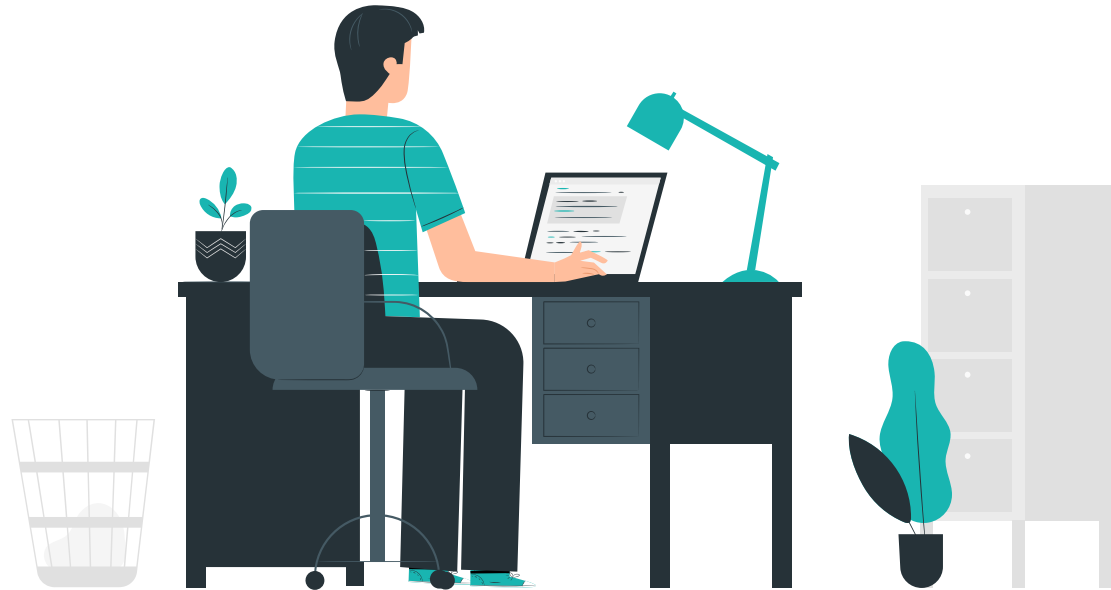# Registered Reports:
Why, What, & How

Melissa Thye

PPLS Open Research

3rd March 2023
