Preregistration of research studies

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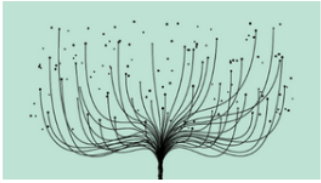
Bochynska, A (2023). *Preregistration of research studies*

Open and reproducible research courses

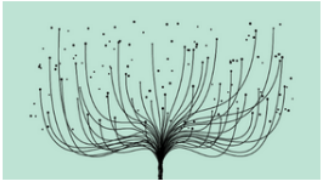
Feb 3rd – March 3rd 2023



Time and place: Feb. 3, 2023 10:00 AM–11:30 AM, Zoom

Introduction to open and reproducible research

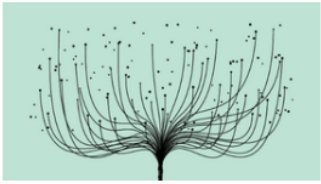
Learn about what open research is and how to make your own research more transparent and reproducible.



Time and place: Feb. 6, 2023 10:00 AM–11:30 AM, Zoom

Preregistration of research studies

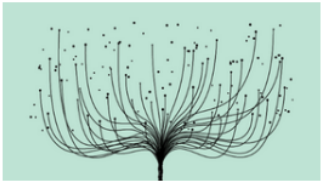
Learn about what preregistration is and how to preregister your own studies.



Time and place: Feb. 8, 2023 10:00 AM–11:30 AM, Zoom

Preregistration on Open Science Framework (OSF)

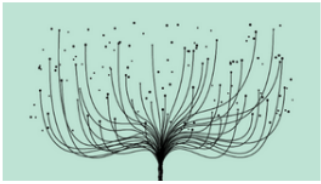
Learn about how to preregister your study on Open Science Framework (OSF) and how to navigate the platform.



Time and place: Feb. 13, 2023 10:00 AM–11:30 AM, Zoom

Reproducible research workflows

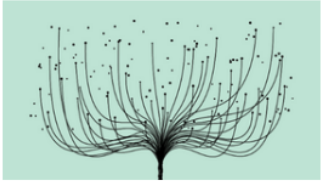
Learn about tools and practices for more reproducible and effective research.



Time and place: Feb. 27, 2023 1:00 PM–2:30 PM, Zoom

Open Access publishing

Learn about Open Access and how can you choose the best way to publish your results openly.



Time and place: Mar. 3, 2023 9:00 AM–10:30 AM, Zoom

Researcher visibility

Learn about different tools, platforms and services to share your research and other contributions, and how you utilise them to make yourself and your work more visible to the academic community and the society at large.

https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

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

PLOS MEDICINE

OPEN ACCESS

ESSAY

Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • https://doi.org/10.1371/journal.pmed.0020124

nature

Published: 07 October 2015

How scientists fool themselves – and how they can stop

Regina Nuzzo

Nature **526**, 182–185 (2015) | Cite this article

1246 Accesses | **152** Citations | **2900** Altmetric | Metrics

Negative or “boring” results are less likely to be published

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

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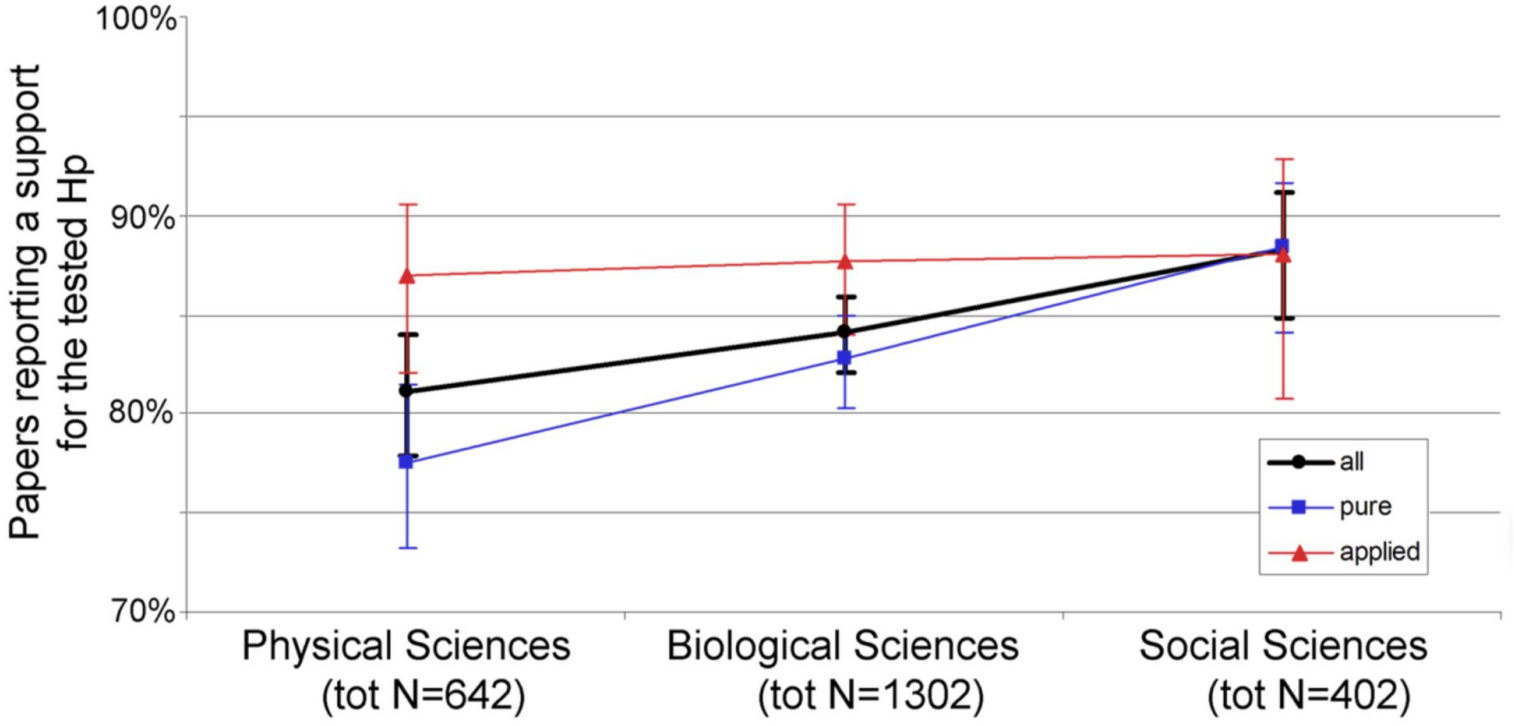

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Fanelli (2010) *PLOS ONE*

Negative or “boring” results are less likely to be published

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

Psychological Bulletin
1979, Vol. 86, No. 3, 638–641

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 nonsignificant results. Quantitative procedures for computing the tolerance for filed and future null results are reported and illustrated, and the implications are discussed.

