Preregistration of research studies

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Roadmap

- Why should we consider preregistration?

- What is preregistration?

- The benefits and challenges of preregistrations

- How to preregister research? A primer

- How to get the most out of preregistration?

- Q&A time!

Credibility of academic research is under debate

ESSAY

Why Most Published Research Findings Are False

John P. A. Ioannidis

nature

How scientists fool themselves – and how they can stop
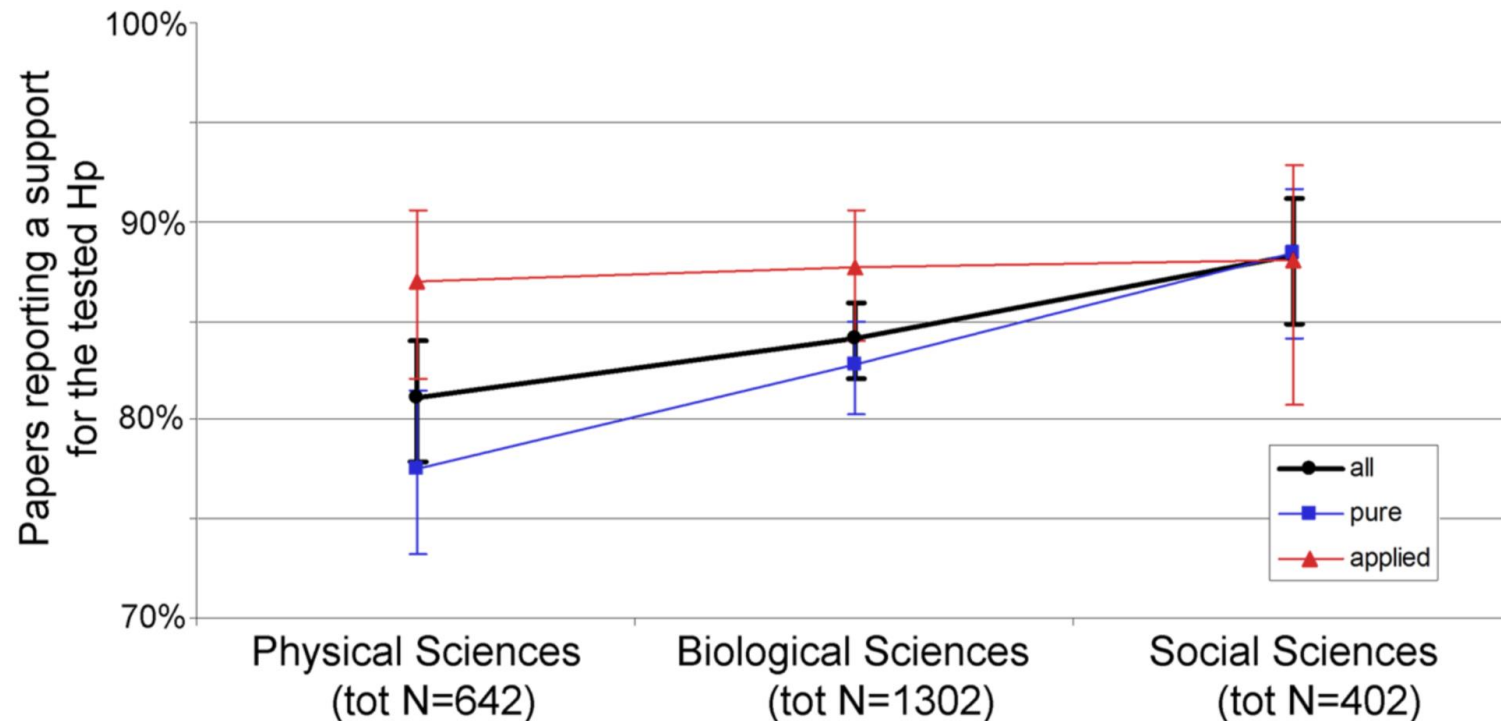
Regina Nuzzo

Negative or "boring" results are less likely to be published

(and more likely to end up in a file-drawer)

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Fanelli (2010) *PLOS ONE*

Negative or "boring" results are less likely to be published

(and more likely to end up in a file-drawer)

The "File Drawer Problem" and Tolerance for Null Results

Robert Rosenthal
Harvard University

For any given research area, one cannot tell how many studies have been conducted but never reported. The extreme view of the "file drawer problem" is that journals are filled with the 5% of the studies that show Type I errors, while the file drawers are filled with the 95% of the studies that show non-significant results. Quantitative procedures for computing the tolerance for filed and future null results are reported and illustrated, and the implications are discussed.

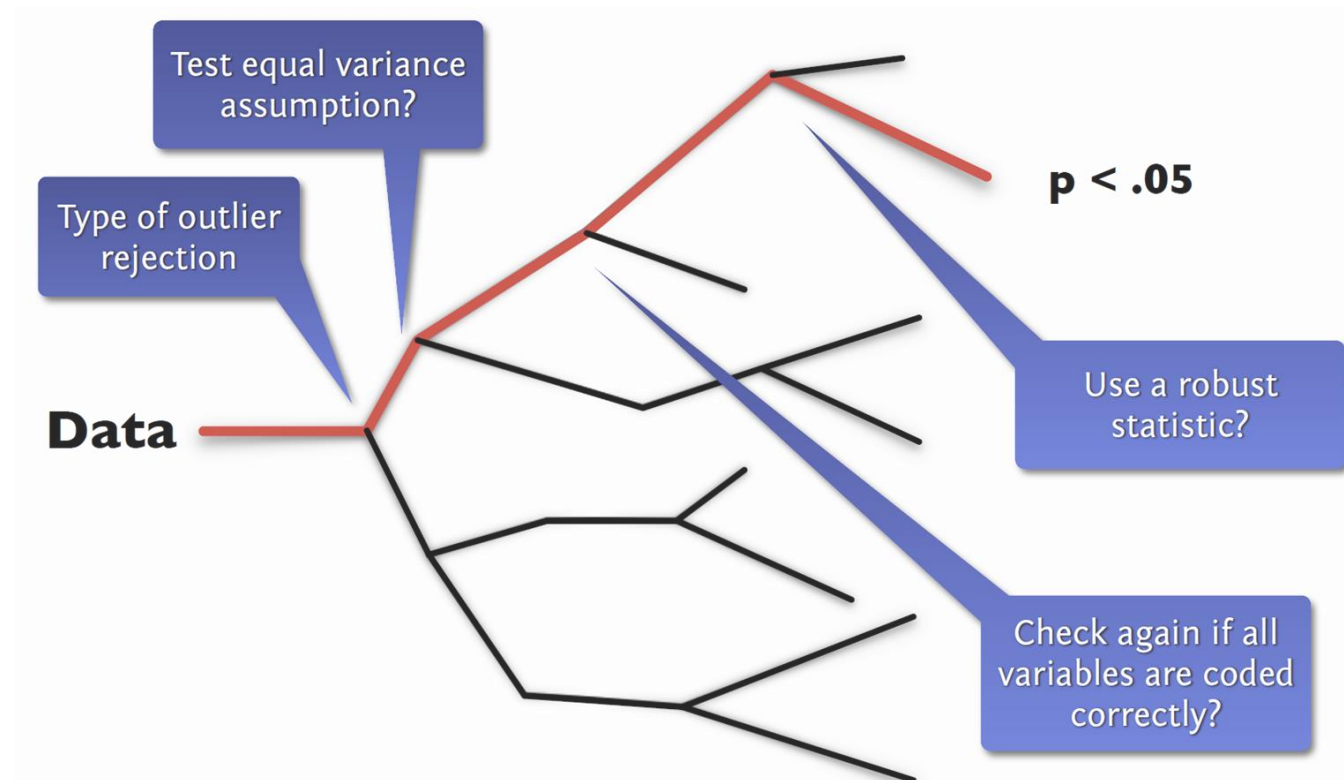UNIVERSITY
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Rosenthal (1979) *Psych Bull*