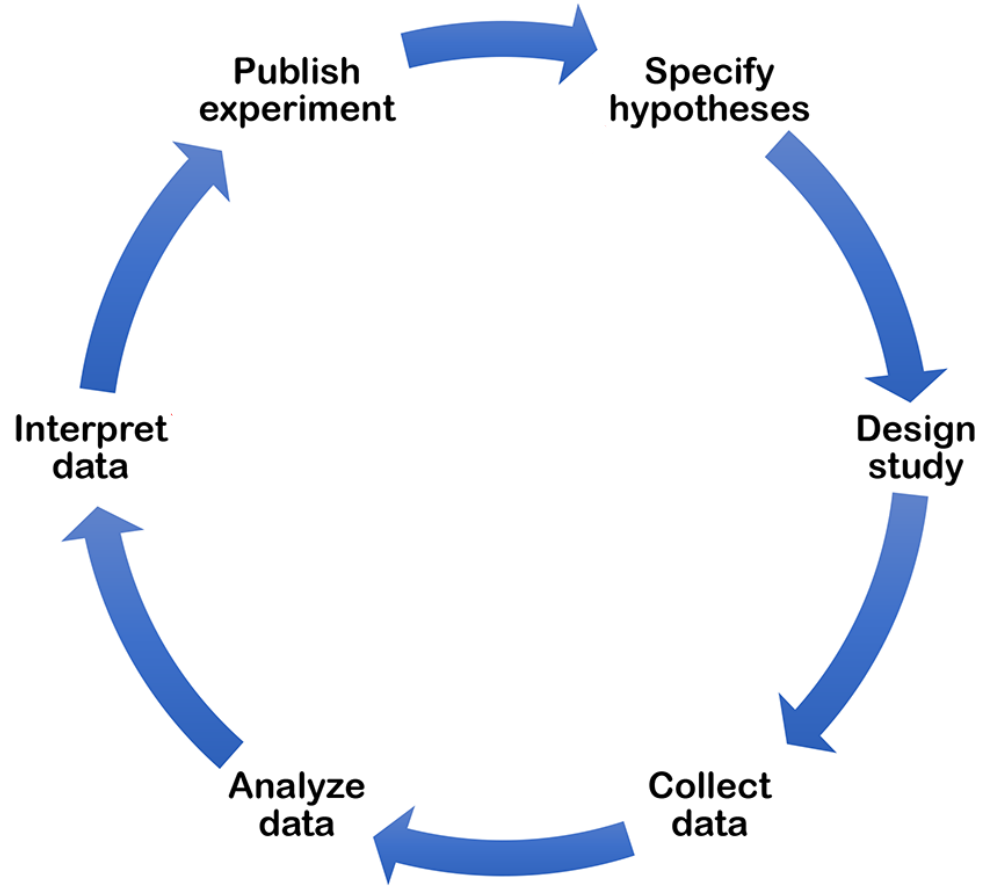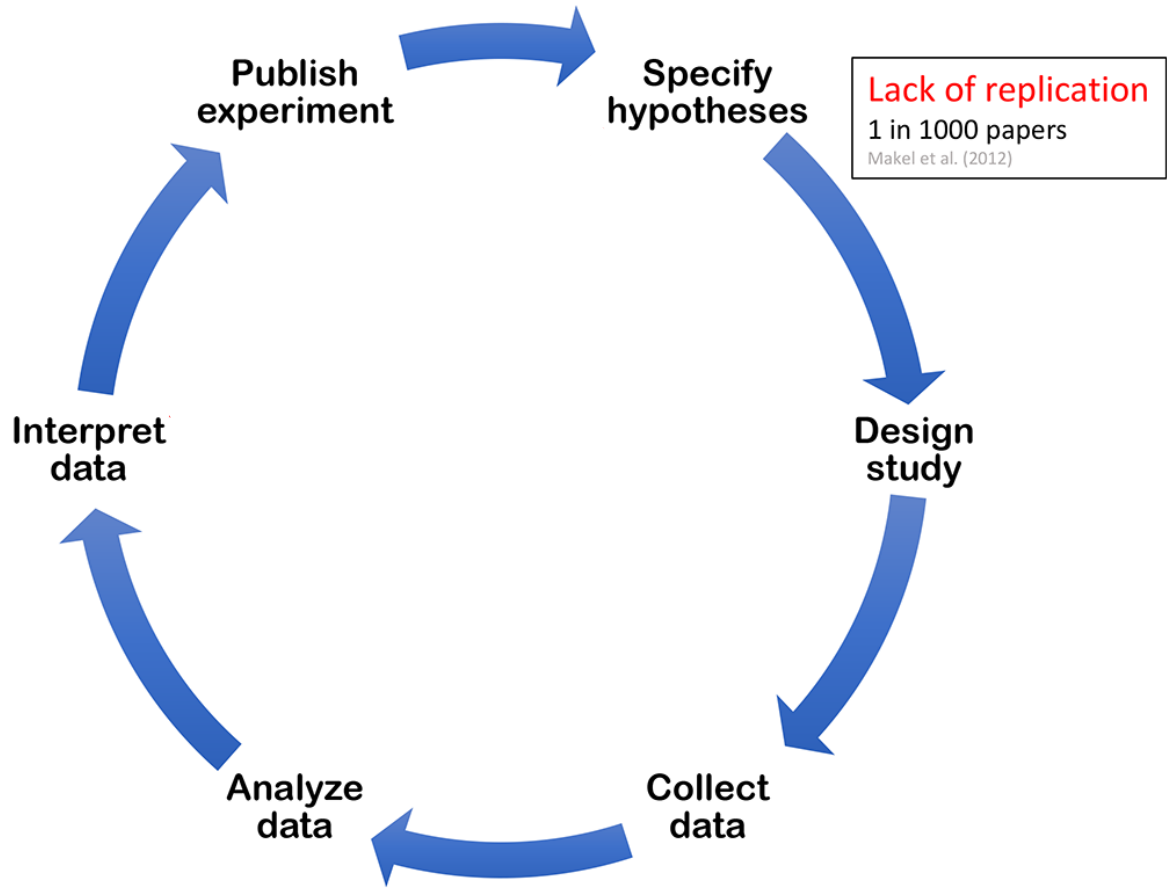
Why registered reports

File Drawer Problem (*Publication Bias*)