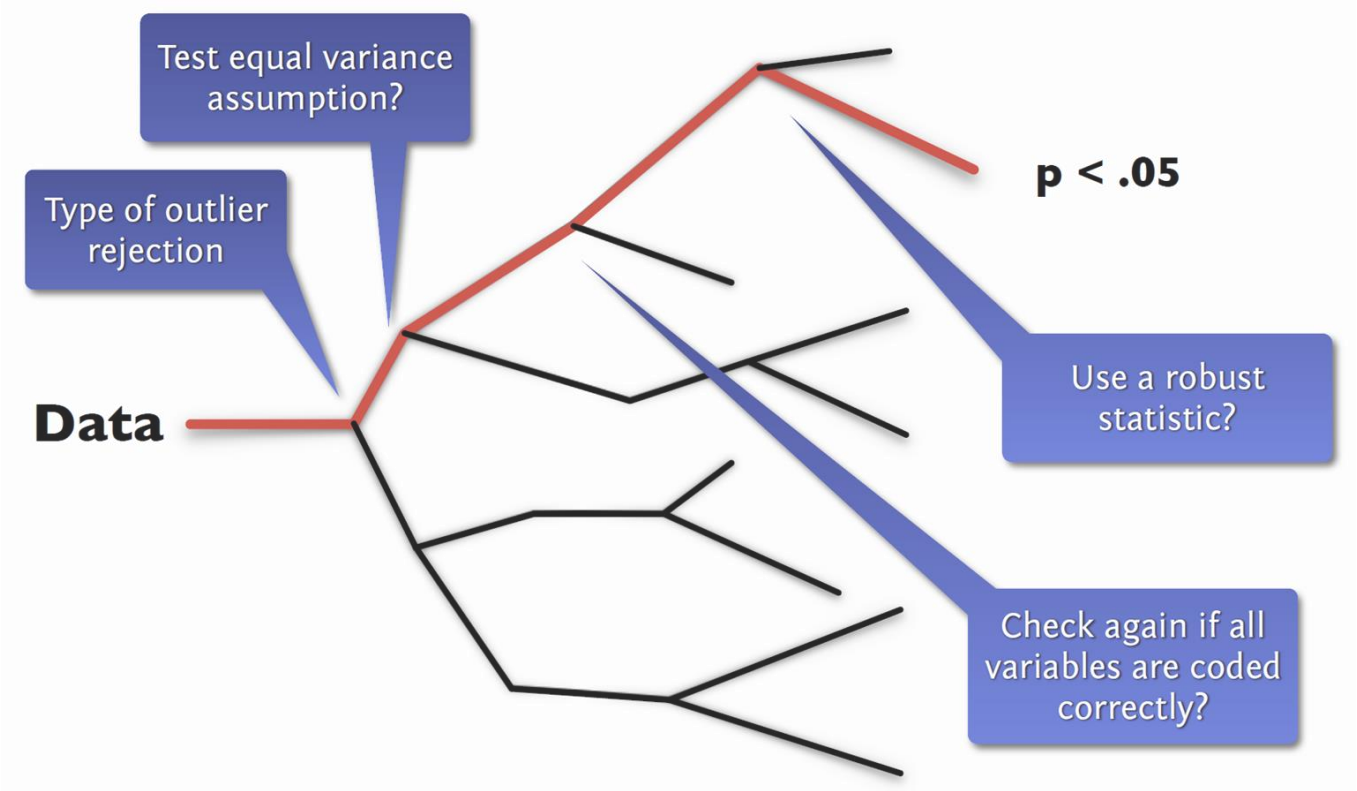
Rosenthal (1979) *Psych Bull*

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

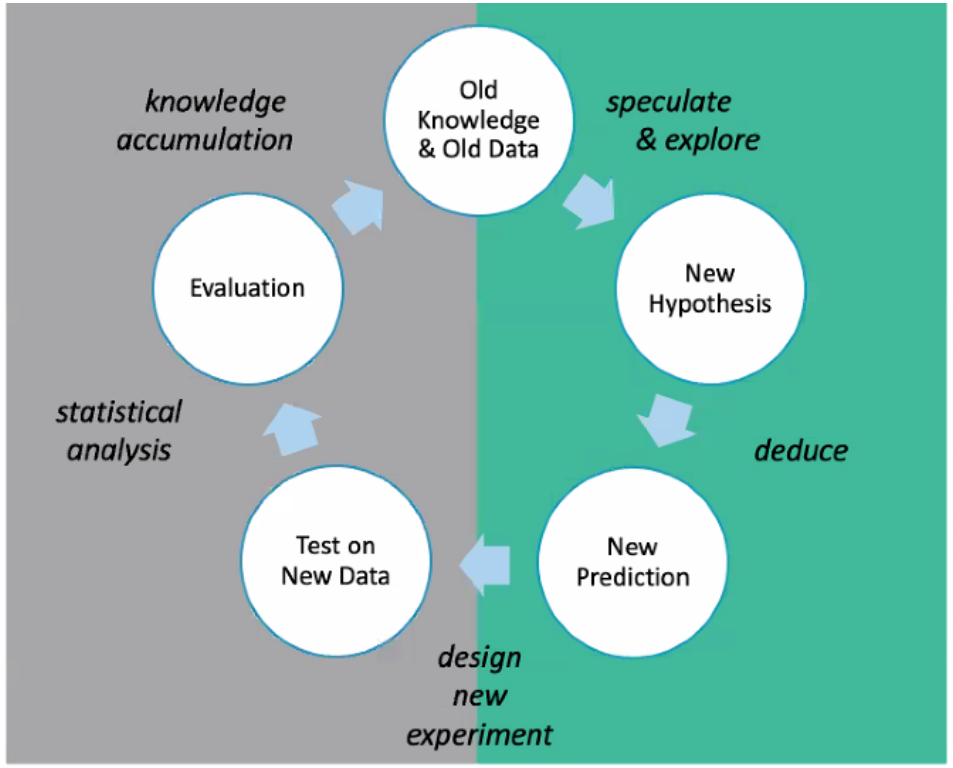
HARK-ing

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

