures in detail
- ☐ If confirmatory, study appropriately considers P-value adjustments for multiple testing where appropriate
- ☐ Describes and rationalizes structure of statistical model for each analysis
- ☐ Describes how statistical model assumptions will be checked
- ☐ Articulates ethical considerations where appropriate
- ☐ BONUS: Study references pre-registration or registered report

Notes:

Reporting and Transparency

- ☐ Reports all unanticipated incidents (e.g., loss of samples; measurement mistakes)
- ☐ If applicable, study details any re-use/overlap of data from previous/ongoing research
- ☐ Connects each analysis with a question or hypothesis

- ☐ Distinguishes exploratory from confirmatory analyses
- ☐ Reports results of evaluations of statistical model assumptions
- ☐ Prioritizes reporting and interpreting effect sizes with uncertainty measures (e.g., confidence intervals)
- ☐ Reveals rather than conceals data (e.g., shows individual data points in figures where feasible)
- ☐ Uses accessible visualizations (e.g., accessible colour palettes in figures)
- ☐ Reports findings of all planned analyses
- ☐ If included, all unplanned analyses and associated results are clearly labelled as such
- ☐ Consistently reports sample sizes for all analyses and figures
- ☐ Statistical significance is not equated with scientific relevance
- ☐ Provides access to data according to FAIR principles and to facilitate independent replication
- ☐ Provides reproducible analysis code and workflows
- ☐ Refers to ethics approvals and/or permits where necessary
- ☐ Describes each author's roles in the research
- ☐ Acknowledges any conflicts of interest
- ☐ Acknowledges all funding supports
- ☐ Acknowledges any use of AI tools
- ☐ Includes acknowledgments of contributions by non-authors

Notes:

Interpretation and Context

- ☐ Interprets findings objectively
- ☐ If observational or quasi-experimental, study acknowledges limits to causal inference
- ☐ Does not imply causation without appropriate justification (e.g., uses 'is associated with' rather than 'causes' or 'affects' for observational research)
- ☐ Absence of evidence (i.e. a statistically non-significant result) is not presented as evidence of absence
- ☐ Discusses alternative interpretations of findings
- ☐ Discusses real-world relevance of effect sizes
- ☐ Articulates scientific relevance of each finding and, where appropriate, practical relevance to all stakeholders

- ☐ Discusses findings relative to both supportive and contrary findings within the literature
- ☐ Discusses study limitations
- ☐ Avoids persuasive language
- ☐ Avoids overselling or over-generalizing findings
- ☐ Any speculation is clearly labelled as such

Notes:

Additional Considerations for Community-Engaged Research

- ☐ Those potentially impacted by the research played a role in designing the study
- ☐ Partners and participants were meaningfully involved
- ☐ CARE guidelines were followed
- ☐ Research extends meaningfully to those impacted
- ☐ Data ownership and sovereignty considerations are addressed

Notes:

Warning signs (no checkmark = better)

Flag any of the following if observed — these do not automatically invalidate a study but warrant closer scrutiny and should be noted in your evaluation.

- ☐ Published in a predatory journal
- ☐ Uses sensationalist or emotive language
- ☐ Emphasizes statistical over scientific significance, or P-values over effect sizes
- ☐ Uses phrase “marginally significant”
- ☐ Uses phrase “preliminary findings” without articulating if and how a preliminary study was planned
- ☐ Conceals rather than reveals the data
- ☐ Appears to disguise exploratory research as confirmatory research
- ☐ Reports results of analyses that were not planned, not described in methods, or not reproducible
- ☐ Draws causal inferences from observational research with minimal justification
- ☐ References primarily supportive works while ignoring contrary findings

- ☐ Presents a pilot study as confirmatory research without acknowledging its exploratory elements or deviations from intended design
- ☐ Does not provide access to data according to FAIR principles and to facilitate independent replication

Notes:

Overall Assessment

Summary:

Reference:

Pither, J. and Vis-Dunbar, M. (2026). Concise guidelines for producing reliable, reproducible research. CC BY-NC 4.0.