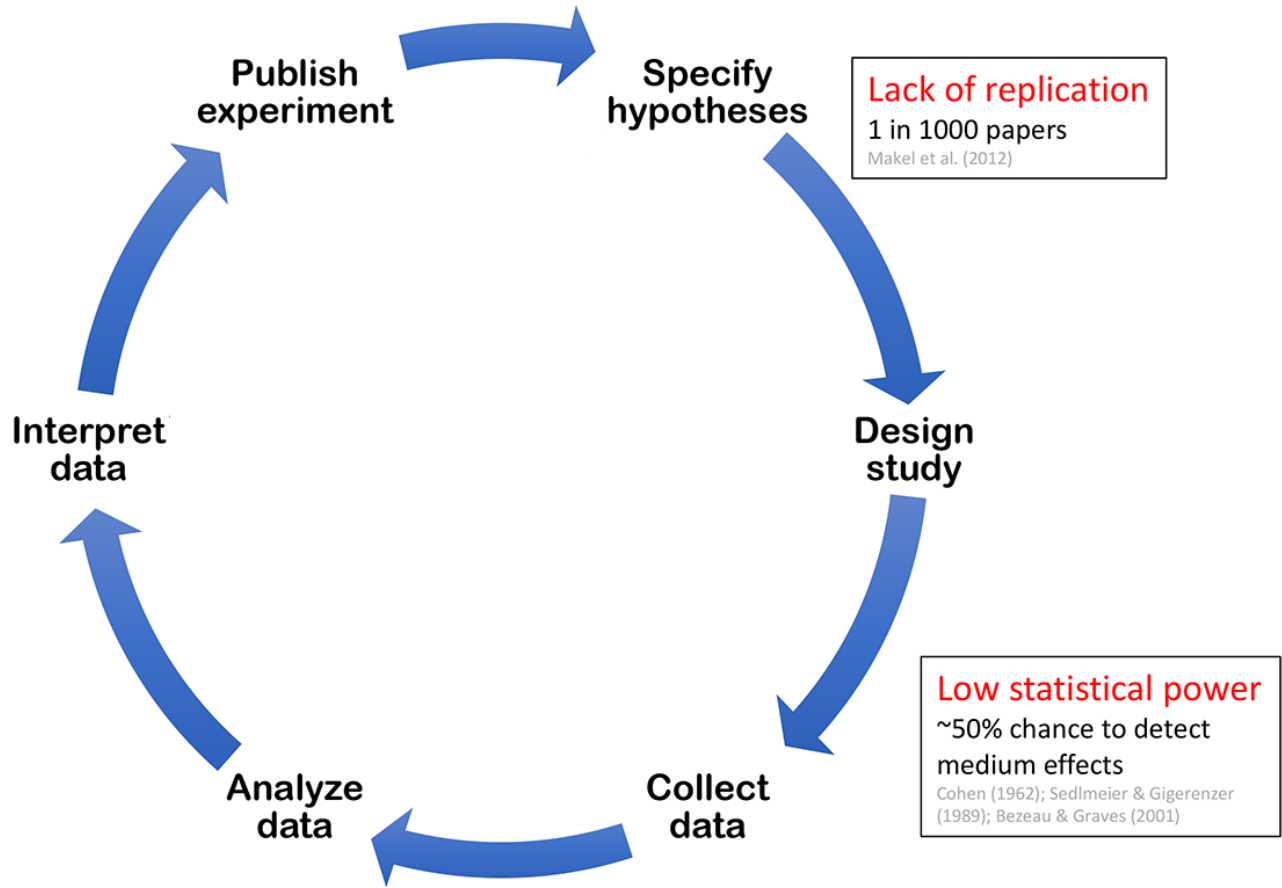- Selective reporting of findings based on experiment outcome
- Tendency to publish positive (statistically significant) results
- Negative (non-significant) results are put into the file drawer and are unknown to other researchers
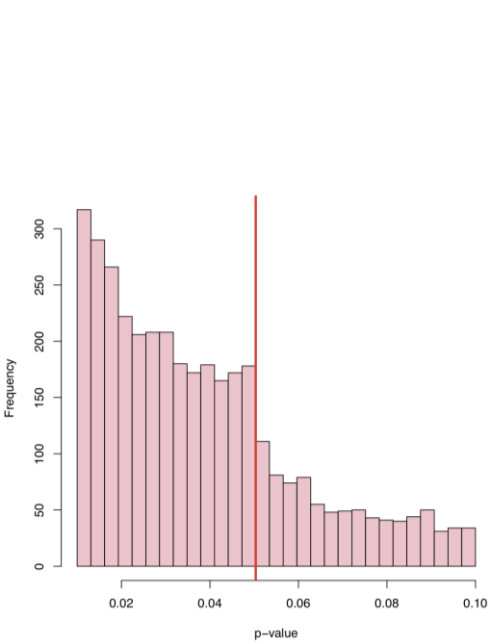- Limits utility of meta-analytic approaches

Why?