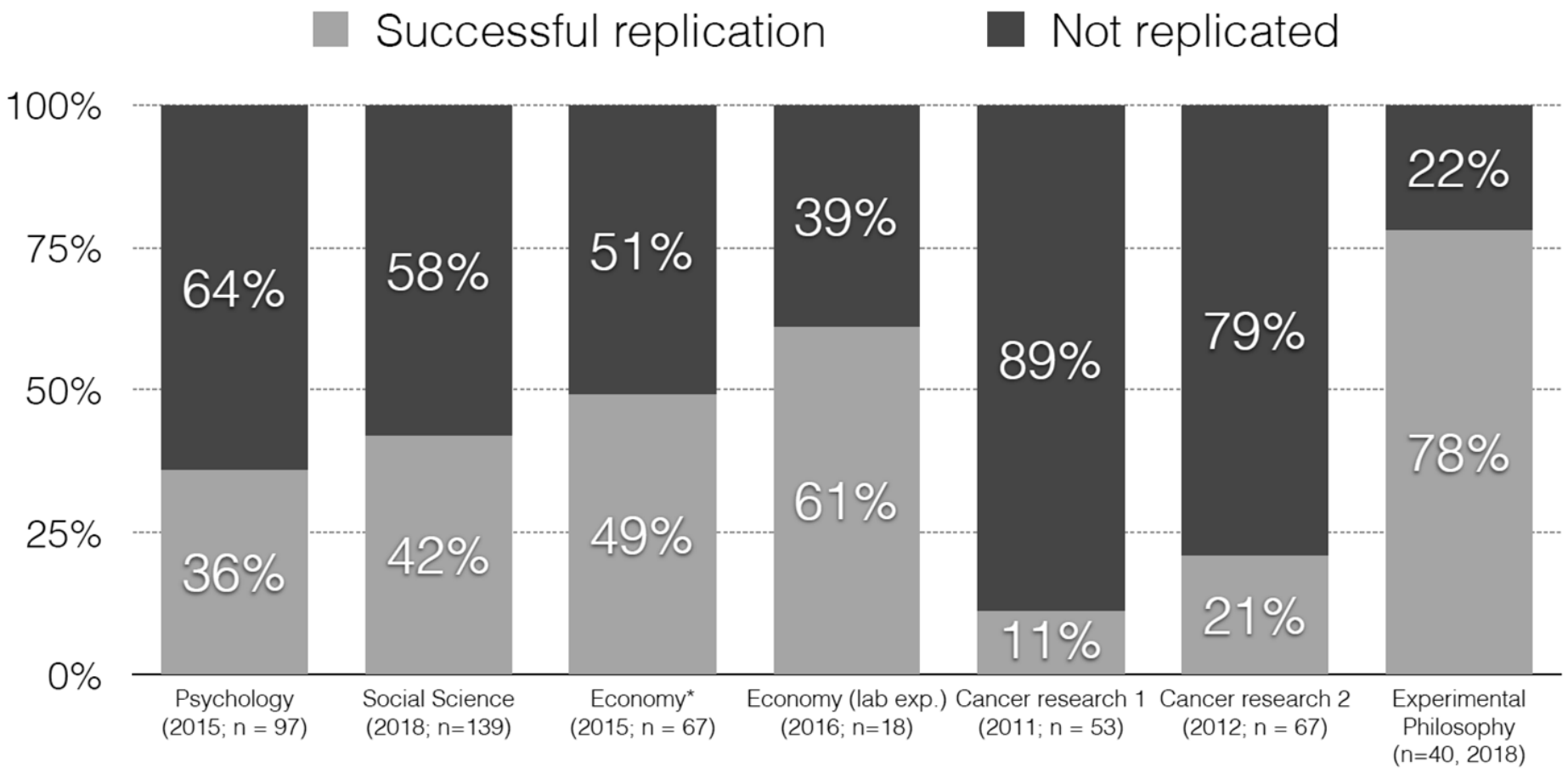
By Sarafoglou, A (2021) *SIOS Lecture*

File-drawer problem and publication bias

Researcher degrees of freedom

Confirmatory vs exploratory research

Replication crisis?