Researchers are biased and make arbitrary decisions

(also called "Researcher degrees of freedom")

Researchers are biased and make arbitrary decisions

(also called "Researcher degrees of freedom")

p-hacking

HARK-ing

By Schoenbrodt (2021)

Confirmatory and exploratory research is being mixed up

(and prediction is confused with post-diction)

The Statistical Context of Justification – Confirmatory Research

The Creative Context of Discovery – Exploratory Research

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By Sarafoglou, A (2021) *SIOS Lecture*
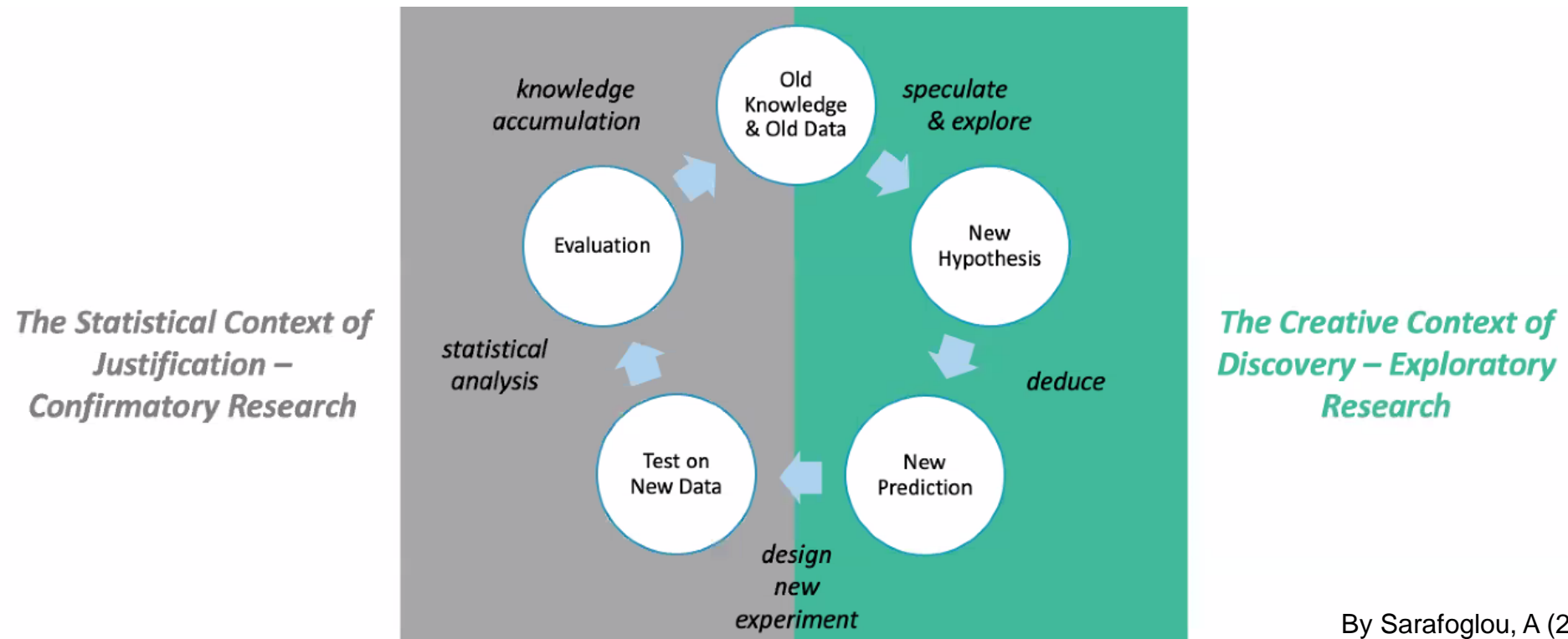
File-drawer problem and publication bias