- Rejection by journals, editors, or reviewers
- Emphasis on novelty
- Competing interests
- Viewed as a "failed" experiment

Publish experiment → Specify hypotheses → Design study → Collect data → Analyze data → Interpret data → Publish experiment

Lack of replication
1 in 1000 papers
Makel et al. (2012)

Center for Open Science

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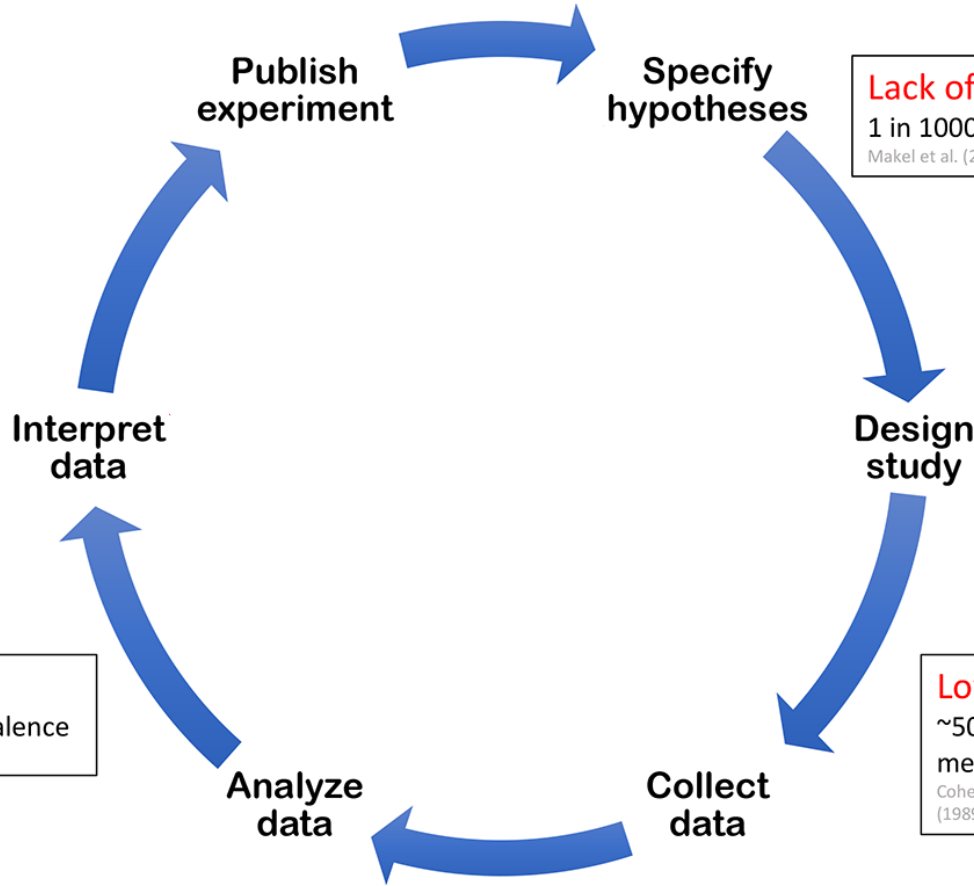
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Low statistical power
~50% chance to detect medium effects
Cohen (1962); Sedlmeier & Gigerenzer (1989); Bezeau & Graves (2001)

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Masicampo & Lalande (2012), Quarterly Journal of Experimental Psychology

Publish experiment → **Specify hypotheses**

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HARKing
~50-90% prevalence
John et al. (2012); Kerr (1998)

Interpret data

Design study

P-hacking
~50-100% prevalence
John et al. (2012)

Analyze data

Collect data

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Cohen (1962); Sedlmeier & Gigerenzer (1989); Bezeau & Graves (2001)

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Publication bias & lack of data sharing
~92% positive & ~70% failure
Fanelli (2010); Wicherts et al. (2006)