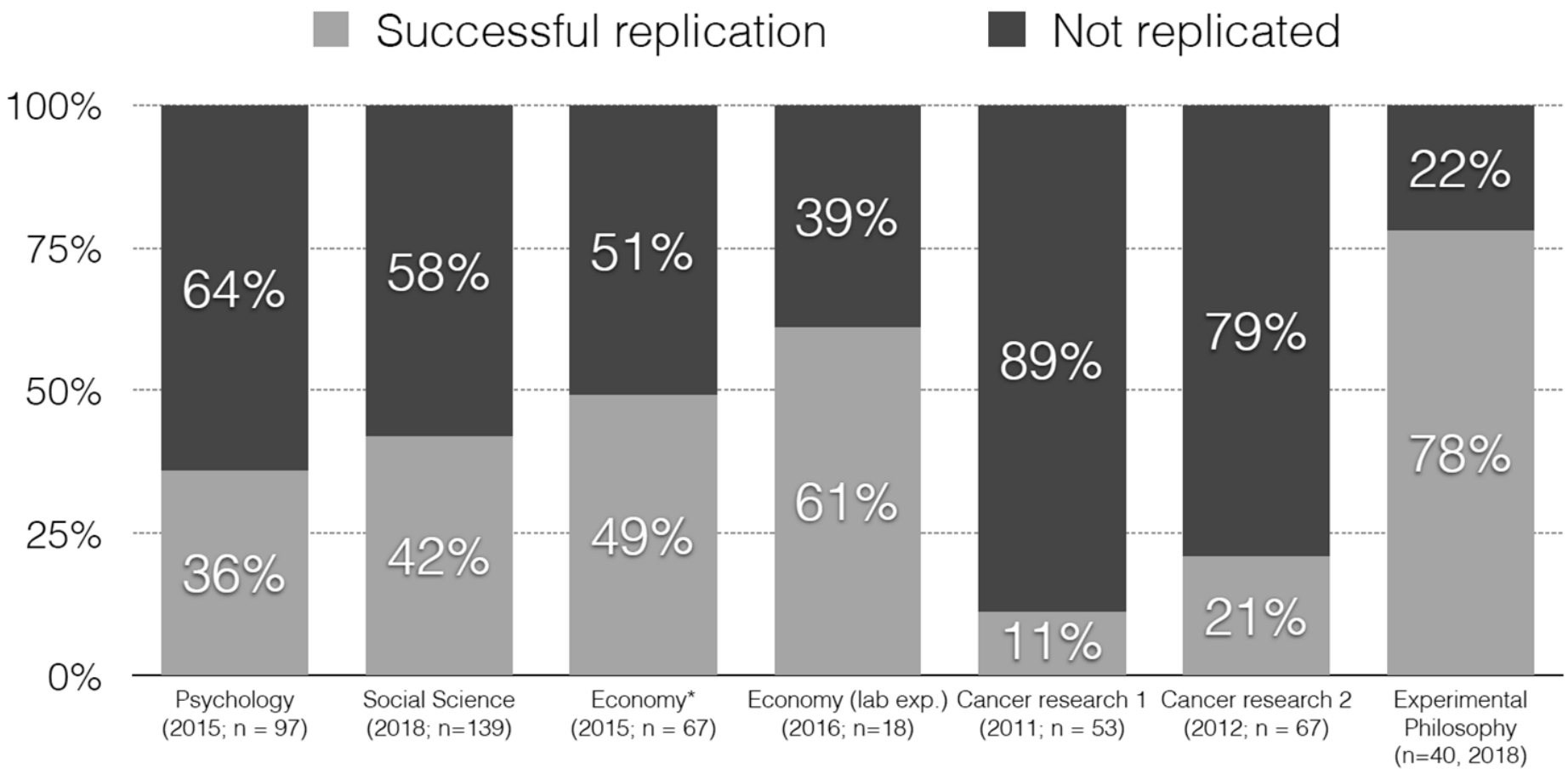


Open Science Collaboration (2015); Social Science: Combined sample of systematically sampled projects (RPP, SSRP, EERP); Chang & Li (2015); Camerer et al (2016); Begley, C. G., & Ellis, L. M. (2012). Prinz, F., Schlange, T., & Asadullah, K. (2011); Cova et al. (2018)

Schoenbrodt (2021)

Replication is obtaining similar results with new data

Reproducibility is obtaining identical results with the same data



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

SUBMIT STUDIES

Submit Studies to ClinicalTrials.gov PRS

Why Should I Register and Submit Results?

FDAAA 801 and the Final Rule

How to Apply for a PRS Account

How to Register Your Study

How to Edit Your Study Record

How to Submit Your Results

Do you or someone you know want to participate in a clinical study? See information for patients and families.

Why Should I Register and Submit Results?

Contents

- What Is the Purpose of Trial Registration and Results Submission?
- Why Do I Need to Register My Trial and Submit Results to ClinicalTrials.gov?

What Is the Purpose of Trial Registration and Results Submission?

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.

ELSEVIER

Journal of Clinical Epidemiology 145 (2022) 164–173

Journal of Clinical Epidemiology

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*

Accepted 18 January 2022; Available online 23 January 2022

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)

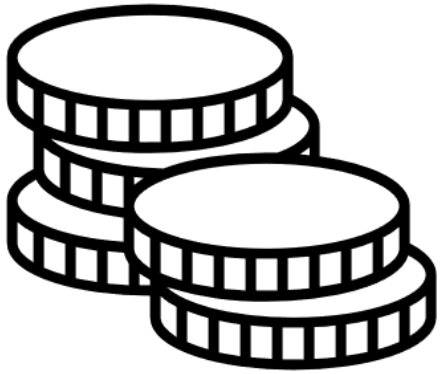
What do I need to preregister?