Researcher degrees of freedom

Confirmatory vs exploratory research

Replication crisis?
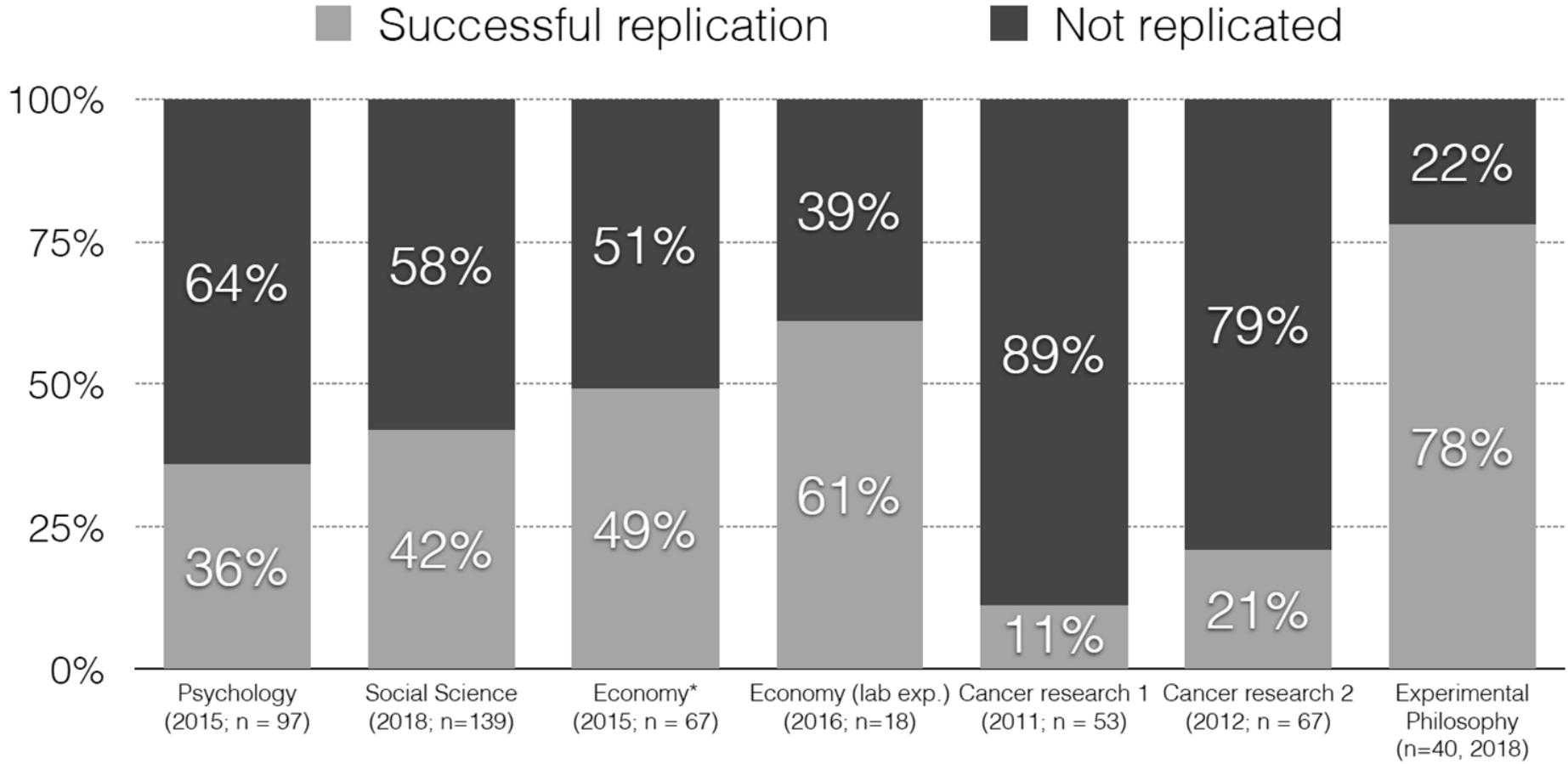
Successful replication — Not replicated

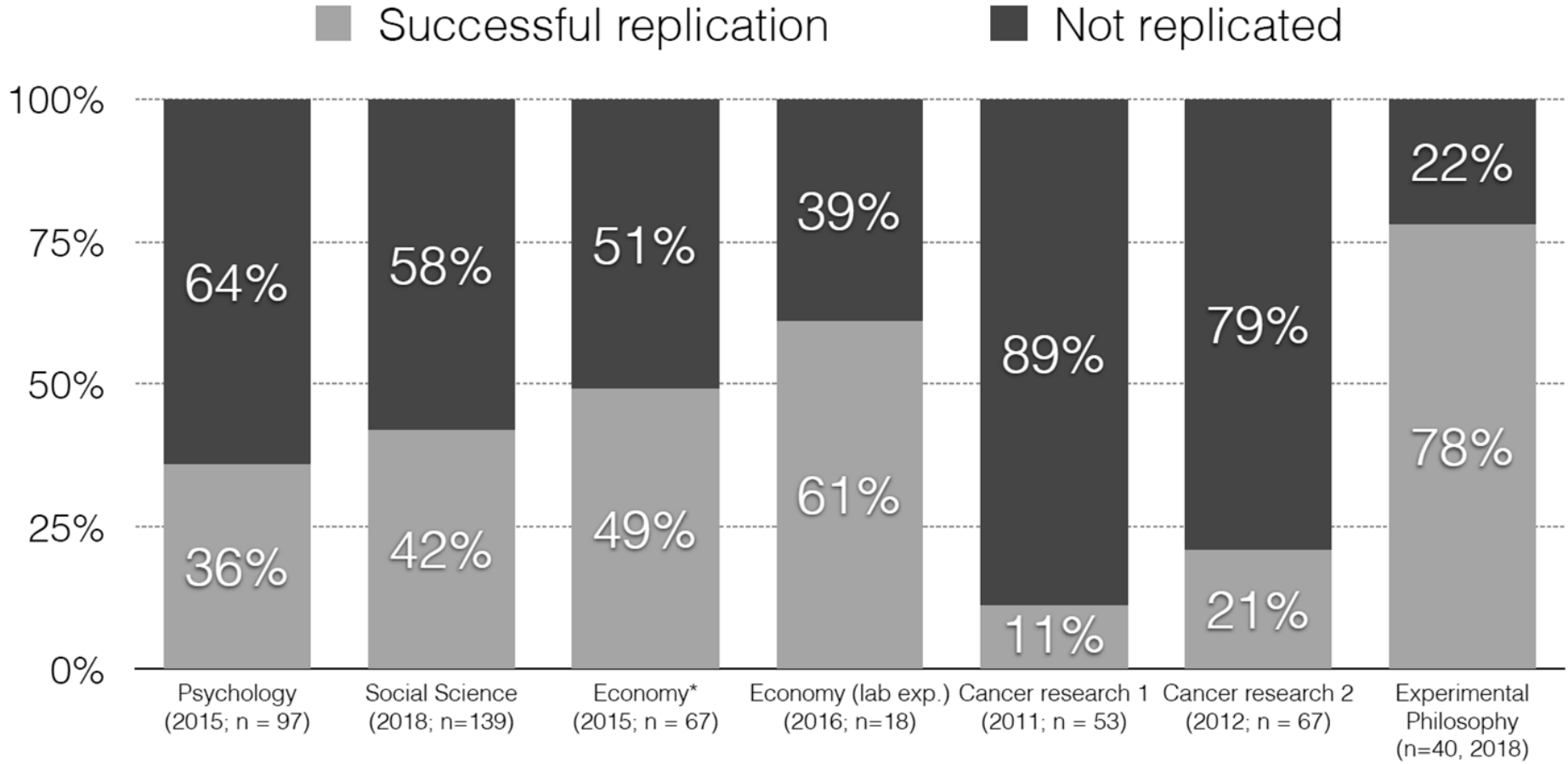|	Not replicated	Successful replication
Psychology (2015; n = 97)	64%	36%
Social Science (2018; n=139)	58%	42%
Economy* (2015; n = 67)	51%	49%
Economy (lab exp.) (2016; n=18)	39%	61%
Cancer research 1 (2011; n = 53)	89%	11%
Cancer research 2 (2012; n = 67)	79%	21%
Experimental Philosophy (n=40, 2018)	22%	78%