Publish experiment

Specify hypotheses

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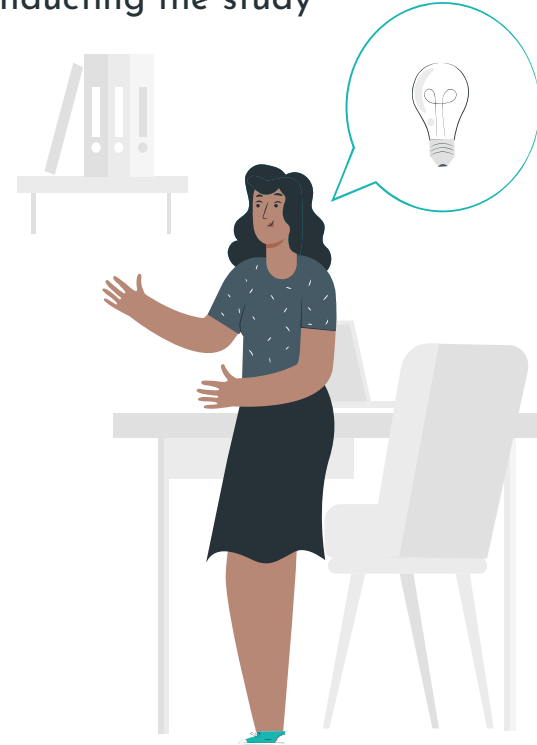
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What are registered reports

Pre-registration

Submitting a study plan (often including analysis plan) to a registry before conducting the study

- Increases transparency of planned versus exploratory analyses
- Reduces HARKing & P-hacking
- Time-stamped (addresses scooping concerns)
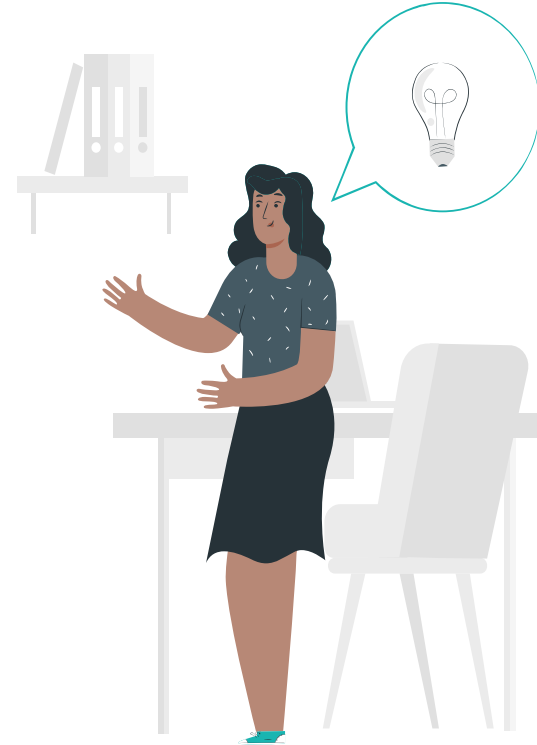
But what happens when the results are hard to publish?

What are registered reports

Registered Reports

A peer-reviewed preregistration

- Provide sufficient detail for an independent researcher to replicate study and analysis plan
- Over 300 journals currently accept Registered Reports

1. Peer review occurs before outcomes are known
2. In-principle acceptance (IPA) will not be revoked based on outcomes

Traditional Peer Review

DEVELOP IDEA → DESIGN STUDY → COLLECT & ANALYZE DATA → WRITE REPORT → PUBLISH REPORT

Peer Review ↑

Registered Report Review

DEVELOP IDEA → DESIGN STUDY → COLLECT & ANALYZE DATA → WRITE REPORT → PUBLISH REPORT

Stage 1 Peer Review ↑

Stage 2 Peer Review ↑

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How to do registered reports

- Primary data collection

- Secondary data analyses

  - Additional constraints on prior data access

- Systematic reviews + meta-analyses

- Allows for exploratory analyses **but not at Stage 1**

  - Any analysis that cannot be planned precisely should be withheld until **Stage 2**