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: quantitative

Voice onset time in Norwegian infant-directed speech over development

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

Real-life example: qualitative

Exploring Loneliness and Social Isolation in Emerging Adulthood

Preregistered on Open Science Framework: https://osf.io/6cq8h

Preregistration vs Registered Report

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

Preregistration vs Registered Report

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

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

Preregistration vs Registered Report

Stage 1
Peer Review

Stage 2
Peer Review

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

Preregistration vs Registered Report

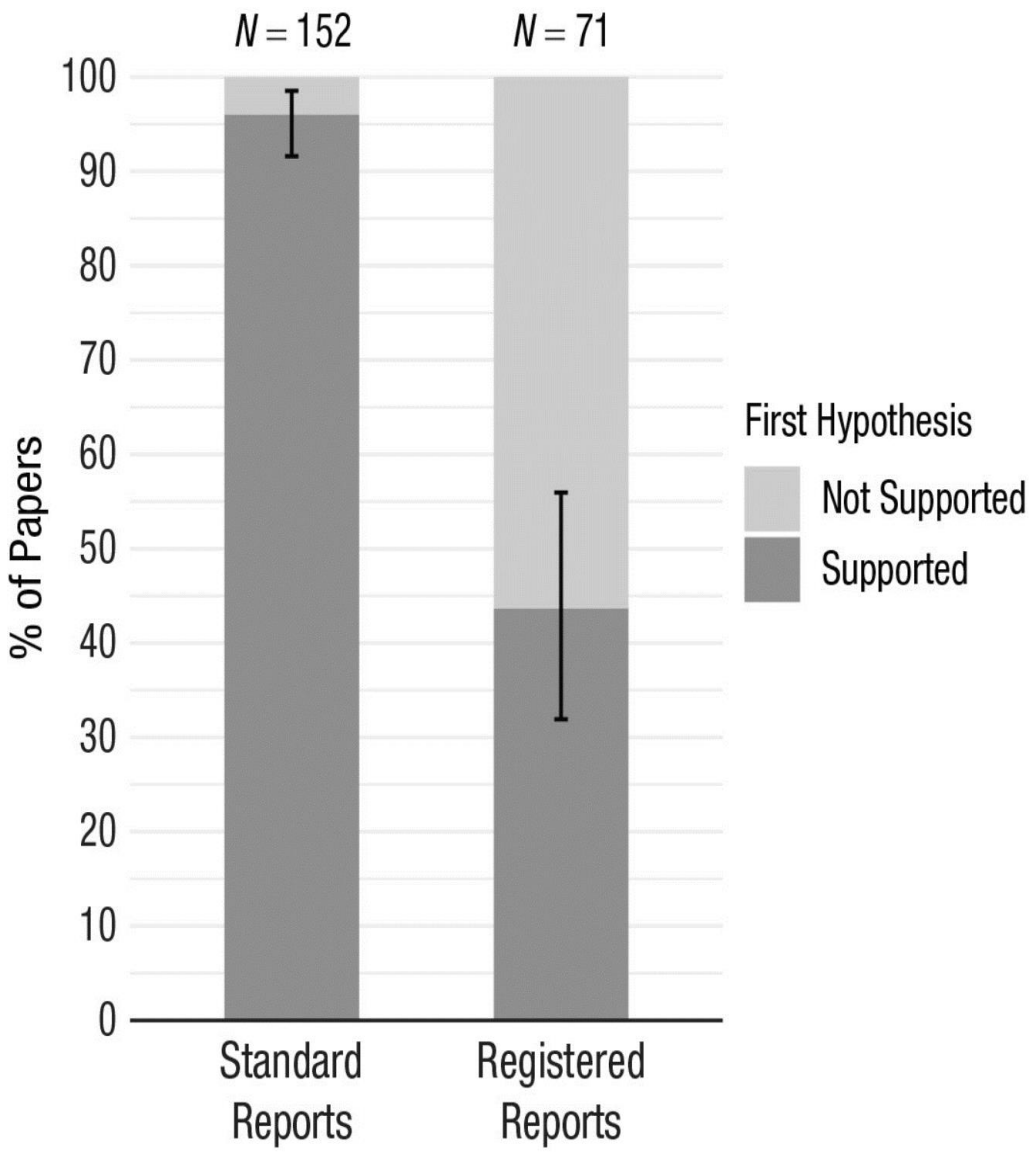
Stage 1
Peer Review

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**.

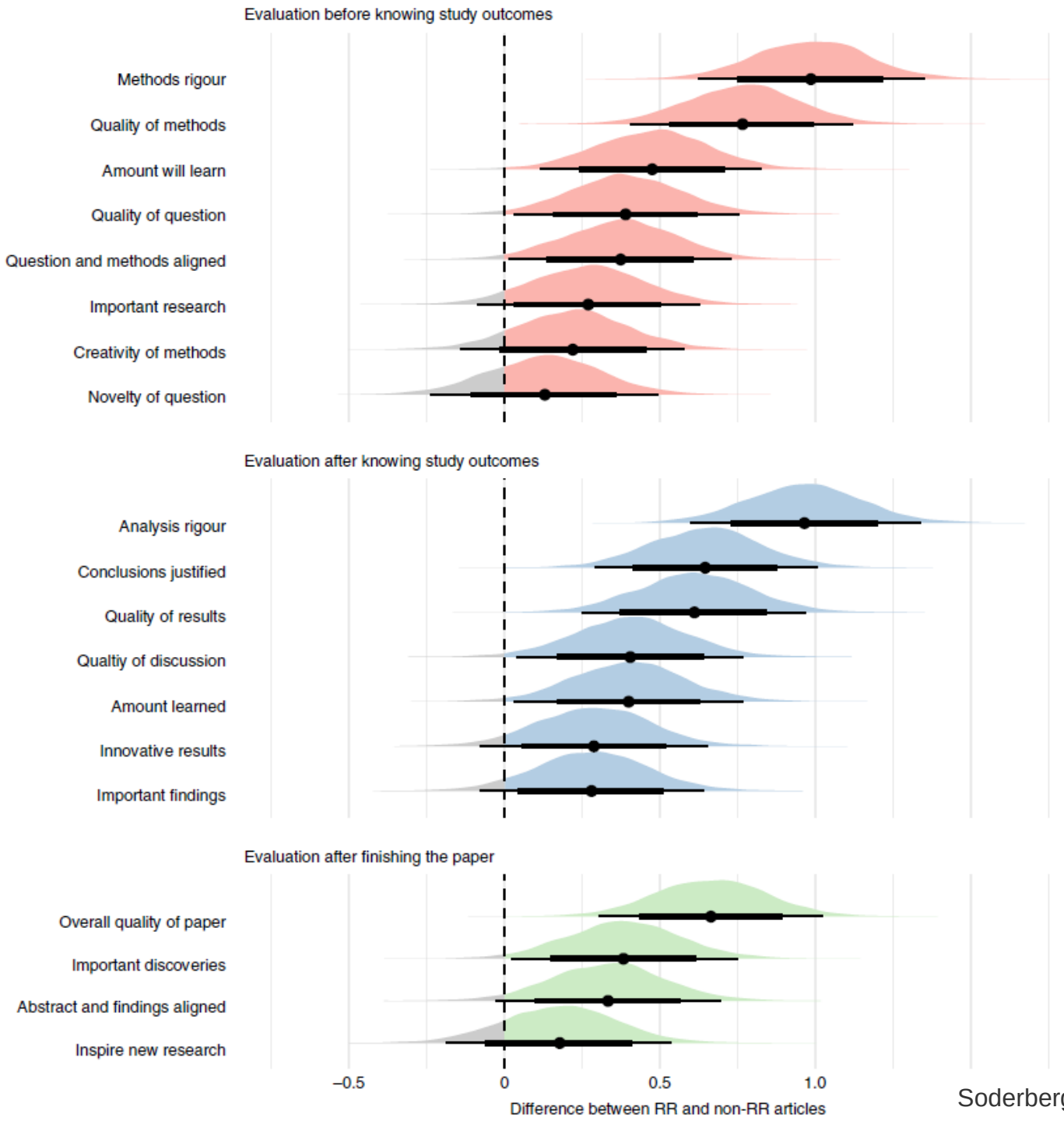
https://www.cos.io/initiatives/registered-reports

It works!