Open Science Collaboration (2015); Social Science: Combined sample of systematically sampled projects (RPP, SSRP, EERP); Chang & Li (2015); Camerer et al (2016); Begley, C. G., & Ellis, L. M. (2012). Prinz, F., Schlange, T., & Asadullah, K. (2011); Cova et al. (2018)

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Schoenbrodt (2021)

Replication is obtaining similar results with new data

Reproducibility is obtaining identical results with the same data

Successful replication   Not replicated

	Successful replication	Not replicated
Psychology (2015; n = 97)	36%	64%
Social Science (2018; n=139)	42%	58%
Economy* (2015; n = 67)	49%	51%
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Open Science Collaboration (2015); Social Science: Combined sample of systematically sampled projects (RPP, SSRP, EERP); Chang & Li (2015); Camerer et al (2016); Begley, C. G., & Ellis, L. M. (2012). Prinz, F., Schlange, T., & Asadullah, K. (2011); Cova et al. (2018)

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*The data on economics is about reproducibility (getting the same results with the same data)

Schoenbrodt (2021)

Preregistration

ClinicalTrials.gov

Find Studies ▾   About Studies ▾   Submit Studies ▾   Resources ▾   About Site ▾   PRS Login

SUBMIT STUDIES

Submit Studies to ClinicalTrials.gov PRS

Why Should I Register and Submit Results?

FDAAA 801 and the Final Rule

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Registering clinical trials when they begin, providing timely updates, submitting summary results, and making this information publicly available fulfills a number of purposes and benefits a variety of people.

https://clinicaltrials.gov

ORIGINAL ARTICLE

Clinical trial registration was associated with lower risk of bias compared with non-registered trials among trials included in systematic reviews

Kristina Lindsley [a,b,*], Nicole Fusco [c], Tianjing Li [d], Rob Scholten [a,b], Lotty Hooft [a,b]

[a] Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands
[b] Cochrane Netherlands, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands
[c] Xcenda, LLC, Boston, MA
[d] Department of Ophthalmology, School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO

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Preregistration

What is preregistration?

The specification of a research design, hypotheses, and/or analysis plan prior to observing the outcomes of a study.

Typically takes a form of a time-stamped, frozen document made available on an online platform.

Nosek & Lindsay (2018)
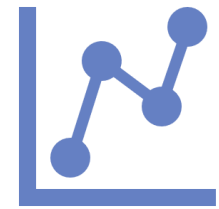
What do I need to preregister?
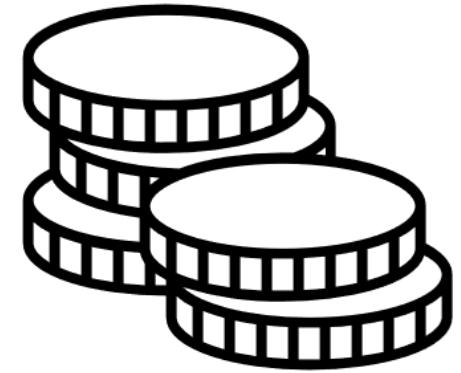
Research questions and hypotheses

Study design and data collection methods

Data preprocessing and analysis plan

A (very) simple example

Hypothesis: The coin is fair. (When throwing a coin multiple times, we will observe equal number of heads and tails).

Methods: We will throw a coin 100 times and register the outcome (head or tail) each time after it falls on the floor. Data collection will stop after N = 100.

Data preprocessing: Head outcomes will be labeled as "1" and tails outcomes will be labeled as "0" in the spreadsheet.

Data analysis: We will perform a t-test on the data against chance level (0.5).

Real-life example

Voice onset time in Norwegian infant-directed speech over development

Preregistered on Open Science Framework: https://osf.io/5nwxu

Preregistration vs Registered Report

https://www.cos.io/initiatives/registered-reports

Preregistration vs Registered Report

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

Preregister and time-stamp on an online platform (no peer review)

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https://www.cos.io/initiatives/registered-reports