  - Be clear which analyses were pre-registered and which were exploratory

  - Allows others to weigh the evidence appropriately
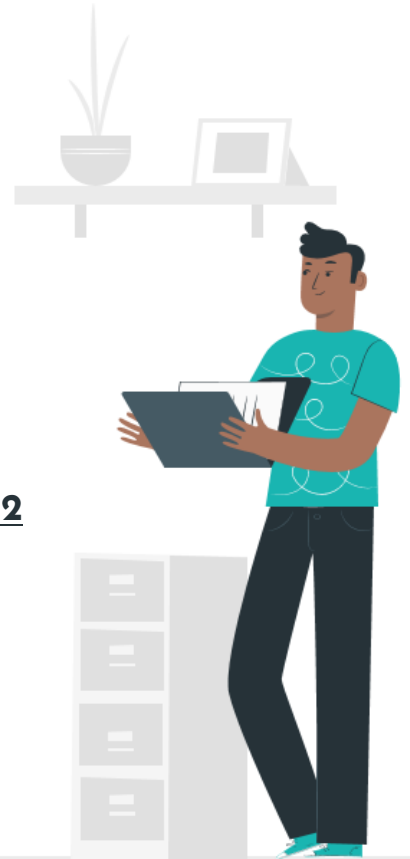
Can you answer these 10 questions....

1. What is the main question being addressed in your study?

2. Can you describe the key independent and dependent variable(s), specifying how they will be measured?

3. What are your hypotheses?

4. How many and which conditions will participants/samples be assigned to?

5. How many observations will be collected and what rule will you use to terminate data collection?

6. What are your study inclusion criteria?

7. What are your data exclusion criteria?

8. What positive controls or quality checks will confirm that the obtained results are able to provide a fair test of the stated hypothesis?

9. Can you specify exactly which analyses you will conduct to examine the main question/hypotheses?

10. Are you proposing to collect new data or analyse existing data?

...then you're ready to do a Registered Report!

https://osf.io/93znh

What to Include in a Registered Report

Introduction

- Review relevant literature
- Describe research questions & hypotheses

Methods

- Ethics information
- Pilot data (if applicable)
- Study design (all experimental procedures)
- Sampling plan
  - Power analysis
  - Inclusion/exclusion criteria
  - How outliers will be handled
- Analysis plan
  - All planned analysis (no exploratory analysis)

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Data/Code Availability

Design Table

Hypotheses, predictions, and interpretations

GOAL: limit space of potential post-hoc interpretation

- Hypotheses should be testable and concrete
- Describe how they will be tested
- Describe how possible outcomes will be interpreted

Reproducible methods and exclusion criteria plan

GOAL: control experimenter degrees of freedom

- Explicitly define variables
- Exhaustively describe inclusion and exclusion criteria
- Could someone repeat the study based on the description?

Power analyses and sample size

GOAL: minimize false positives and negatives

- Estimate expected effect size
- Determine required sample size with power analysis
- Identify critical tests that will be used to test predictions

Is the proposed protocol doable?

- Could a simpler design address the same question?
- Is every criterion well-motivated?
- Is sample size practical?

Kiyonaga & Scimeca (2019), Trends in Neurosciences

Design Table

Question	Hypothesis	Sampling Plan	Analysis Plan	Interpretation given to different outcomes
RQ 1				
RQ 2				
...				

- Gives readers an overview of analysis plans and predictions
- Number of rows will depend on number of research questions (RQ)
- Ensure exact correspondence between each hypothesis and statistical test
  - **NOT** acceptable: "*Condition A will affect performance differently than Condition B*"
  - Instead define: **(1)** the performance measure (e.g., RT), **(2)** the predicted direction of the difference, and **(3)** the anticipated effect sizes or smallest effect size of interest (if possible)

Peer Community In Registered Reports

A community, not a journal → manages peer review of Registered Report preprints

- The review process is managed by accredited recommenders (i.e., editors)
- Peer review occurs independent of journal
  - Decide which journal to publish in after Stage 2 recommendation
  - Currently 28 PCI RR-friendly journals
- Peer reviews published for increased transparency
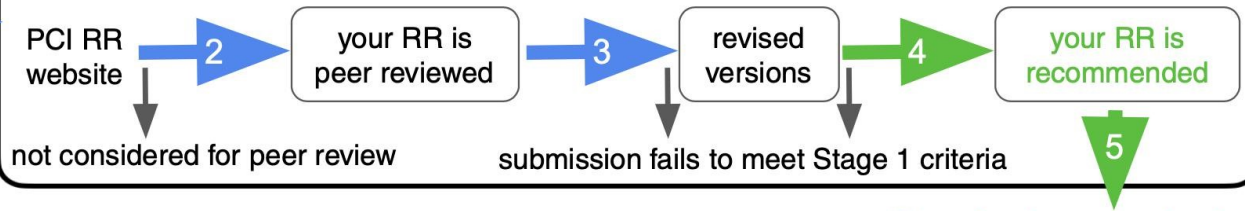- Offer scheduled review
  - Reduces Stage 1 review from weeks to days
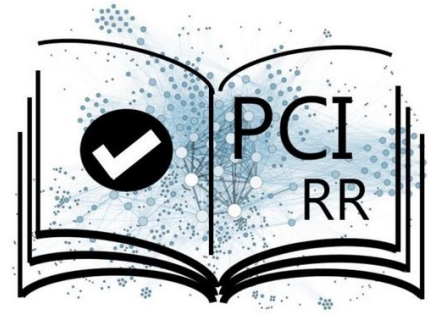
Free and transparent pre- and post-study recommendations across research fields

