Open Science and Pre-Registration in Management Research: Myths, Truths, and Best Practices

Dr. Roman Briker
Assistant Professor in Organizational Behavior & HRM
Maastricht University

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Disclaimer

looking it from a micro-/quantitative perspective, own experiences -> **take it with a grain of salt**

Slides, references, Pre-Reg. Templates available at https://osf.io/cgkua/
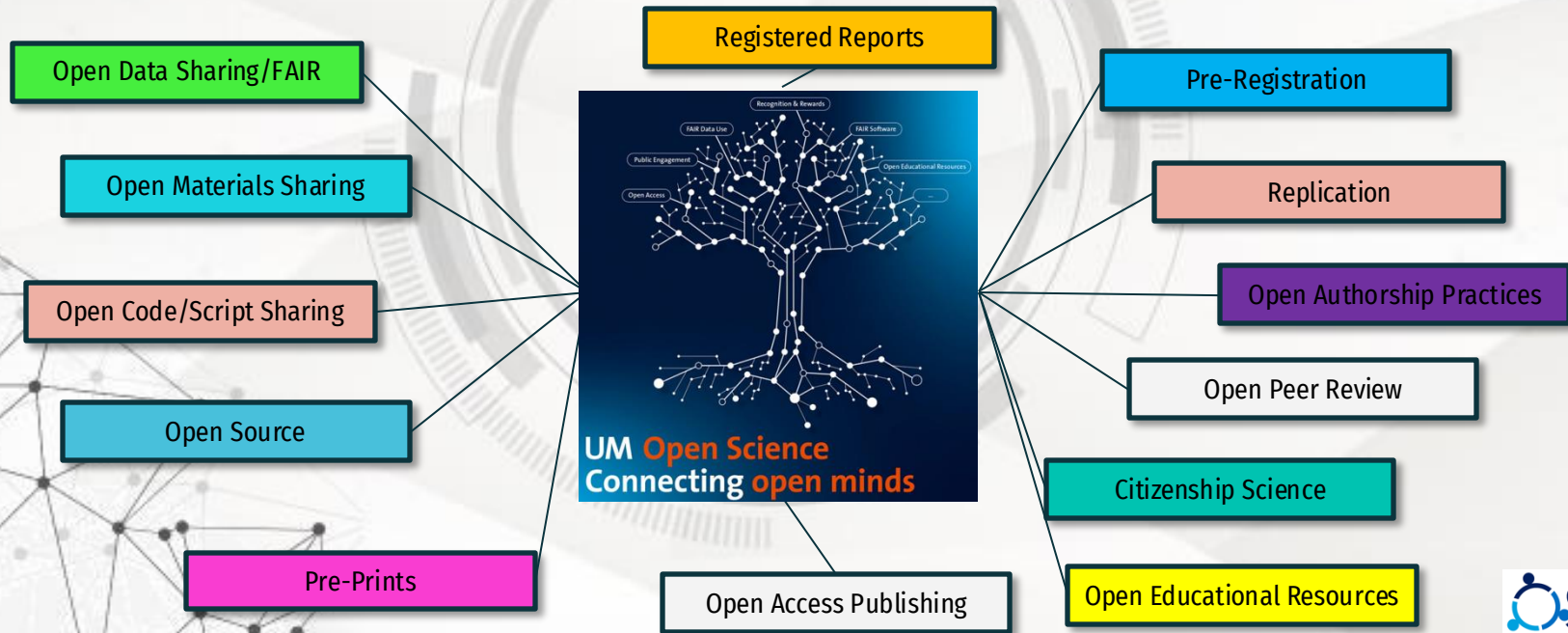
Fabiola Gerpott

George Banks

Yerun

What is Open Science?

"Open science refers to an array of practices that promote openness, integrity, and reproducibility in research" (Banks et al., 2018, p. 1)

Registered Reports

Open Data Sharing/FAIR

Pre-Registration

Open Materials Sharing

Replication

Open Code/Script Sharing

Open Authorship Practices

Open Source

Open Peer Review

Pre-Prints

Citizenship Science

Open Access Publishing

Open Educational Resources

Why Open Science?