Scheel, Schijen, Lakens (2021) *AMPPS*

It works!



RR – Registered Reports
non-RR – Standard Reports

Soderberg et al (2021) *NatHumBeh*

Registered Report: peer-reviewed preregistration (stage 1) and article (stage 2) in a journal

Preregistration: not peer-reviewed research plan, time-stamped on an online platform

Preregistration works …even when not followed

Article | Published: 02 March 2022

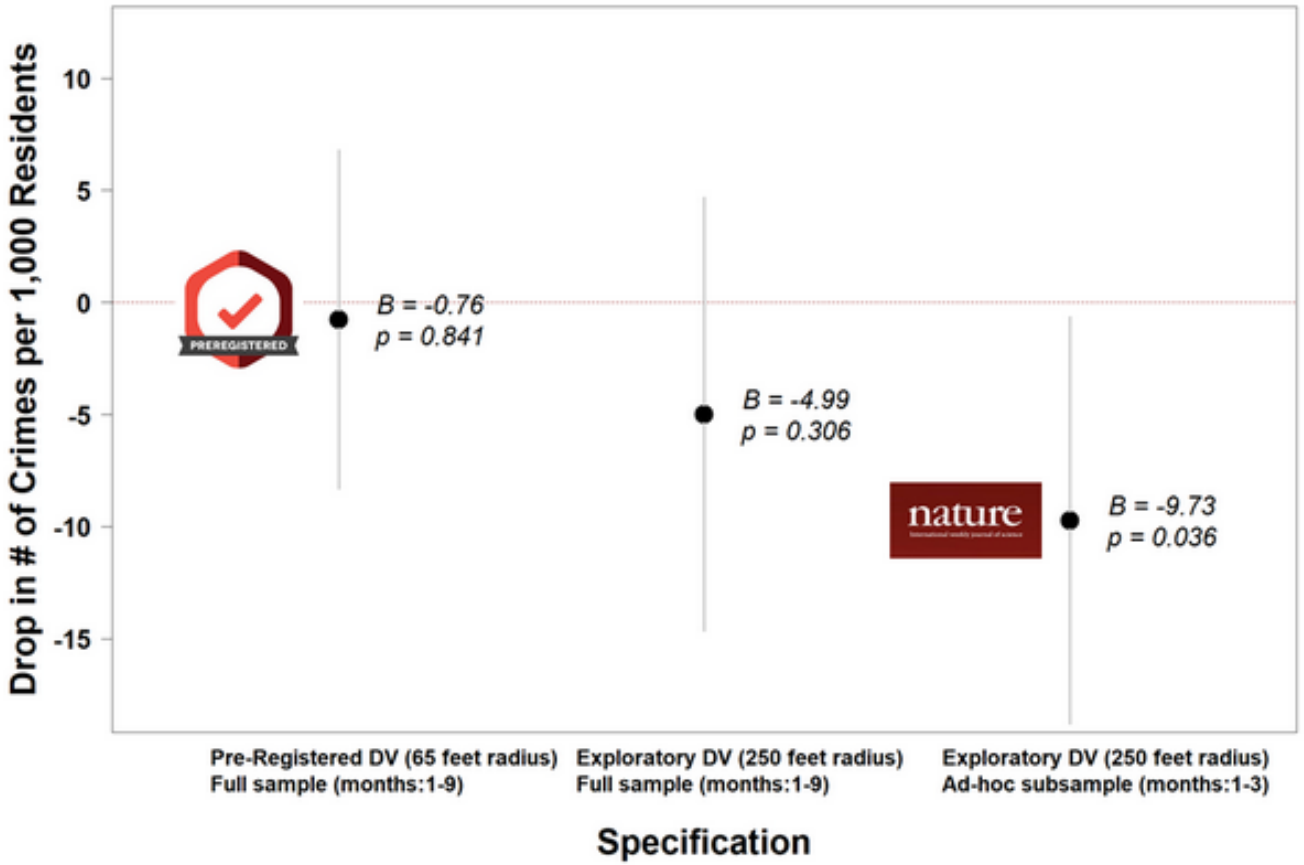
Knowledge about others reduces one's own sense of anonymity

Anuj K. Shah & Michael LaForest

Nature **603**, 297–301 (2022) | Cite this article

5586 Accesses | **1** Citations | **181** Altmetric | Metrics

1) All p-values mentioned are reported in the paper and/or its supplement. The authors **did not hide those results**.
2) There is **nothing wrong** with focusing on different outcomes than those preregistered. 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