Submit your RR to PCI RR as a private or public URL to a file in a repository (e.g. OSF, GitHub)

PDF
html
doc
rmd

1

PCI RR process Stage 1

PCI RR website

2

your RR is peer reviewed

3

revised versions

4

your RR is recommended

5

not considered for peer review

submission fails to meet Stage 1 criteria

Conduct your study

Submit your RR to PCI RR as a private or public URL to a file in a repository (e.g. OSF, GitHub)

PDF html doc rmd

1

PCI RR process Stage 1

PCI RR website

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not considered for peer review

submission fails to meet Stage 1 criteria

Conduct your study

6
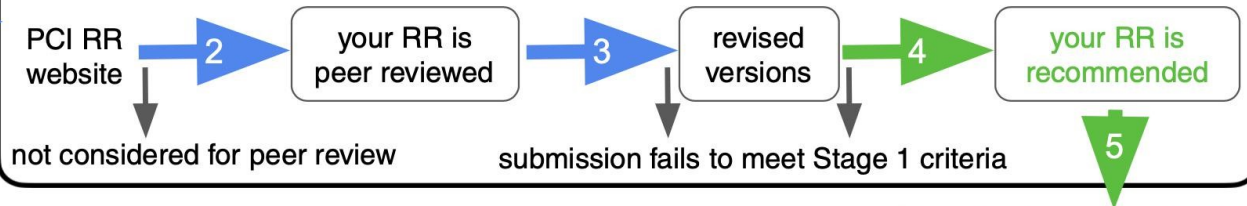
Preprint server (OSF preprints, arXiv, bioRxiv)

deposit preprint at preprint server

revised versions

Recommended, peer reviewed preprint

PDF v1

PDF v2

PDF v3

PDF vn

Valid, citable final article AND can still be submitted to a journal

Optional: submit to PCI RR-friendly journal where article is accepted without further peer review

Submit preprint to PCI RR

7

PCI RR process Stage 2

preprint assessed by recommender and reviewers

8

your preprint is recommended

9

PDF

Citable recommendation text + reviews published by PCI (doi)

- Open access
- Free for authors and readers
- Searchable

submission fails to meet Stage 2 criteria

Pros

Cons

Reduces publication bias

Pre-study review when feedback is most useful

Acceptance after IPA regardless of results

Beneficial for PhD students & ECR

Increases credibility of study results
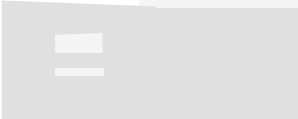
Easier write-up after IPA (work frontloaded)

Stage 1 IPA can take awhile

Not all journals accept secondary data analyses

Journal policies, timelines, editing requirments vary

Not guaranteed to get useful reviews or informed reviewers

Challenging when proposing new (to you) analyses

Significant workload shift to start of project

Approaches to registered reports

Familiar Territory

- Confident proposing study design or methods before implementation

- Anticipate possibility of null or complex results

- Guaranteed to be added to scientific record

- Reviewer feedback is more about interpretation of outcomes and threshold for significance