Importance of Open Science

We're told to 'follow the science' — yet some of it is just plain wrong

Harvard dishonesty expert accused of dishonesty

Francesca Gino on administrative leave at Harvard Business School after allegations of fraudulent data use

PERSPECTIVE

nature human behaviour

Using social and behavioural science to support COVID-19 pandemic response

Jay J. Van Bavel, Katherine Baicker, Paulo S. Boggio, Valerio Capraro,

Fraudulent data raise questions about superstar honesty researcher

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The problem of (social) science

SCIENCE

Daryl Bem Proved ESP Is Real

Which means science is broken.

CAREER NEWS | 22 July 2021

8% of researchers in Dutch survey have falsified or fabricated data

Study of nearly 7,000 scientists also finds that more than half engage in 'questionable research practices'.

Scientific Values: Publish or Perish

- Urge to publish (a lot/ in "A" journals)
- Focus on novel & significant results
- Ignorance of null results, replications (file drawer)
- Outcome focus reduces rigor

Questionable (Unethical) Research Practices

- How to make you findings significant?

- Se······· ·······nditions)
- Opt······· ·····on results)

Consequences of QRP

Table 1. Likelihood of Obtaining a False-Positive Result

Researcher degrees of freedom	Significance level		
	$p < .1$	$p < .05$	$p < .01$
Situation A: two dependent variables ($r = .50$)	17.8%	9.5%	2.2%
Situation B: addition of 10 more observations per cell	14.5%	7.7%	1.6%
Situation C: controlling for gender or interaction of gender with treatment	21.6%	11.7%	2.7%
Situation D: dropping (or not dropping) one of three conditions	23.2%	12.6%	2.8%
Combine Situations A and B	26.0%	14.4%	3.3%
Combine Situations A, B, and C	50.9%	30.9%	8.4%
Combine Situations A, B, C, and D	81.5%	60.7%	21.5%

Simmons et al. (2011)
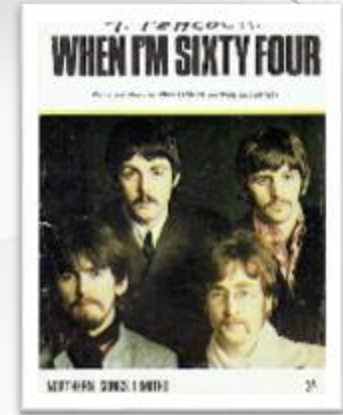
With QRPs, p-values /regular coefficients are meaningless

The problem of (social/behavioral) science

Only 25% to 60% of findings replicate!

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. T

Many Labs 2: Investigating Variation in Replicability Across Samples and Settings

Richard A. Klein, Michelangelo Vianello, Fred Hasselman, more...

First Published December 24, 2018 | Research Article

https://doi.org/10.1177/2515245918810225

Abstract

We conducted preregistered replications of 28 classic and contemporary published findings, with protocols that were peer reviewed in advance, to examine variation in effect magnitudes across samples and settings. Each protocol was administered to approximately half of 125 samples that comprised 15,305 participants from 36 countries and territories. Using the conventional criterion of statistical significance ($p < .05$), we found that 15 (54%) of the replications provided evidence of a

REPRODUCIBILITY PROJECT
Cancer Biology

The Reproducibility Project: Cancer Biology is a collaboration between the Center for Open Science and Science Exchange to independently replicate selected results from a substantial number of high-profile papers in the field of cancer biology. For each paper a Registered Report detailing the proposed experimental designs and protocols for the replications is peer reviewed and published prior to data collection. The results of these experiments will be published in a Replication Study. The project will provide evidence about reproducibility in cancer biology, and an opportunity to identify factors that influence reproducibility more generally.

r on average than the original

more criteria than they failed

y to replicate successfully (40%)