Transparency makes research evaluable

The benefits

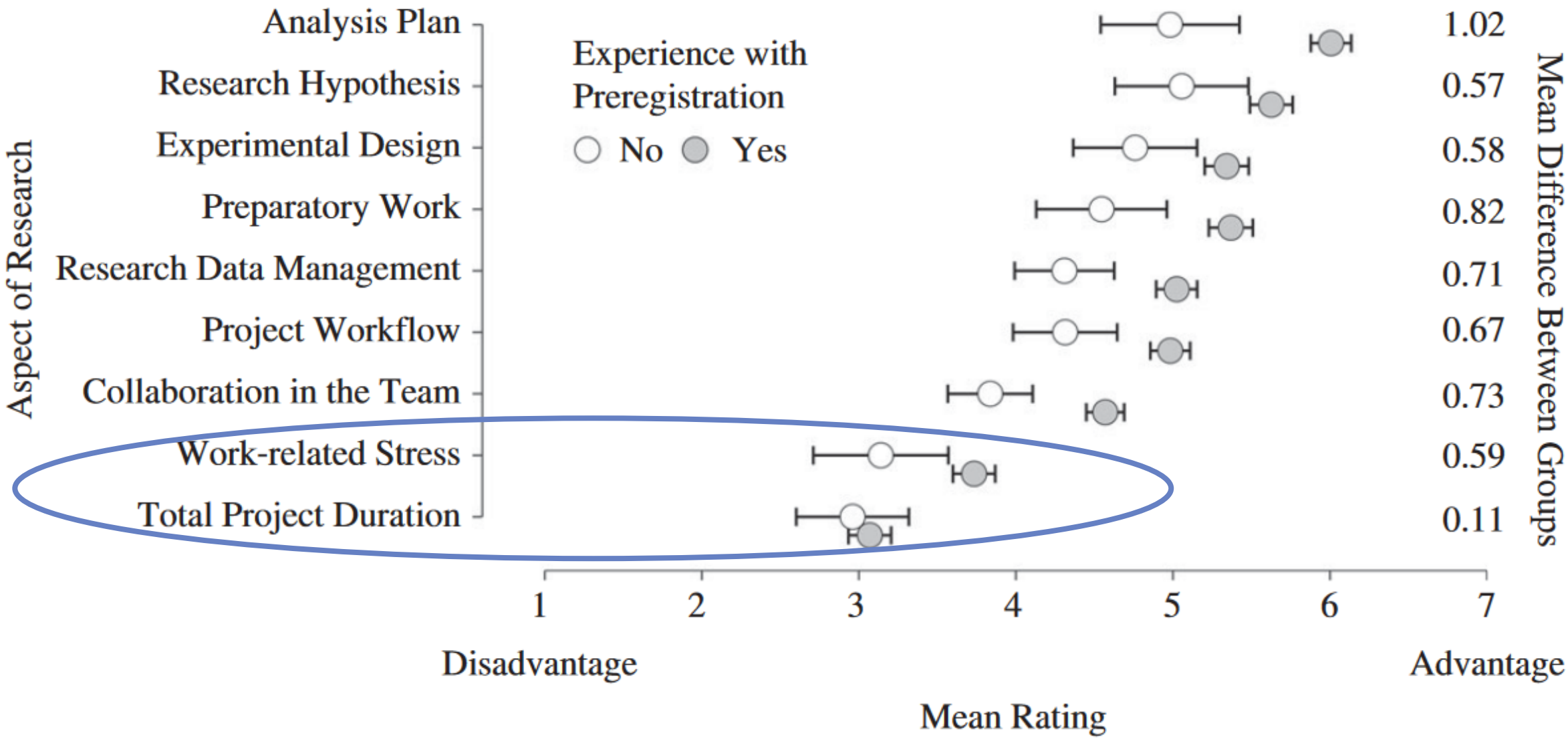
- Increased research **transparency**
- More visibility to **null results**
- More **visibility to research ideas and plans** early in the process
- More **trust** in research studies (through reduced biases)
- Clearer **distinction** between confirmatory and exploratory research as well as *a priori*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

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 selfish 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



Sarafoglou et al, 2022 https://doi.org/10.1098/rsos.211997

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

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Step 1: Choose the platform and the template

Focus	Type of research	Platform	Template
Discipline-specific	Clinical research	clinicaltrials.gov	Generic
		clinicaltrialsregister.eu	
	Animal research	animalstudyregistry.org	Generic
	Economics/Social sciences	socialscienceregistry.org	Generic
	Systematic reviews in health-related research	www.crd.york.ac.uk/prospero/	Generic
Discipline-general	Basic research	aspredicted.org	Generic
		osf.io/registries	Structured, Unstructured, Qualitative research, Replications, etc.

More hands-on guidance?

Time and place: Feb. 8, 2023 10:00 AM–11:30 AM, Zoom

Preregistration on Open Science Framework (OSF)

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

https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/osf-2023-02-08.html

Step 2: Write up!

- **Think through** your research questions and/or hypotheses, your methods and/or planned statistical analyses
- 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?

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.

ACCOUNTABILITY IN RESEARCH
2019, VOL. 26, NO. 3, 229–244
http://dx.doi.org/10.1080/08989621.2019.1580147

Taylor & Francis
Taylor & Francis Group

OPEN ACCESS

Preregistering qualitative research

Tamarinde L. Haven [a] and Dr. Leonie Van Grootel [b]

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

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

Ulrich Dirnagl

Published: March 26, 2020 • https://doi.org/10.1371/journal.pbio.3000690

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

Theoretical-review Articles

Preregistration of Analyses of Preexisting Data

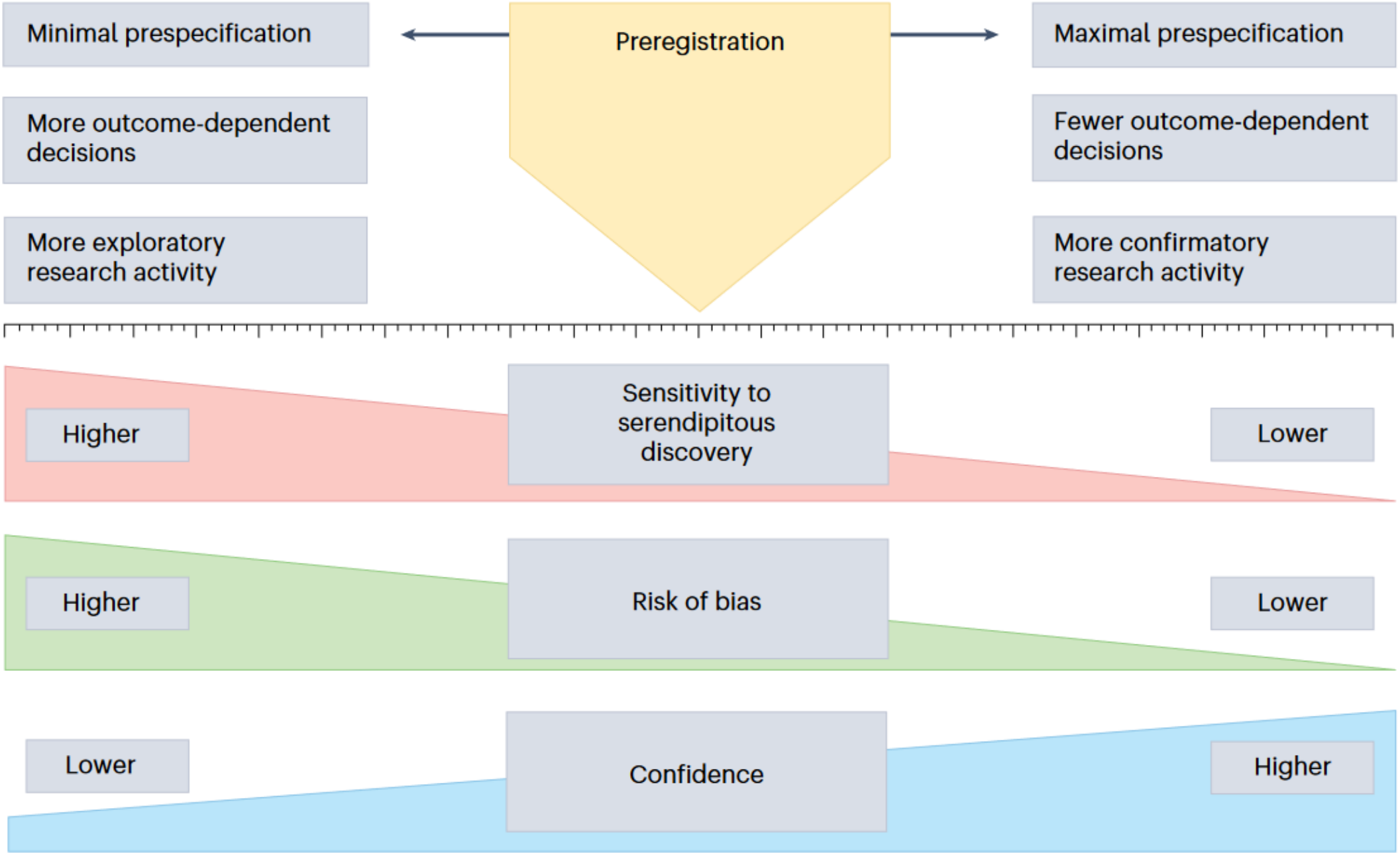
Authors: Gaëtan Mertens, Angelos-Miltiadis Krypotos