Preregistration vs Registered Report

Preregistration vs Registered Report

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

Stage 1 Peer Review
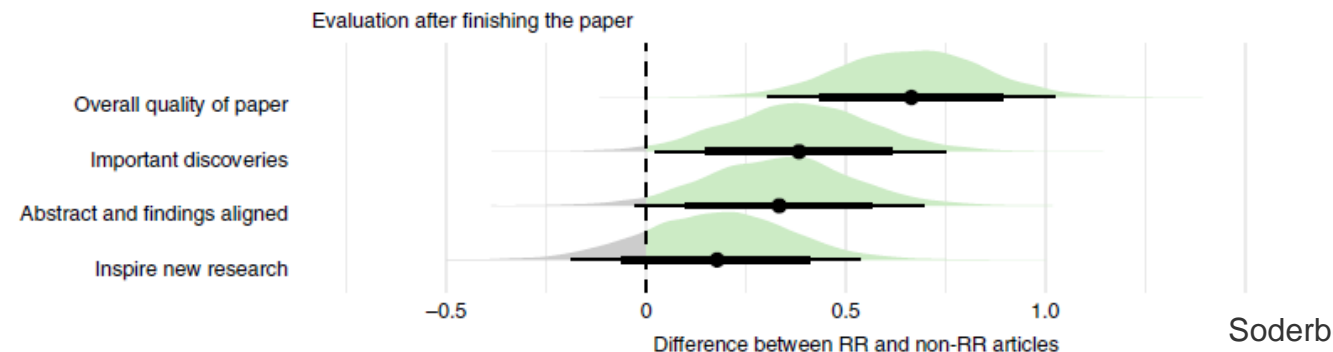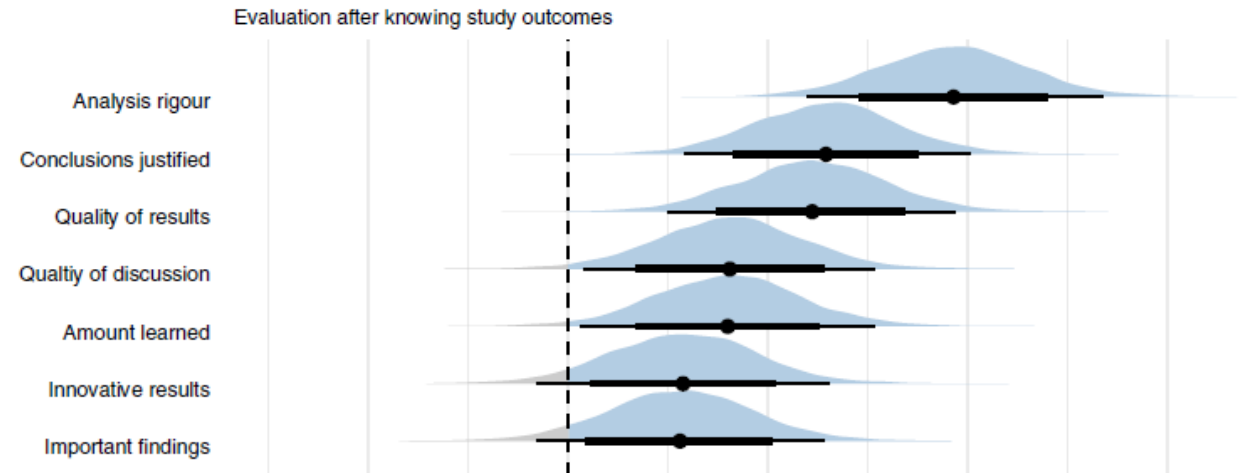
Stage 2 Peer Review
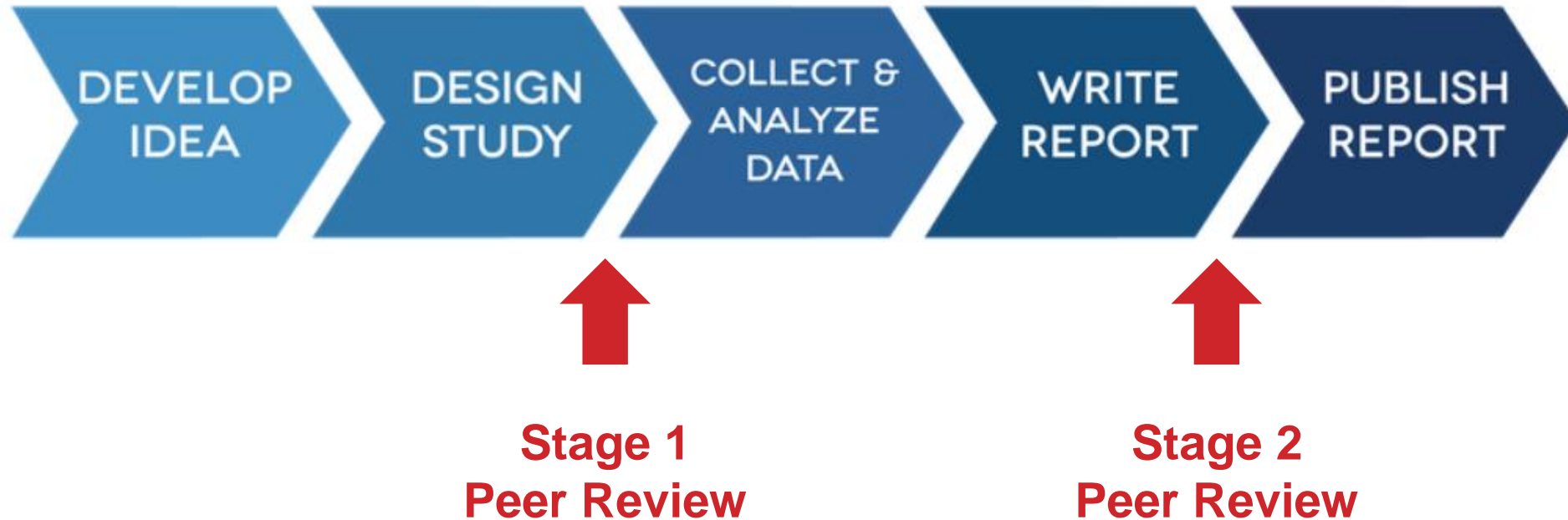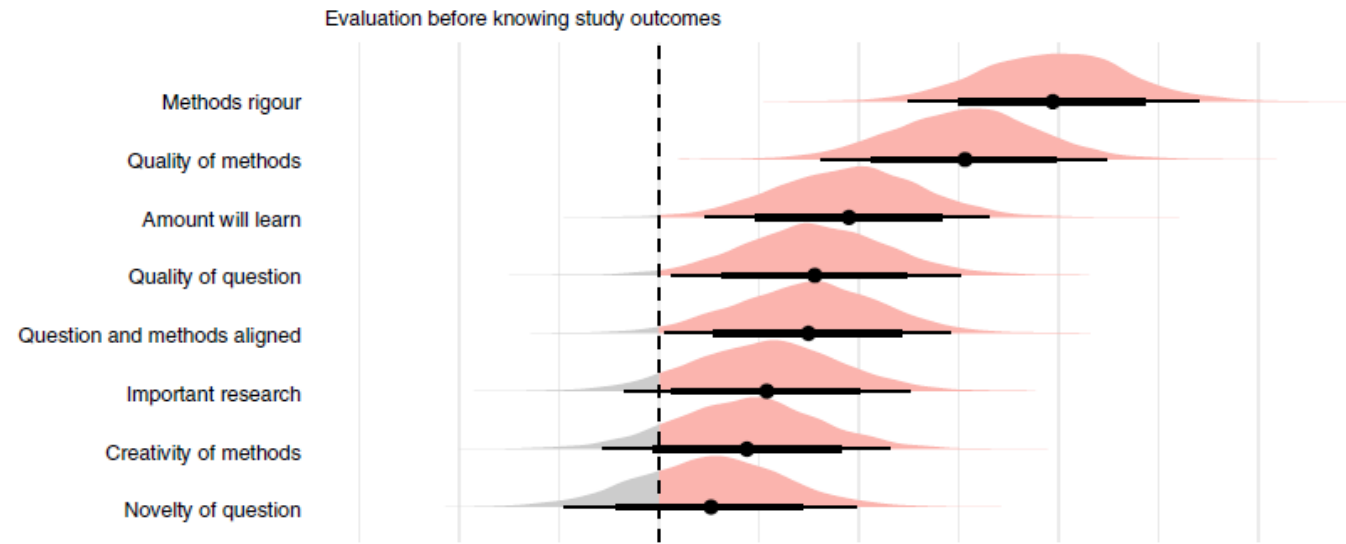
Currently, over **300** scientific journals use the Registered Reports publishing format either as a **regular submission option** or as part of a single **special issue**.

https://www.cos.io/initiatives/registered-reports

It works!