Reliable Research Practices Checklist

Your Name

2026-08-07

Project Information

Project Title: *[Enter project title]*

Manuscript Title: *[Enter manuscript title if different]*

Date Completed: 2026-08-07

ORCID: *[Enter your ORCID]*

Instructions: Check off items as you complete them throughout your research project. Optionally, add notes or links to documentation (e.g., preregistration URLs, repository links) beneath relevant sections to provide evidence for peer review.

A. EVALUATING EXISTING RESEARCH

Critical Evaluation of the Literature

- ☐ Evaluate the existing literature critically and objectively (see also the companion “Checklist for Evaluating Primary Research”)
- ☐ Distinguish exploratory (hypothesis-generating) from confirmatory (hypothesis-testing) published research when assessing the existing evidence base
- ☐ Be wary of published studies that emphasize P-values over effect sizes, report unplanned or non-reproducible analyses, draw unwarranted causal inferences, or fail to discuss limitations and alternative interpretations
- ☐ Consider conducting a systematic review, including critically evaluating risk of bias following standardized protocols

Notes:

B. PLANNING YOUR RESEARCH

Study Rationale and Planning

- ☐ Objectively establish the state of knowledge through unbiased literature assessment
- ☐ Articulate research questions and/or hypotheses
- ☐ Specify whether study is exploratory (ER), confirmatory (CR), or includes both, and provide rationale(s)
- ☐ Articulate how each question/hypothesis will be evaluated
- ☐ Specify whether study is experimental, quasi-experimental, or observational (units not randomly assigned to treatments = observational or quasi-experimental)
- ☐ If observational or quasi-experimental, plan how sampling bias will be minimized
- ☐ If experimental, plan for proper controls, randomization, and blinding (where appropriate)
- ☐ If experimental, describe and rationalize all interventions/treatments
- ☐ If observational or quasi-experimental, describe and rationalize all dependent and independent variables
- ☐ Define target population(s)
- ☐ Define scope of inference
- ☐ Define units of observation and/or experimental units
- ☐ If applicable, detail any re-use/overlap of data from previous/ongoing research
- ☐ Describe study materials and procedures in detail
- ☐ Choose statistical methods best suited to addressing the question(s)/hypotheses
- ☐ Describe and rationalize structure of statistical model for each planned analysis
- ☐ Specify how statistical model assumptions will be checked and violations dealt with
- ☐ Plan to accommodate non-Gaussian error distributions, multivariate responses and/or hierarchical/non-independent sampling designs where appropriate
- ☐ If confirmatory, define what would constitute a meaningful effect size
- ☐ If confirmatory, conduct prospective power analysis using relevant statistical methods and plausible effect sizes
- ☐ Especially when power is limited, acknowledge uncertainty and focus on sound study design and data useability
- ☐ If exploratory, justify sample sizes based on feasibility, resource constraints, or desired precision
- ☐ If confirmatory, detail what would constitute evidence (i) consistent with and (ii) contrary to each distinct hypothesis
- ☐ If confirmatory, plan P-value adjustments for multiple testing where appropriate

- ☐ Consider sensitivity (“multiverse”) analysis to evaluate robustness of findings to alternative data pre-processing and/or analysis methods
- ☐ Identify those who could be impacted by the research (if applicable)
- ☐ Articulate ethical considerations where appropriate
- ☐ Complete ethics approvals prior to data collection

Notes:

Research Partnerships and Contributions

- ☐ Establish research partnerships considering ethical, cultural, and practical dimensions
- ☐ Ensure those potentially impacted by research can contribute meaningfully to design, implementation, and dissemination (where applicable)
- ☐ Plan to track all contributors and contributions throughout project using Dragon Kill Points, CRediT, or MeRIT frameworks
- ☐ Encourage all contributors to acquire an ORCID
- ☐ Plan for appropriate licenses for all outputs

Notes:

Preregistration, Workflow Transparency, and Data Management

- ☐ Preregister study design and analysis plan in a public repository (embargo if necessary)
- ☐ Create a data management plan, ensuring adherence to community-specific engagement protocols, data sovereignty policies, and FAIR and CARE guidelines
- ☐ Plan to use version-controlled reporting systems if possible

Notes:

