From „the replication crisis“ to „the credibility revolution“ in psychological science?

What have we achieved, where do we go?

PD Dr. Felix Schönbrodt
Ludwig-Maximilians-Universität München

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LMU Open Science Center

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1. The crisis: A recap
2. Psychology's renaissance? What we have achieved so far
3. Current challenges

The crisis: Recap

Science

The **smartest heads** in the world immerse themselves into a research topic for years.

In that process, they become the experts – nobody knows more about that topic. The boundaries of knowledge have been **pushed forward**.

When the scientist are confident in their findings, they publish them in the best scientific journals, with the highest standards of **quality, rigor, and integrity**.

HOW MUCH OF THAT LITERATURE DO YOU THINK IS TRUE?

Richard Horton,
Editor von *The Lancet*

Much of the scientific literature, perhaps half, may simply be untrue.

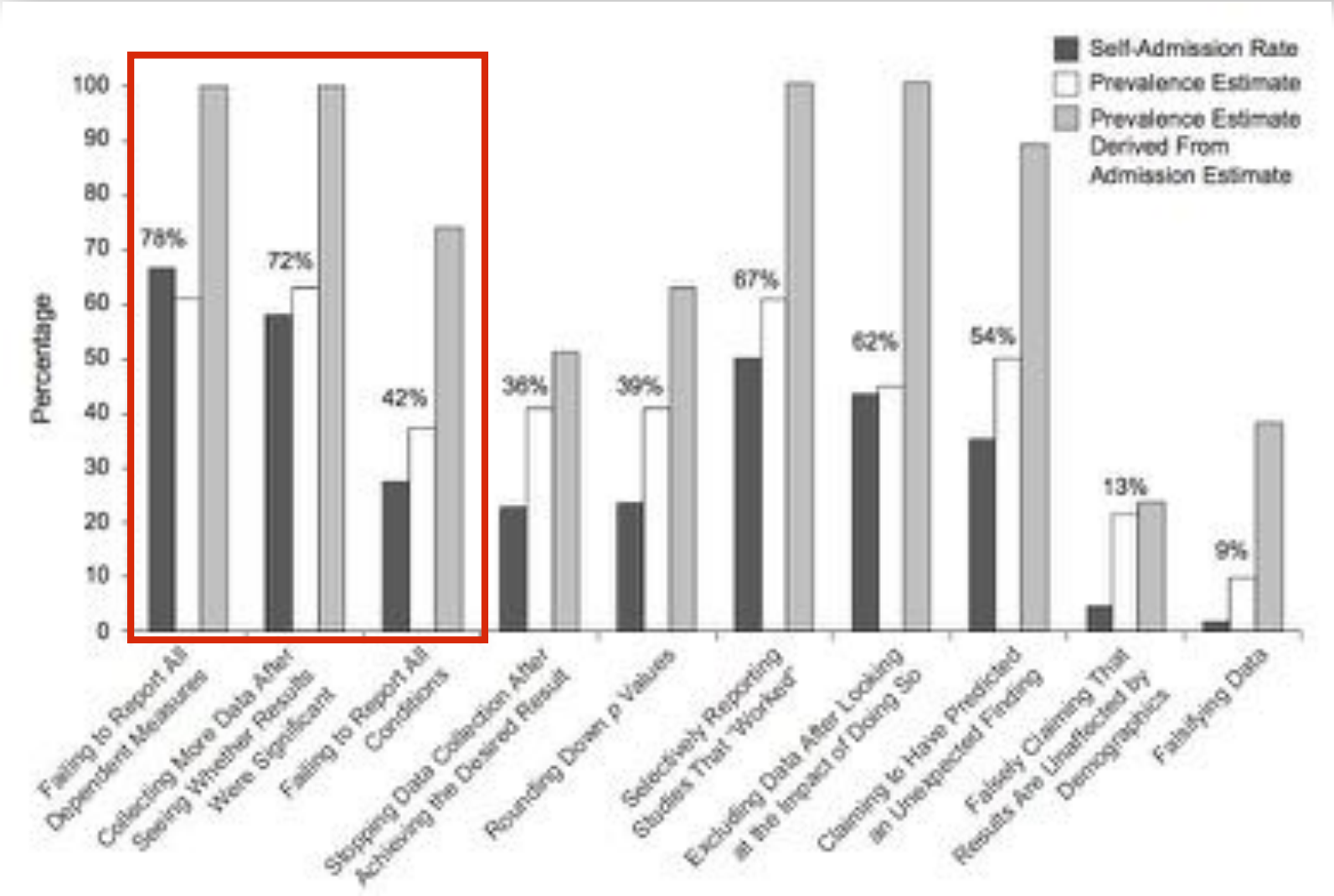
Part of the problem is that no one is incentivised to be **right**.