Scheel, Schijen, Lakens (2021) *AMPPS*
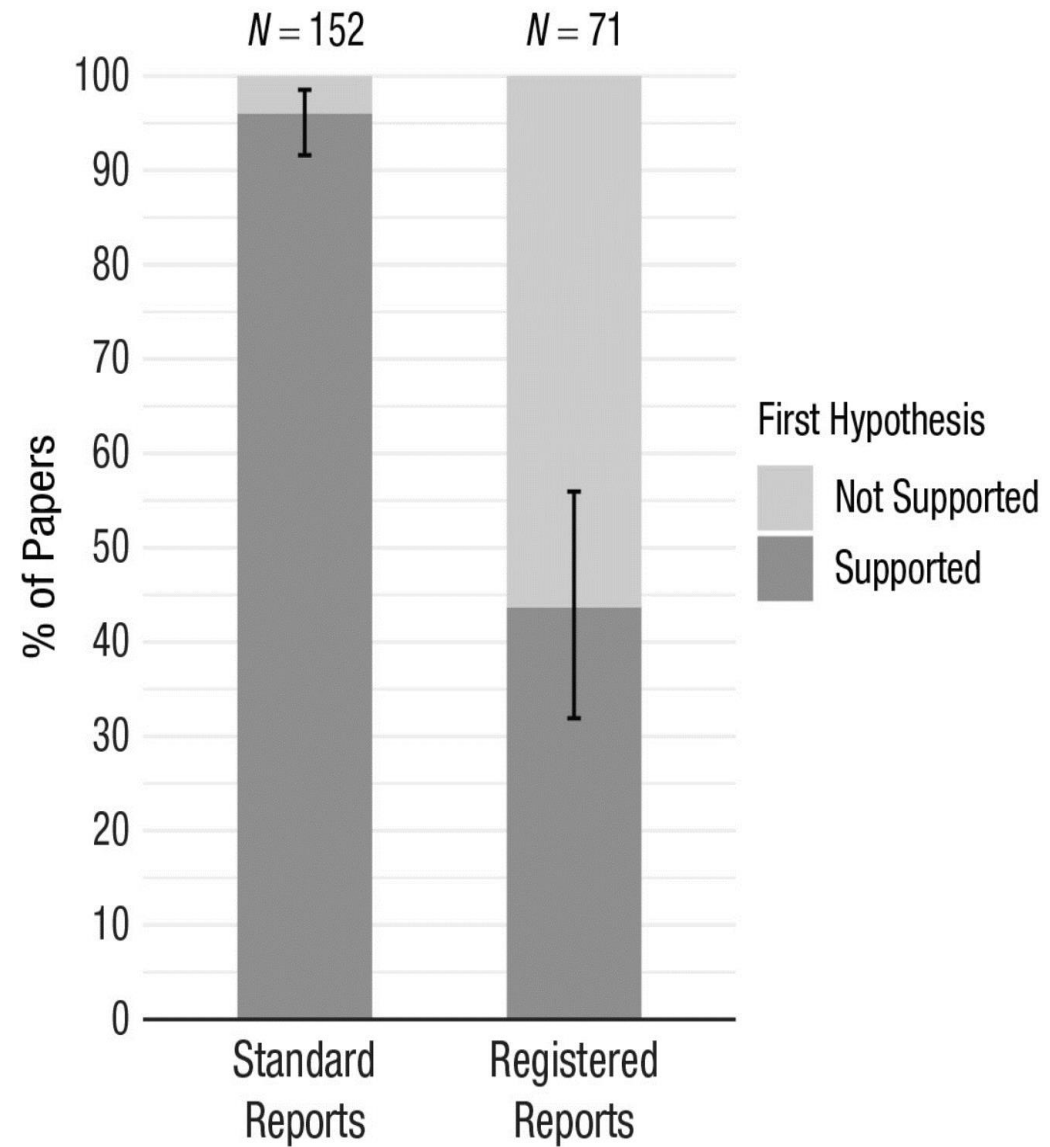
It works!

RR – Registered Reports
non-RR – Standard Reports

Soderberg et al (2021) *NatHumBeh*

Preregistration works
…even when not followed

Knowledge about others reduces one's own sense of anonymity

Anuj K. Shah ✉ & Michael LaForest

1) All p-values mentioned above are reported in the paper and/or its supplement. The authors **did not hide those results**.
2) There is **nothing wrong** with focusing on crimes occurring within 250 feet or within three months of the intervention. These are justifiable decisions.
3) What is wrong – not ethically, but mathematically – is **choosing which analyses to report or emphasize *based* on the results** that were obtained, and then taking the resulting p-values at face value

