How can an Open Science Community facilitate open science practices?

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Partly adapted from “Study pre-registration: Benefits and considerations” (Krzysztof Gorgolewski, 2017)
Reproducibility is a defining feature of science, but the extent to which current research is unknown. We conducted replications of 100 studies published in three psychology journals using high-quality materials when available. Replication effects were half the magnitude of original effects, representing a substantial decline. Ninety-seven percent of original results were significant results. Thirty-six percent of replications had statistically significant effects. Difference in the 95% confidence interval of original and replication effects were subjectively rated to have replicated the original result, and if no bias in original results is assumed, combining original and replication results left 68% with statistically significant effects. Correlational tests suggest that replication success was better predicted by the strength of original evidence than by characteristics of the original and replication teams.
HAVE YOU FAILED TO REPRODUCE AN EXPERIMENT?

Most scientists have experienced failure to reproduce results.

- **Someone else's**
- **My own**

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Someone else's</th>
<th>My own</th>
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<tbody>
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<td>Chemistry</td>
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<td>Biology</td>
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<td>Earth and environment</td>
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<td>Other</td>
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IS THERE A REPRODUCIBILITY CRISIS?

- 7% Don’t know
- 52% Yes, a significant crisis
- 38% Yes, a slight crisis
- 3% No, there is no crisis

1,576 researchers surveyed

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Baker (2016)
The problem: Science isn’t perfect
Publish and/or conduct next experiment

Generate and specify hypothesis

Design study
  Low statistical power

Conduct study and collect data

Analyze data and test hypothesis

Interpret results
Munafò et al. (2017)
**P-hacking**

1. Stop collecting data once $p < .05$
2. Analyze many measures, but report only those with $p < .05$.
3. Collect and analyze many conditions, but only report those with $p < .05$.
4. Use covariates to get $p < .05$.
5. Exclude participants to get $p < .05$.
6. Transform the data to get $p < .05$. 
Munafò et al. (2017)

Diagram illustrating the process of scientific research with a cycle starting with Publish and/or conduct next experiment, followed by Generate and specify hypothesis, then Design study, Conduct study and collect data, Analyse data and test hypothesis, and Interpret results. The cycle includes the term HARKing (Hypothesis-Driven Analysis and Reporting Kinetic).
HARKing = Hypothesizing After the Results are Known
Munafò et al. (2017)
Confirmatory vs. Explorative Research
The solution: Pre-registration
Pre-registration

“Stating as clearly and specifically as possible what you plan to do, and how, before doing it in a manner that is verifiable by others.”

Lorne Campbell (2018)
Pre-registration

Introduction
- Research question
- Hypothesis

Method
- Sample(size)
- Design, variables
- Measures
- Exclusion criteria
- Analysis plan
What to do with your pre-registration?

1) **Post somewhere private or public (e.g., Open Science Framework, As predicted)**
2) **Submit to journal for peer review** (Registered Reports)
Why pre-register?

1) Increase the reproducibility of science
2) Keep track of what you did and why
3) Publish based on idea/design, not outcome
Common misconceptions

Pre-registration prevents the exploration of your data/creativity.

No, pre-registration allows for exploratory science. It simply prevents reporting exploratory analyses as confirmatory.
Common misconceptions

Open Science Is Liberating and Can Foster Creativity

Willem E. Frankenhuis\textsuperscript{1} and Daniel Nettle\textsuperscript{2}
\textsuperscript{1}Behavioural Science Institute, Radboud University and \textsuperscript{2}Centre for Behaviour and Evolution and Institute of Neuroscience, Newcastle University
Common misconceptions

Pre-registration doesn’t allow for making changes and I cannot predict what will happen.

No, you cannot predict exactly what will happen. You might make mistakes. It’s fine to make (small) changes as long as you report your deviation from your pre-registered plan.
Common misconceptions

Pre-registration is too much work.

Every new procedure takes time. However, it’s more a shift in when a study takes up most of the time (begin vs. end). Might also actually save time once data are in.
Common misconceptions

Others will steal my ideas when I pre-register.

Your pre-registration might stay private until publication.
How to pre-register?

I can help you!
Goals Open Science Community

1) Make Open Science more visible and accessible
   - Promote knowledge exchange

2) Inspire and enable researchers to take the next small step

3) Identify obstacles and need for support to inform policy makers
“We should all adopt OS practices”
"We should all adopt OS practices"

"I'm already practising OS"
"We should all adopt OS practices"

"Yes, but why?"

"Yes, but how?"

"What?"

Interested

Policy makers

Researchers
"We should all adopt OS practices"
Innovation Adoption Lifecycle

- Innovators: 2.5%
- Early adopters: 13.5%
- Early majority: 34%
- Late majority: 34%
- Laggards: 16%

Rogers (1962)
Expert

Interested
The future is open!
Interesting links

Blog post on pre-registration by Lorne Campbell
https://www.lornecampbell.org/?p=181

Article Frankenhuis & Nettle (2018) on Pre-registration and creativity
https://journals.sagepub.com/doi/10.1177/1745691618767878

Article on pre-registration in qualitative research

Common misconceptions on pre-registration and responses (Table 1 in the article)
https://osf.io/xn35j/
Our formats

- Website

Workshops to learn & talk about open science

- 27/9 - Publishing Open Access with Jan de Boer & Barbara Vreede
  Tielezaal, University Library city centre

- 1/11 - Managing your data FAIR with Annemiek van der Kuil
  Drakenborchzaal, University Library, Uithof

- 24/1 - Working with the Open Science Framework

- 7/3 - Being Open & Successful with Daniel Oberski
  Event room, Langeveld building, Uithof

- 2/5 - Shaping OS Policies with Frank Miedema
  Sweelinckzaal, Drift 21

- 13/6 - Pre-registering your study & celebrating one year of OSCU

News

- New member: Cedric Thieulot
  25 July 2019

- New member: Daniel Cohnitz
  25 July 2019

- New member: Mary Felix
  19 July 2019

- New member: Ian Smith
  11 July 2019
Our formats

• Website
• **Membership**
  • >200 members from ALL faculties

Anita Eenland
Centre for Open Science, Open Access, Open Data, Open peer review, Open Science Framework, Open Science tools, Pre-registration, Preprints, Referring to data on the OSF, Replication, SIPS
Our formats

• Website
• Membership
• Newsletter

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Newsletter July 2019

Thanks for being part of OSCU!
Together, we make science more transparent, accessible, reliable, and inclusive.

In this newsletter:

• Looking back at the pre-registration workshop
• Open Science Summerschool (August 26-30, Utrecht)
• Coming up: 7x OSCU Open Science Symposium
• Member initiative: Journal of Trial and Error
• Meet the member: Laura Dijkstraen

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Looking back at the workshop on pre-registration

On June 13 the last OSCU workshop of this academic year took place. Around 40(!) researchers gathered to discuss pre-registration. After a brief introduction on the topic by Anita Eerland, Reine van der Wal shared her experience with pre-registration. Afterwards, participants were divided into groups for brainstorming and discussing their own workflows for pre-registration.
Our formats

• Website
• Membership
• Newsletter
• Social media
Our formats

• Website
• Membership
• Newsletter
• Social media
• Workshops
• OS Cafes

Workshops to learn & talk about open science

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13/6 - Pre-registering your study & celebrating one year of OSCU
Room E1.22, Langeveld building, Uithof
New formats

• Stickers
• OS symposia per faculty
• Member initiatives