Measuring the Prevalence of Questionable Research Practices With Incentives for Truth Telling IN PSYCHOLOGY

Psychological Science
23(5) 524-532

DOI: 10.1177/0956797611430953
http://pss.sagepub.com
SAGE

Leslie K. John[1], George Loewenstein[2], and Drazen Prelec[3]
[1]Marketing Unit, Harvard Business School; [2]Department of Social & Decision Sciences, Carnegie Mellon University; and [3]Sloan School of Management and Departments of Economics and Brain & Cognitive Sciences, Massachusetts Institute of Technology

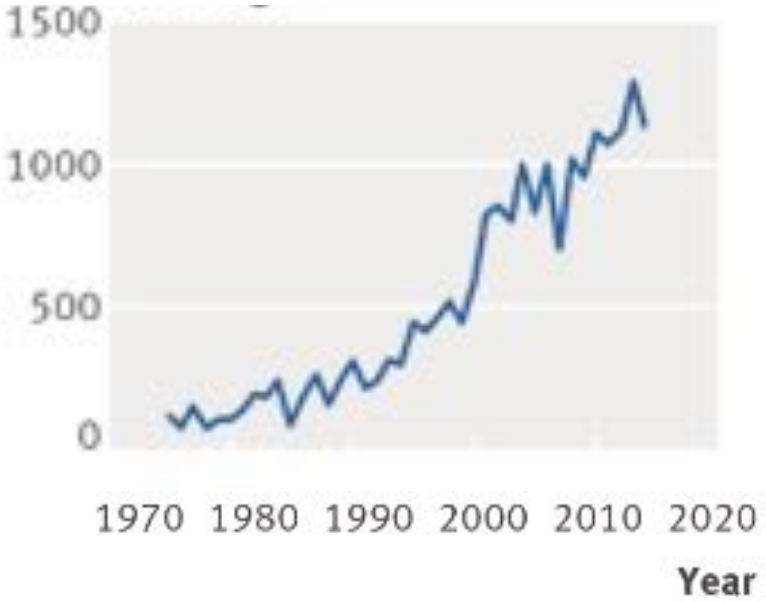


„Innovative, unprecedented, transformative!“

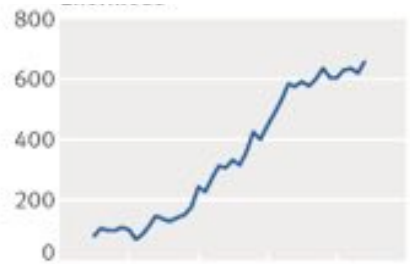
+880% von 1974- 2014

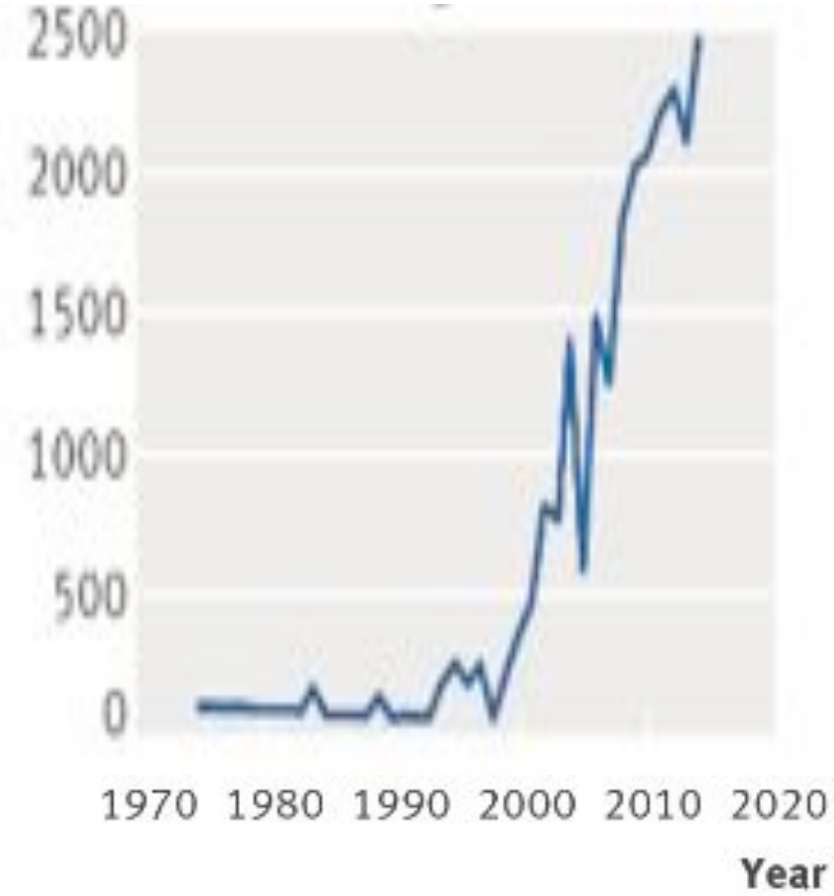
Groundbreaking!!!

Amazing!!



Enormous!!