Science

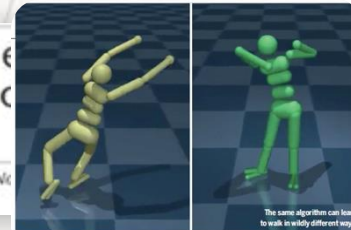Contents ▾   News ▾   Careers ▾   Journals ▾

SHARE

An economics study featuring a performance by Robin Williams failed to replicate after the actor's death. BONNIE SCHIFFMAN/TOUCHSTONE/THE KOBAL COLLECTION

About 40% of economics experiments fail replication survey

By John Bohannon | Mar. 3, 2016 , 2:00 PM

Power failure: why small sample size undermines the reliability of neuroscience

Katherine S. Button[1,2], John P. A. Ioannidis[3], Claire Mokrysz[1], Brian A. N... Jonathan Flint[5], Emma S. J. Robinson[6] and Marcus R. Munafò[1]

The same algorithm can learn to walk in wildly different ways.

COMPUTER SCIENCE
Artificial intelligence faces reproducibility crisis

Unpublished code and sensitivity to training conditions make many claims hard to verify

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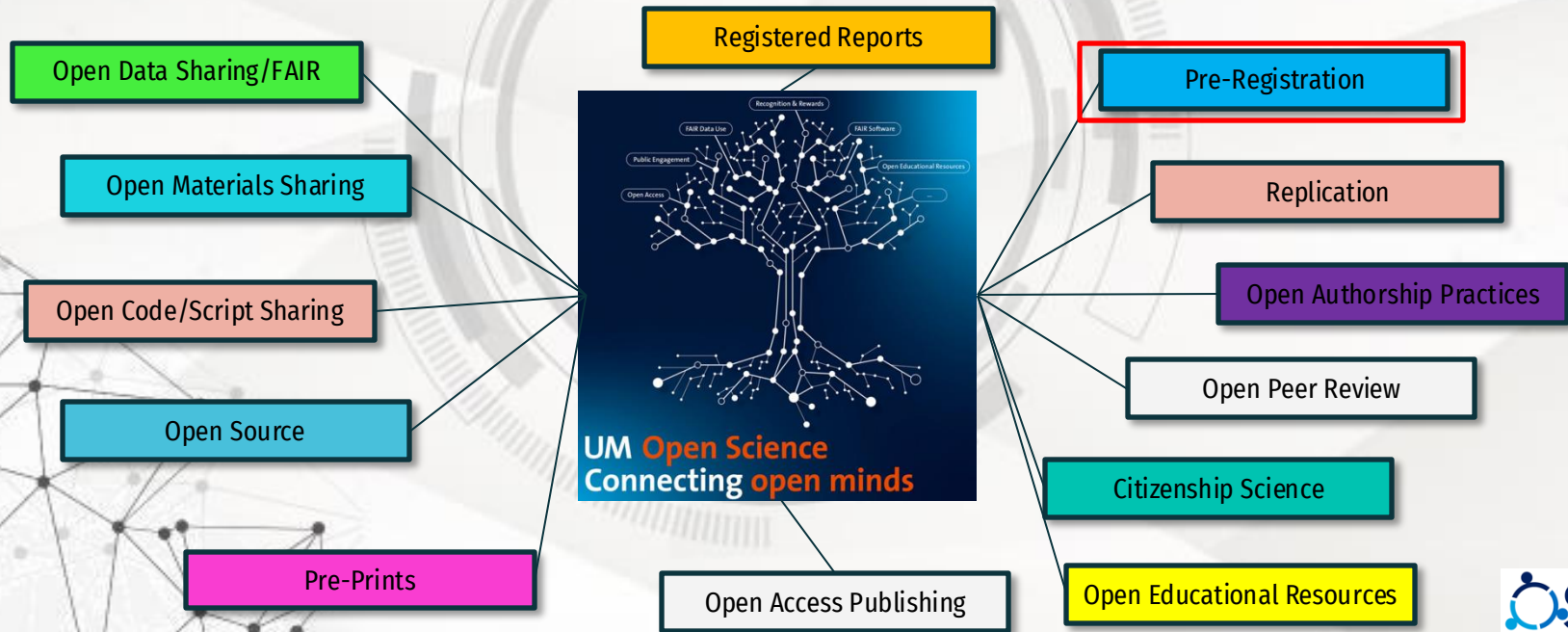# We Are All in This Together!