http://datacolada.org/101
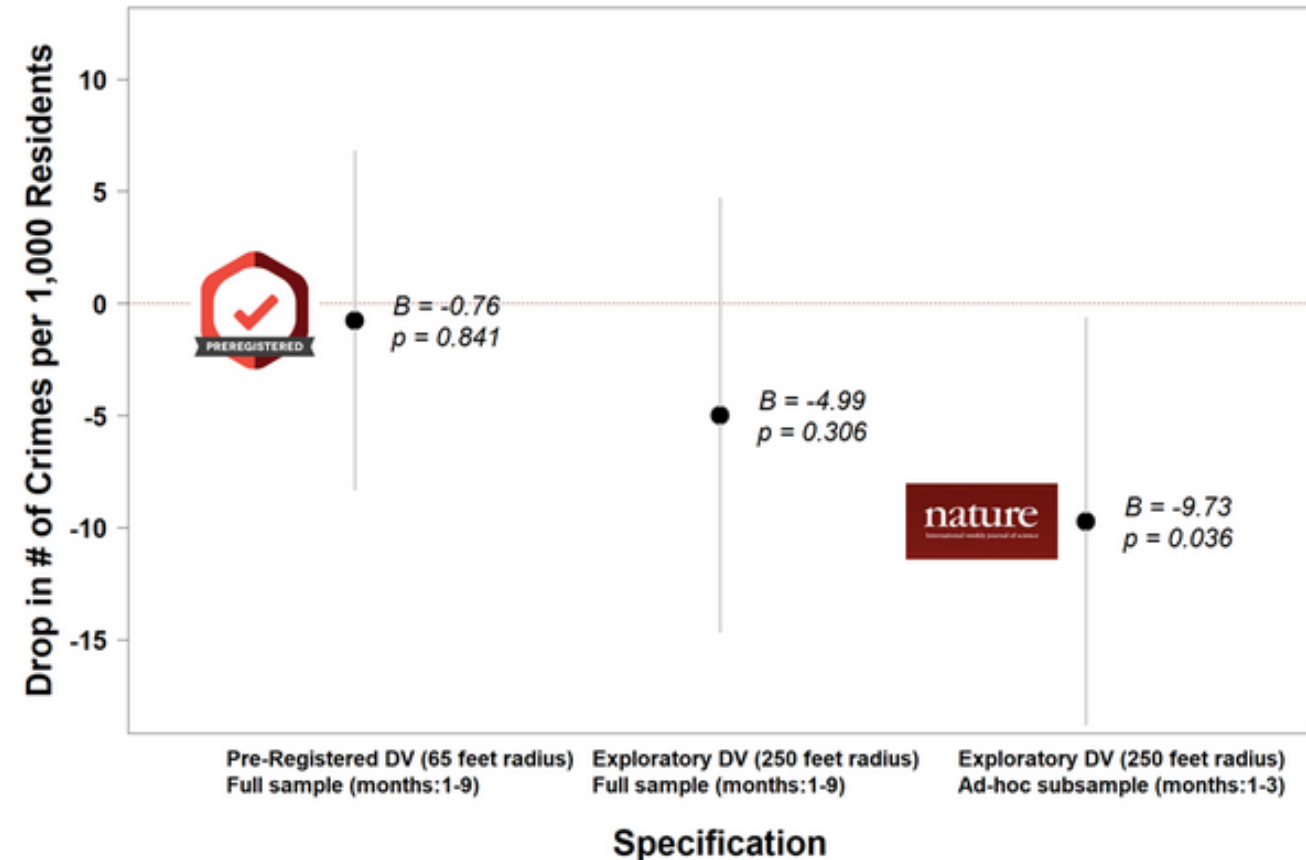
The benefits

- More visibility to **null results**
- More **visibility to research ideas and plans** early in the process
- More **trust** in research studies (through reduced biases)
- Clearer **distinction** between confirmatory and exploratory research as well as *a priori* and *post hoc* analyses
- Reduced redundancy of research studies?

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Ioannidis (2022) *Mat Bio;* Kathawalla et al. (2021) *Collabra;* Nosek et al. (2019) *TiCS;* see also: https://www.psychologicalscience.org/observer/seven-selfish-reasons-for-preregistration

The <u>selfish</u> benefits

- You will be more **transparent** about your research and analyses plans (and increase **trust** in your work)
- You will be encouraged to **think more deeply** about research design and planned analyses before collecting data
- You can claim early **credit** for your research ideas
- You will increase the **visibility** of your research and odds of getting **published** (despite the negative or "boring" findings)
- You will be more competitive on the **academic job market** (more and more listings mention scientific transparency and open science practices) and for **grant applications**

Ioannidis (2022) *Mat Bio;* Kathawalla et al. (2021) *Collabra;* Nosek et al. (2019) *TiCS;* see also: https://www.psychologicalscience.org/observer/seven-selfish-reasons-for-preregistration

The challenges

- **More time** required at the planning phase (but less time required at the analysis and writing stage!)

- Higher **visibility of errors** (e.g., if wrong types of analyses are preregistered)

- **Less flexibility** (however, changes to preregistration are possible)

- Writing preregistration may improve study design and analyses, but there is **no quality stamp**

Kathawalla et al. (2021); Nosek et al. (2018) *PNAS*; Nosek et al. (2019) *TiCS; Collabra*; Szollosi et al. (2020) *TiCS*

The myths

- It prevents **exploratory** research
- It limits research **creativity** or **flexibility**
- It might lead to others **scooping** my idea and my research plan
- There is no way to decide on data processing and analysis **without looking at the data**

How to preregister research?
A primer

Step 1: Choose the platform and the template

Focus	Type of research	Platform	Template
Discipline-specific	Clinical research	clinicaltrials.gov	Generic
	Animal research	animalstudyregistry.org	Generic
	Economics/Social sciences	socialscienceregistry.org	Generic
Discipline-general	Basic research	aspredicted.org	Generic
		osf.io/registries	Structured, Unstructured, Qualitative research, Replications, etc.

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Animal Study Registry

Animal Study Registry is an online registry for scientific studies involving animals conducted around the world. It is operated by the German Centre for the Protection of Laboratory Animals (Bf3R) at the German Federal Institute for Risk Assessment (BfR). The registry was launched as a reaction to the reproducibility crisis and provides scientists a platform to register an exact study plan prior to the start of experiments in order to prevent selective reporting. This allows reviewers or other scientists to compare the initially registered contents with the final publication. Thereby, Animal Study Registry encourages transparency, reproducibility, and animal welfare.

Register your study in Animal Study Registry

Take all the time you need to prepare the registration of your study in Animal Study Registry. As long as your study is in preparation, you can save all changes and come back to it anytime you want. Once your study is submitted, you can still decide to change or retract it within two weeks from the submission date. After this period, the registration becomes binding and your study receives a DOI (Digital Object Identifier) number which marks your study as your intellectual property. From this date on you can only add comments to your study. Our platform allows registration of a study without making it immediately publicly accessible. You can restrict the visibility of your study for a period of up to five years. During this embargo period, your study will appear in Animal Study Registry only with its title, your institution and optionally your name, accompanied by a short summary. At the end of the embargo period, your study will automatically become fully publicly accessible. Please have a look at our sample study 10.17590/asr.0000091.

https://www.animalstudyregistry.org

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AEA RCT Registry

The American Economic Association's registry for randomized controlled trials

About   Registration Guidelines   Data   FAQ

Advanced Search

SEARCH

REGISTRATION GUIDELINES

REGISTER A TRIAL ›

Please review these instructions before beginning a trial registration.

Accounts

You will need a valid account to register a trial. To create an account go to the Sign Up page.

Trial Registration

Once you have a valid account, you can register a trial at the Trial Registration page. The person registering the trial is considered to be the primary principal investigator (PI). For studies with additional PIs, there are additional fields to enter their names, emails and affiliations. Email addresses are hidden from public view.

https://www.socialscienceregistry.org/

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ASPREDICTED

Create a new pre-registration

CREATE

☐ **Just trying it out; make this pre-registration self-destroy in 24 hours.** 💣

See your pre-registrations

(e.g., to share with reviewers or make public)

[email address you have used in AsPredicted]

Sign in

I cannot access my AsPredicted email account anymore

WHAT IS ASPREDICTED?

AsPredicted is a platform that makes it easy for researchers to pre-register their studies, and easy for others to read and evaluate those pre-registrations. To pre-register a study on AsPredicted, a researcher answers nine simple questions about their research design and analyses. The platform then generates a time-stamped, single page .pdf document that includes a unique URL for verification.

HOW DOES IT WORK?

- One author creates the pre-registration.
- Participating authors are emailed, requesting approval.
- If all approve, it is saved but remains private until an author makes it public; or remains private forever.(Why?)
- Authors may share an anonymous version of the pre-registration with reviewers.
- If made public, the final .pdf (sample) is automatically stored in the web-archive.

https://aspredicted.org/

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OSFREGISTRIES

The **open** registries network

Add New Registration

You are submitting to OSF Registries. *Click here* to learn more about other hosted registries.

STEP 1

Do you have content for registration in an existing OSF project?

YES	NO

STEP 2

Which type of registration would you like to create? *

OSF Preregistration ▲
OSF Preregistration
Open-Ended Registration
OSF-Standard Pre-Data Collection Registration
Pre-Registration in Social Psychology (van 't Veer & Giner-Sorolla, 2016): Pre-Registration
Preregistration Template from AsPredicted.org
Qualitative Preregistration

https://osf.io/registries

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Step 2: Write up!