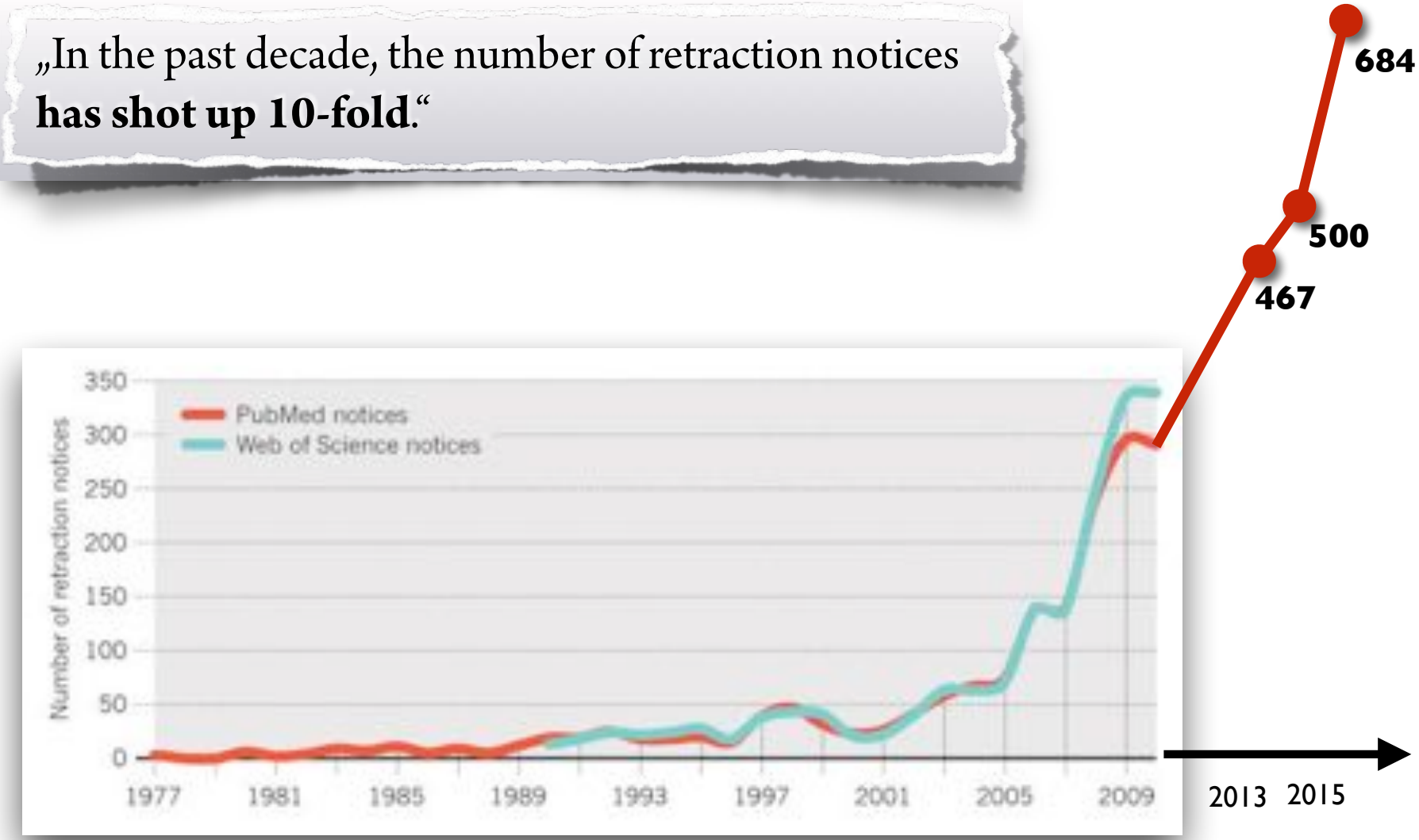




Vinkers, C. H., Tijdink, J. K., & Otte, W. M. (2015). Use of positive and negative words in scientific PubMed abstracts between 1974 and 2014: retrospective analysis. *Bmj*, *351*, h6467–6. http://doi.org/10.1136/bmj.h6467