Society

Research Community

YOU

How does Open Science help?

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UM **Open Science**
Connecting **open minds**

Recognition & Rewards

FAIR Data Use

FAIR Software

Public Engagement

Open Educational Resources

Open Access

What is Pre-Registration?

- = (Publicly) **time-stamped pre-specification** of design, hypotheses, sample size, exclusion criteria, planned statistical analyses of a study or data set *before* collecting/analyzing data data (Logg & Dorison, 2021)

  - **"Our data suggests that pre-registration will become the norm in the social and behavioral sciences"** (Logg & Dorison, 2021)

Number of New AsPredicted Pre-registrations In Each Month
(November 2015-October 2020)
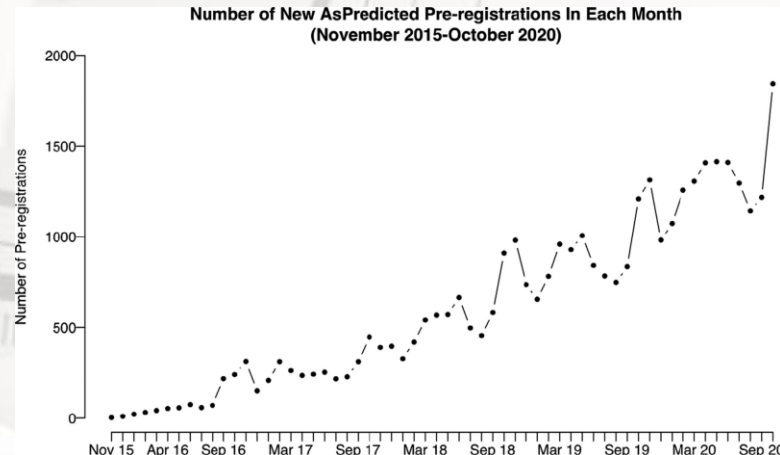
Pre-Registration

- **Decreases researcher degrees of freedom**
- **Holds you accountable** to yourself and others (hindsight bias/motivated reasoning)
- Can help catch shortcomings and ambiguities (Simmons et al., 2021)
- Helps replication attempts
- **Low-cost, scalable intervention** (Logg & Dorison, 2021)

Pre-Registration: How and What?

What to Pre-Register:
- Hypotheses
- (In)Dependent variables (including wording)
- Sample (size)
- Design (all conditions)
- Handling outliers and/or exclusion criteria
- Analytic plan

Characteristics:

- Can be one page or less (OSF more)
- Ability to share it anonymously (e.g., via link with reviewers)
- Not changeable after finalizing it (but free to allude to changes in the manuscript!)

PREREGISTERED

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Pre-Registration: OSF and aspredicted

(cf. Logg & Dorison, 2021)
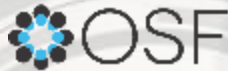
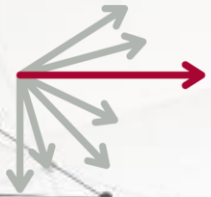|	OSF	ASPREDICTED
Founded by	Center for Open Science	Wharton School at the University of Pennsylvania
Requires Log-In/Account	Yes	No
Template available?	Yes	Yes
Standardized Template	No	Yes
Number of questions	15 required (standard template)	9 questions
Made public?	Depends (e.g., after 4 years with template)	No (unless you click „make public")
Co-Authors must approve	No	Yes
Anonymous sharing possible?	Yes	Yes
Attach documents possible?	Yes	No (but Yes with ResearchBox)
Editing after time stamp?	No	No

Templates: OSF and aspredicted

Templates available for
- Experimental studies
- Survey research
- Secondary/Archical Data
- ESM
- fMRI
- Qualitative Studies (different forms)
- Meta-Analysis
- Systematic Review
- Many more...