- Think through your hypotheses, methods, and planned statistical analyses very carefully

- Be precise about your exclusion criteria, stopping rule, handling missing data and outliers

- Try out your methods and planned analyses in a pilot study or on mock data

- Think about possible unexpected scenarios

Step 2: Write up!

We are interested in testing group differences.

❌

We hypothesize that groups A and B will differ in condition X based on...

✓

Step 2: Write up!

We will exclude inattentive participants. ✗

We will exclude participants who did not pass 2 out of 3 control questions. ✓

Step 2: Write up!

We will remove outliers.

❌

We will remove influential observations identified through Cook's Distance analysis.

✓

Step 3: Register and time-stamp!

You can decide whether you want your preregistration to be open to public or closed until the results are published.

Step 4: Changes to preregistration

- Even the best plans might need changes once implemented

- When reporting deviations from the original, preregistered plan, be **explicit** about what has changed

- If needed, you can upload changes to your time-stamped preregistration or preregister a new plan (but refer to the original preregistration and explain why you made the changes)

How to get the most out of preregistration?

Preregistering quantitative vs qualitative studies

Quantitative research: have the right confirmatory analyses been carried out based on original hypotheses?

Qualitative research: have the right data collection and analysis methods been used? Is the interpretation convincing, based on original theoretical framework and planned methodology?

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Preregistration will look different depending on scientific discipline or the type of research study.

Choose **the right template** for your preregistration.

Take a look at **preregistration examples** for similar studies before you write up yours.

Consult your **colleagues** if they have experience with preregistration in your field.

Preregistering qualitative research

Tamarinde L. Haven ✉ iD & Dr. Leonie Van Grootel iD

https://www.tandfonline.com/doi/full/10.1080/08989621.2019.1580147

Preregistration of exploratory research: Learning from the golden age of discovery

Ulrich Dirnagl ✉

https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000690

Theoretical-review Articles

Preregistration of Analyses of Preexisting Data

Authors: Gaëtan Mertens ✉, Angelos-Miltiadis Krypotos

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https://www.psychologicabelgica.com/articles/10.5334/pb.493/

Preregistration is a plan, not a prison.

Remember that you can make changes to the preregistration or report non-preregistered findings, as long as you are explicit about what was planned and what was not planned.

Thank you!

Questions?

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Open and reproducible research

Time and place: May 19, 2022 12:00 PM–1:30 PM, Zoom, Add to calendar

Preregistration on Open Science Framework (OSF)

Learn about how to preregister your study on Open Science Framework (OSF) and how to navigate the platform.

Time and place: May 24, 2022 9:00 AM–3:30 PM, Undervisningsrom 1, 3rd floor Georg Sverdrups hus, Add to calendar

R Markdown: Writing Reproducible Research Papers with R

Learn how to write your research papers in R Markdown to communicate your results in a reproducible way.

Carpentry: Training on foundational coding and data science skills

At University of Oslo (UiO), Carpentries workshops based on Software Carpentry, Data Carpentry, and Library Carpentry lessons are offered to facilitate sharing and re-using of code and data among graduates and researchers from all faculties and units.

Upcoming workshops

Carpentry: R for Reproducible Scientific Analysis (Novices)

May 31, 2022 9:00 AM - 4:00 PM , Ole-Johan Dahls hus, seminarrom Perl

Carpentry@UiO: Plotting and Programming with Python (Novices)

June 1, 2022 9:00 AM - 4:30 PM , Kristine Bonnevies hus, rom 3127

Digital Scholarship Center

UiO's Digital Scholarship Center (DSC) can help you take advantage of digital tools and methods in your research. We offer support with data management, visualization, digital research methods, and digital skill development.

Research Data Management at UiO

Having proper Research Data Management (RDM) routines will help you save time, enables sharing and reuse of data, and promotes open science. However, RDM in a digital context can be challenging and complex. We offer guidance and consultation on RDM topics including:

- data management plans (DMP)
- classification and storage
- organization, documentation, and metadata
- legal questions (i.e.privacy, copyright, and licensing)
- archiving and sharing

Digital research methods

On these pages you will find overviews and user guides on digital research methods for researchers and students. There will be information about relevant digital research methods in many subject areas.

Currently, we have information about text mining - or digital research methods for those working with text data.

Need advice?

Visit us at the room 230, in the 2nd floor of Niels Henrik Abels hus.

Book an appointment $\rightarrow$

Or send us an email to research-data@uio.no

Digital scholarship communities

Interested in teaching or helping at workshops? Join us in:

$\rightarrow$ Carpentries@UiO

$\rightarrow$ CodeRefinery - Get Involved

$\rightarrow$ UiO Data Managers Network

$\rightarrow$ ReproducibiliTea Journal Club

Do you have any suggestions for workshops or seminars or questions about the workshops? Send an email to digitalscholarship@ub.uio.no

Journal Clubs

ReproducibiliTea

Our mailing list:

https://sympa.uio.no/uio.no/subscribe/open-science-oslo

University of Oslo

Welcome

Our journal club is open to both staff and students at UiO across all departments. Everyone is welcome to join us - whether you are an enthusiast, a skeptic, or a cautious explorer. Feel free to get in touch if you are interested to participate or contribute!

Our mission

- provide an informal and friendly platform for discussions about meta scientific topics
- help each other get familiarized with open science practices (e.g., pre-registrations, sharing data, sharing preprints, etc.)
- connect students and researchers from various disciplines who are interested in meta science.

Format

Before each meeting, we read an article on meta scientific topics, which we then discuss during the meeting. At each meeting, a different discussion leader will begin by providing a short overview of the paper and facilitate discussion throughout the meeting. Anyone can propose a possible paper or topic to present if we have not covered it already. Grab a cup of tea (coffee?) and join us! Due to the current pandemic, all sessions will be held online (Zoom) for the time being.

🌐 Universitetet i Oslo
⚙ osf.io/mvx54
Z collection
❓ timo.b.roettger@gmail.com
👤 Timo B. Roettger
👤 Agata Bochynska

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Welcome to Norway's Reproducibility Network

Towards open & reproducible science

JOIN US

Our Mission

The Norwegian Reproducibility Network (NORRN) is a peer-led network that aims **to promote and enable rigorous, robust and transparent research practices in Norway**. We attempt to achieve this goal by establishing appropriate training activities, designing, and evaluating research improvement efforts, disseminating best practices, and working with stakeholders to ensure coordination of efforts across the sector. NORRN's activities span multiple levels, including researchers, librarians, institutions, and other stakeholders (e.g., funders and public authorities).

https://www.norrn.no/

Thank you!

Questions?

Agata Bochynska, PhD

Open Research group, University of Oslo Library

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References

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