Peer Review and Feedback

- ☐ Have research plan reviewed by subject matter experts
- ☐ Have research plan reviewed by peers outside your immediate field
- ☐ Foster a peer community that values providing and receiving constructive criticism

Notes:

C. CONDUCTING YOUR RESEARCH

Documentation and Transparency

- ☐ Document data and procedures as per planned protocols and data management plan
- ☐ Document deviations from planned protocols (e.g., loss of samples, measurement mistakes)
- ☐ Document data exclusions with justification
- ☐ Regularly maintain data and undertake quality control

Notes:

D. REPORTING, INTERPRETING, AND COMMUNICATING YOUR RESEARCH FINDINGS

Reporting and Transparency

- ☐ Report all unanticipated incidents (e.g., loss of samples, measurement mistakes)
- ☐ Connect each analysis with a specific question or hypothesis
- ☐ Distinguish exploratory from confirmatory analyses
- ☐ Clearly label any unplanned analyses as such; only planned analyses retain their intended statistical meaning
- ☐ Report results of checks on model assumptions and remedies to violations
- ☐ Prioritize reporting and interpreting effect sizes with uncertainty measures (e.g., confidence intervals) for all analyses
- ☐ If confirmatory, report effect sizes (with confidence intervals) alongside P-values
- ☐ If confirmatory, report adjusted P-values for multiple testing (where appropriate)
- ☐ If exploratory, report effect sizes (with confidence intervals)
- ☐ Include figures that reveal rather than conceal data
- ☐ Use accessible visualizations (e.g., accessible colour palettes in figures)
- ☐ Consistently report sample sizes for all analyses, treatments, figures, and tables
- ☐ Maximize the accessibility and inclusivity of outputs

Notes:

Interpretation and Context

- ☐ Interpret findings objectively
- ☐ If observational or quasi-experimental, acknowledge limits to causal inference
- ☐ Do not imply causation without appropriate justification; consider ‘is associated with’ rather than ‘causes’ or ‘affects’ for non-experimental results
- ☐ Absence of evidence (i.e. a statistically non-significant result) is not necessarily evidence of absence
- ☐ Discuss alternative interpretations of findings
- ☐ Discuss real-world relevance of effect sizes
- ☐ Articulate scientific significance of each finding and, where appropriate, practical relevance to all stakeholders
- ☐ Discuss findings relative to both supportive and contrary findings within the literature
- ☐ Discuss study limitations

- ☐ Avoid persuasive language
- ☐ Avoid overselling or over-generalizing findings beyond target population
- ☐ Clearly label any speculation as such
- ☐ Evaluate draft manuscript against criteria in Section A (Evaluating Existing Research)

Notes:

Additional Reporting

- ☐ Refer to ethics approvals and/or permits where necessary
- ☐ Describe each author's roles in the research using Dragon Kill Points, CRediT, or MeRIT
- ☐ ORCIDs are reported for all co-authors
- ☐ Acknowledge any conflicts of interest
- ☐ Acknowledge all funding supports
- ☐ Acknowledge any use of AI tools
- ☐ Acknowledge all (non-authors) who contributed to the research

Notes:

E. ENHANCING REPLICABILITY, DISCOVERABILITY, ACCESSIBILITY, AND REACH

Data and Code Sharing

- ☐ Ensure data are as open as possible and as closed as necessary according to FAIR principles or applicable data access and sharing agreements
- ☐ Where relevant, ensure data are as open as possible and as closed as necessary according to CARE principles or applicable data sovereignty agreements
- ☐ Archive data in an appropriate repository with detailed metadata, shared to facilitate independent replication
- ☐ Ensure executable analysis code is as open as possible and as closed as necessary
- ☐ Archive code in an appropriate repository

Notes:

Publication and Dissemination

- ☐ Publish Open Access and/or as a preprint
- ☐ Follow best practices for title, abstract, and keywords to maximize discoverability

Notes:

Documentation & Evidence

Use this section to provide links and evidence for checklist items (e.g., preregistration URLs, data repository links, ethics approval numbers).

References:

Pither, J. and Vis-Dunbar, M. (2026). Concise guidelines for producing reliable, reproducible research. CC BY-NC 4.0.

Checklist Citation: *[This section can be used to cite this checklist if submitted with a manuscript]*