Let´s try it!

Guidelines

Balance between too m~~~~ enough informa~~~~

- Specify **exactly** h~~~~ (confirmatory) ana~~~~ conducte~~~~
- **Short and eas**~~~~

Item in preregistration	Bad answer	What's wrong with it?	Good answer
Research Question or Hypothesis	Building on the work of Picasso (1901-1904), we hypothesized that....	You don't need reasons for asking the research question because they do not inform possible p-hacking. Just state the question or hypothesis of interest.	Question: Does sadness increase preference for the color blue?
Dependent variable	Preference for the color blue	This preference can be measured in many different ways so this statement underspecifies how it will be measured.	Participants will rate their liking for red, blue, orange, and purple on 7-point scales (1 = not at all; 7 = an extreme amount). Prefereence for blue will be defined as the difference between a participant's rating for blue and their average rating of the three non-blue colors.
Manipulations/Conditions	We will manipulate mood by having participants watch different videos.	This leaves room for cherry-picking from amongst a larger set of conditions. Specify the exact conditions and the exact manipulations.	Before rating their color preferences, participants will be randomly assigned to one of three conditions in which they watch a clip from either a sad video (My Dog Skip), a happy video (Pitch Perfect), or a neutral video (Gone Curling) .
Analyses	We will regress preference for the color blue on mood condition	There are many ways to run these analyses. For example, are you including covariates? How will "mood condition" be coded? If applicable, how will the standard errors be computed?	We will run an OLS regression predicting preference for the color blue with condition (coded 1 = sad video; 0 = happy or neutral video). We will control for gender (1 = male; 0 = female) in this analysis.
Outliers & Exclusions	We will exclude participants who are inattentive, and those who show an extreme preference for the color orange.	What counts as "inattentive"? What counts as "extreme preference for the color orange"? You must define these things.	We will exclude participants who fail at least two out of the three attention checks that we will include at the beginning of our study (before the manipulation). We will also exclude participants whose rating of orange is higher than 5 on the 7-point scale.
Sample size	We conducted a power analysis that showed that ... And so we decided to collect between 100 and 200 observations.	Your power analysis is irrelevant to whether you p-hacked; leave it out. Also, any sample size between 100 and 200 is consistent with this preregistration.	We will stop data collection once 150 participants have submitted a response on MTurk. Deviations from this goal are entirely due to MTurk software and outside of our control.