- Everyone agrees with what will count as evidence for an effect
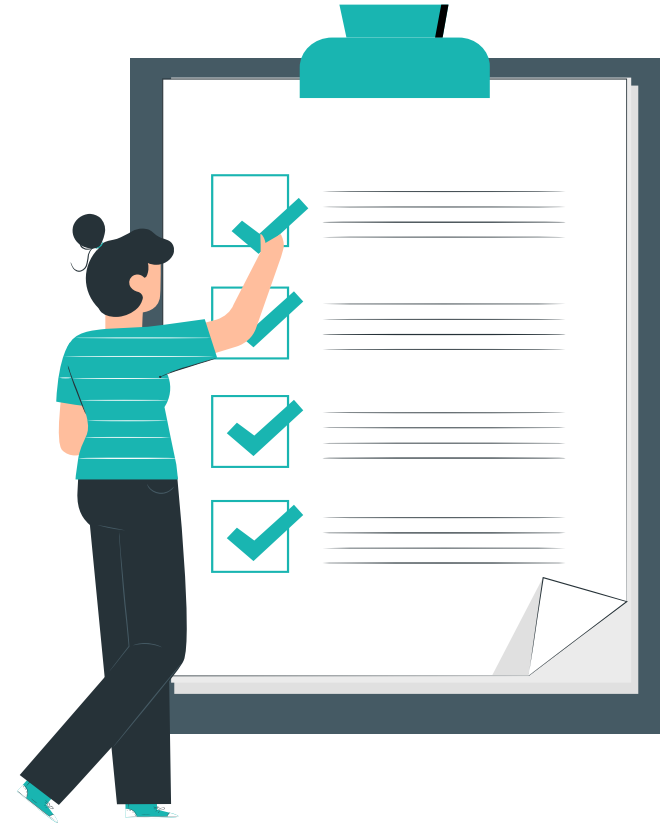
Approaches to registered reports
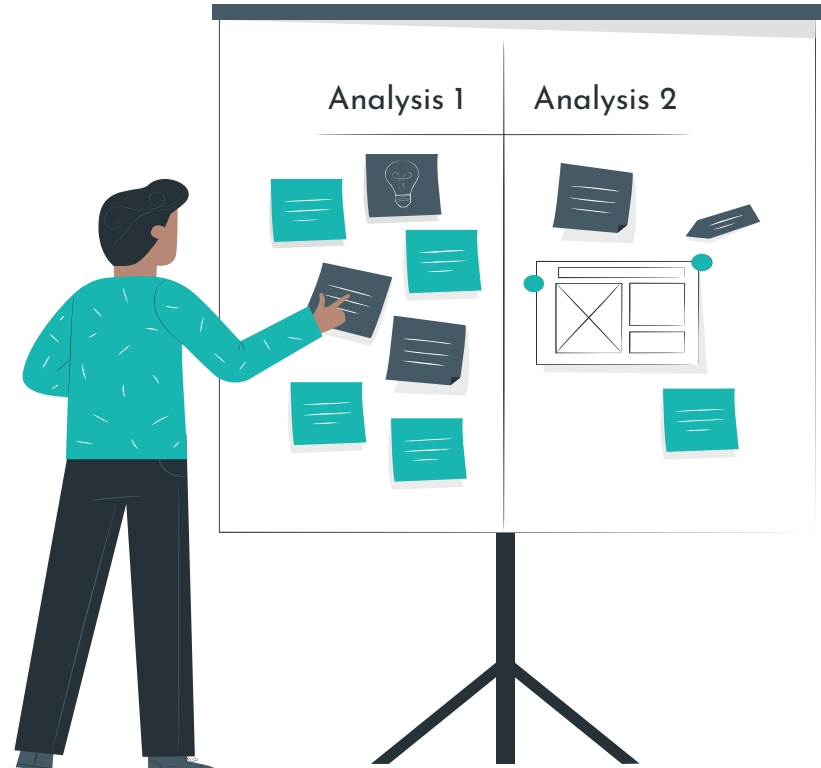
Unfamiliar Territory

- Less confidence in study design, methods or approach

- Anticipate that the results might be hard to publish

- Reviewer feedback might help ensure that the methods actually test the research question

- Useful for students & ECR who might be less familiar with methods
  - Thesis proposal model → hear from several experts before starting study

- Great chance to get feedback which many students want earlier in the process

Resources to get started

- Pre-Registration Templates: https://osf.io/zab38/

- Registered Report criteria across journals: https://docs.google.com/spreadsheets/d/1D4_k-8C_UENTRtbPzXfhjEyu3BfLxdOsn9j-otrO870/edit#gid=0

- Registered Report Checklist: https://osf.io/93znh

- Zotero library of published Registered Reports: https://www.zotero.org/groups/479248/osf/collections/KEJP68G9

- Webinars (including pre-registering qualitative research): https://www.cos.io/events