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.

https://www.cos.io/blog/preregistration-plan-not-prison



Hardwicke & Wagenmakers (2023)

Thank you!

Questions?

Read more about preregistration on *PhD on track*:
https://www.phdontrack.net/open-science/preregistration/

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Bochynska, A (2023). *Preregistration of research studies*

Menu

← Libraries and centres

https://www.ub.uio.no/english/libraries/dsc/

Norwegian version of this page

Digital Scholarship Centre

At the Digital Scholarship Centre (DSC) you get guidance on how you can make the best possible use of digital tools and methods in your research and communication activities.

Open Access →

Information about open access publishing, publisher agreements, self-archiving, requirements, and guidelines.

Open and reproducible research →

Make your research more transparent and reproducible.

Research Data Management →

Managing your data both during and after a research project.

Text-mining →

Information about digital tools for searching, mining, and analysing textual data.

Systematic search →

Information about systematic literature searching, how to get started, and how to get help.

Visualisation →

Use of visual methods to explore, communicate and understand data.

Carpentry@UiO →

Offers workshops in foundational digital skills such as coding and data management.

Reference management →

Styles, tools, and information on reference management.

Norwegian version of this page

Open research

Research methods

workshop-bilder

Open and reproducible research

Learn about how to make your research more open and reproducible and get involved in initiatives and communities that are interested in sharing and improving research at UiO.

More and more researchers and students across disciplines are implementing open research practices, preregistering their hypotheses, methods, and analysis plans and sharing research materials, data and analysis scripts. Digital Scholarship Center can help you learn about and implement these practices in your own research as well as advise on the policies and requirements from funders.

Open Science Lunch →

Every last Thursday of the month we meet at noon to discuss topics related to open research.

ReproducibiliTea@UiO →

Join us for a Journal Club where we read and discuss papers on open research and meta-science.

Norwegian Reproducibility Network →

Join a broader community that aims to promote and enable rigorous, robust and transparent research practices in Norway

Courses and workshops →

Click here for the list of upcoming and previous courses and workshops on open and reproducible research at UiO.

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ReproducibiliTea

Journal Club

JOIN IN AND DISCUSS WITH FELLOW STUDENTS AND RESEARCHERS

OPEN RESEARCH, REPRODUCIBILITY and RESEARCH IMPROVEMENT

Join us

Everyone is welcome to join us - whether you are an enthusiast of open and reproducible research, a skeptic, or a cautious explorer. Currently, all meetings are hybrid with the possibility of joining on-site at Blindern or via Zoom. Grab a cup of tea (coffee?) and join us!

Subscribe to our mailing list →

https://www.ub.uio.no/english/libraries/dsc/open-repro-research/reproducibilitea/

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University of Oslo Library

Digital Scholarship Center and Open Research

Open Science Lunch 2023

Each **last Thursday of the month at 12.00** we invite you to join us virtually for an **online open lunch** to hear about **how to make your research more open**.

February 23rd
Open your data with DataverseNO

March 30th
Public health reporting: an open source approach

April 27th
Open knowledge resources: Store norske leksikon and Wikipedia

May 25th
Keep the rights to your work: UiO's Rights Retention Policy

www.ub.uio.no/english/courses-events/events/open-science-lunch/

Upcoming

Time and place: Feb. 23, 2023 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom

Open your data with DataverseNO

Learn about DataverseNO - a new institutional data archive for open data at UiO.

Time and place: Mar. 30, 2023 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom

Public health reporting: an open source approach

Join us for a discussion on how open source tools can enable automated, reproducible and scalable public health reporting.

Time and place: Apr. 27, 2023 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom

Open knowledge resources: Store norske leksikon and Wikipedia

Join us for a discussion on using, maintaining and contributing to freely available open knowledge resources.

Time and place: May 25, 2023 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom

Keep the rights to your work: UiO's Rights Retention Policy

Learn about how you can retain the rights to your published work with the new Rights Retention Policy at UiO.

https://www.ub.uio.no/english/courses-events/events/open-science-lunch/

Menu

← Libraries and centres

https://www.ub.uio.no/english/libraries/dsc/

Norwegian version of this page

Digital Scholarship Centre

At the Digital Scholarship Centre (DSC) you get guidance on how you can make the best possible use of digital tools and methods in your research and communication activities.

https://sympa.uio.no/ub.uio.no/subscribe/dsc-news/subscribe

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