AS PREDICTED

OSF

http://datacolada.org/64

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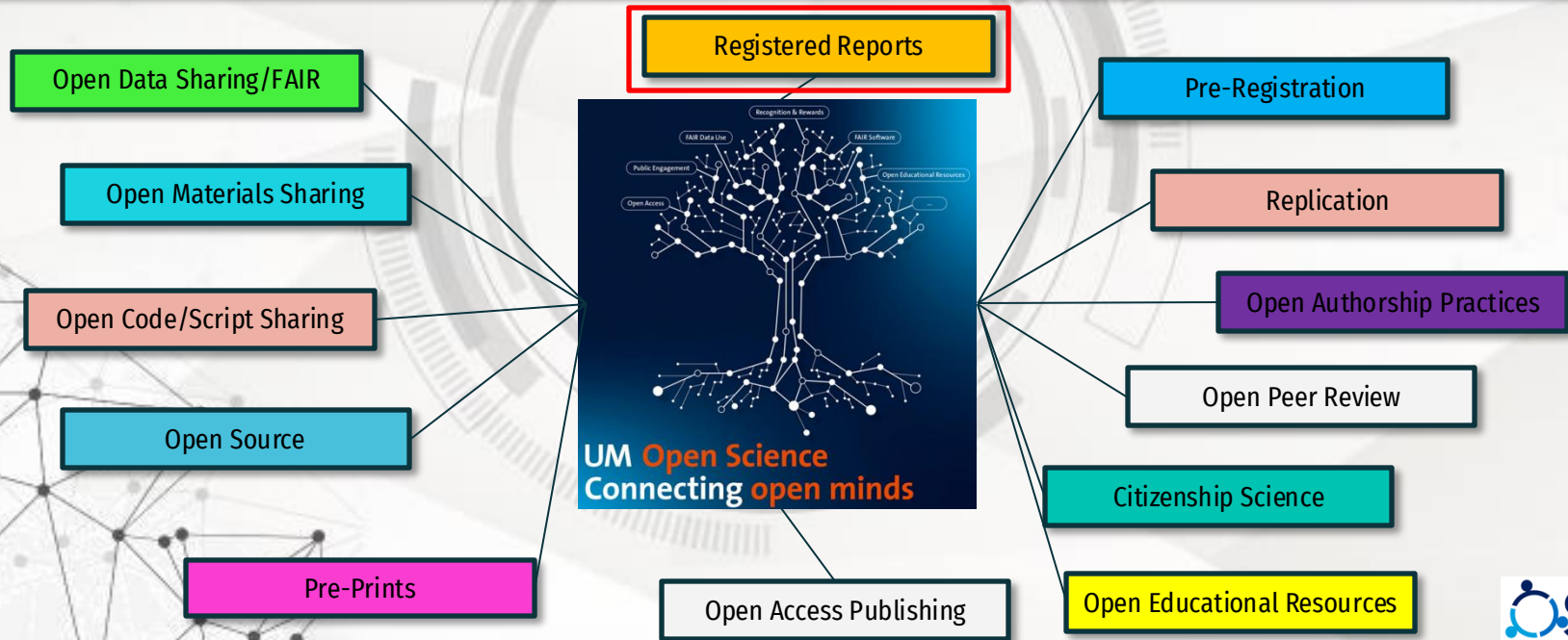
Pre-Registration and Registered Reports

No publication of protocol by journal or requirement for authors to publicly register the accepted protocol following in principle acceptance

Registered Replication Reports (RRR)
- Offered exclusively for replication studies by multi-site consortia
- Offered by 1 journal

Registered Reports (RR)
- Peer review before research is undertaken
- In principle acceptance regardless of results
- Offered for original studies and replications
- Offered by >120 journals
- https://cos.io/rr/

Study preregistration
- Protocol publicly registered on e.g. OSF, clinicaltrials.gov, ISRCTN
- Published protocol articles

Accepted protocol either published in the journal or must be publicly registered following in principle acceptance

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

Stage 1 Peer Review

Stage 2 Peer Review

How can we change? Registered Reports

Submission of Introduction, theory and hypotheses, suggested methods and analytic approach to a journal **before collecting/analyzing data.** Research proposal **receives peer-review before data collection** (Chambers & Tzavella, 2022)
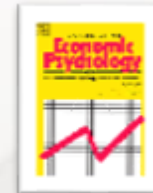
Where and how to pre-register

Registered Reports (https://cos.io/rr)
PNAS, Nature: Human Behavior, Science, Academy of Management Discoveries, The Leadership Quarterly, Journal of Personality and Social Psychology, Psychological Science, Experimental Economics, Journal of Economic Psychology, Journal of Development Economics, Journal of Personality and Social Psychology, American Political Science Review

- **Pre-Register via: https://aspredicted.org/**
- **OSF (https://osf.io/ + https://www.youtube.com/watch?v=8QK2-udwoK8)**

PNAS

nature human behaviour

Science

Psychological SCIENCE

PREREGISTERED

Discoveries

Experimental Economics

AMERICAN POLITICAL SCIENCE REVIEW

Economic Psychology

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Pre-Registration: Getting Started

- Low-cost intervention
- Easy and quickly done
- Pre-register – and you never go back
- Challenge: Pre-Register one of your next 3 studies

Questions?

Thank your for inviting me and for caring about Open Science!

Let´s talk!