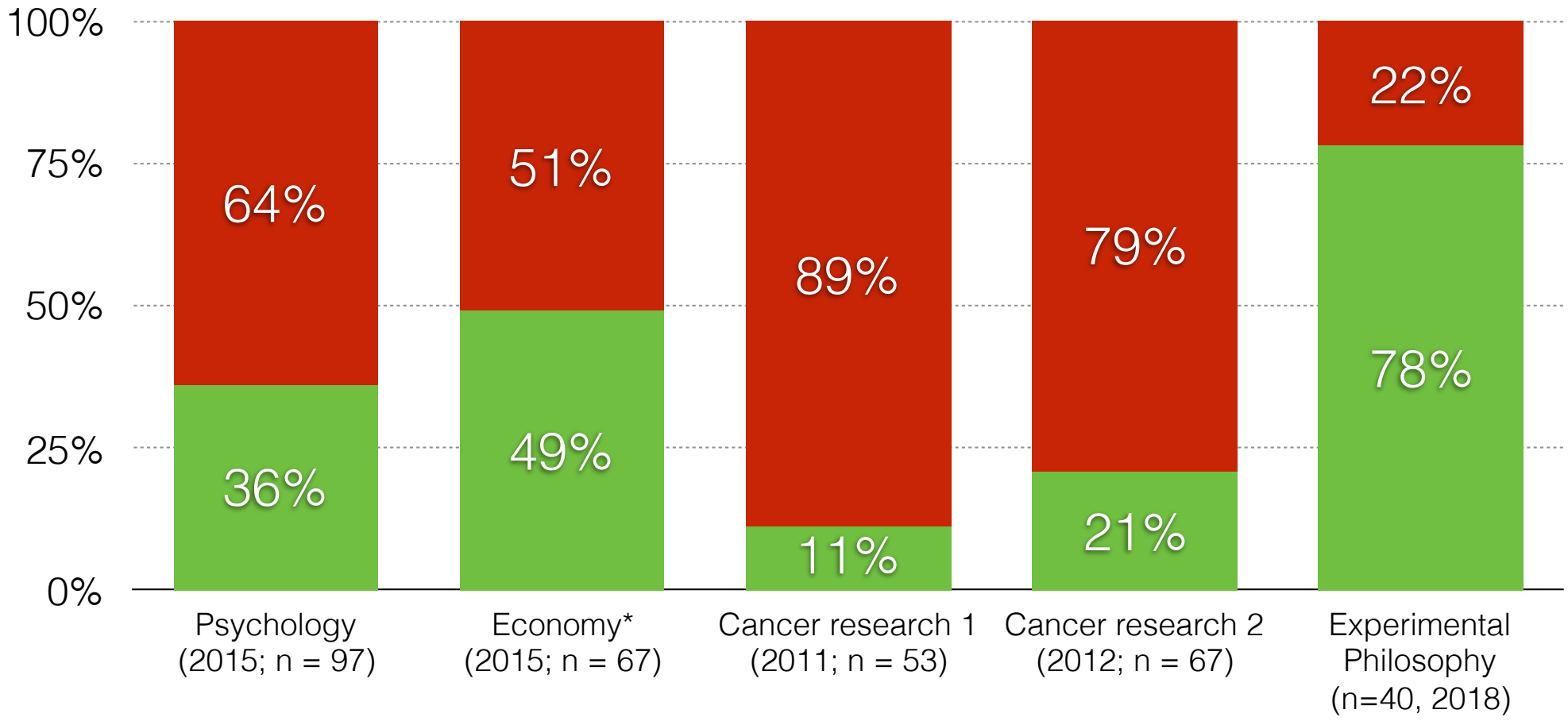
Retractions: **+1000%** in 10 years

„In the past decade, the number of retraction notices **has shot up 10-fold**."



http://www.nature.com/news/2011/111005/full/478026a/box/2.html
http://retractionwatch.com/2016/03/24/retractions-rise-to-nearly-700-in-fiscal-year-2015-and-psst-this-is-our-3000th-post/
https://www.washingtonpost.com/news/speaking-of-science/wp/2016/04/01/when-scientists-lie-about-their-research-should-they-go-to-jail/

Which part of published findings can be independently replicated?



*The data on economics is about *reproducibility*; i.e. the attempt to get the same results if you apply the original data analysis on the original data set.

Open Science Collaboration (2015); Chang & Li (2015); Begley, C. G., & Ellis, L. M. (2012). Prinz, F., Schlange, T., & Asadullah, K. (2011); Cova et al. (2018)

My personal take away, 7 years after the start of the crisis

- A large part of the literature (maybe ~50% or more) cannot be trusted
- Many established indicators of quality cannot be trusted at all
  - e.g. journal impact factor, prestige of institution, prestige of senior author
  - If anything, these are rather negatively related with quality
- Naive meta-analyses are fucked
  - A single well-powered and well-conducted registered reports is worthier than a meta-analysis of 100 *p*-hacked noise studies
- Either change something (both in my everyday scientific work, and beyond!), or leave academia

My personal take away, 7 years after the start of the crisis

- Everybody has to make a choice, we cannot claim a lack of knowledge any more.

- Do you want to waste tax money, participants time, or animals' lives to produce noise, or do you want (at least try!) to produce knowledge?

Psychology's renaissance?
What we have achieved so far

"the European Commission is now moving decisively from 'Open access' into the broader picture of '**Open science**'"

➔ Open Data is default (with opt-out possibility)

- German Research Foundation (DFG): Publicly funded research data belongs to the public

- G7 science ministers: „recognize open science practices during evaluation of funding proposals and outcomes; reward open science activities in career advancement"

http://ec.europa.eu/programmes/horizon2020/en/h2020-section/open-science-open-access
http://www8.cao.go.jp/cstp/english/others/20160517communique.pdf

https://osf.io/tvyxz/wiki/home/

Open Science Badges

Roberta Michnick Golinkoff , Amy Pace, Paula K. S. Yust, and Katharine Suma

The Contribution of Early Communication Quality to Low-Income Children's Language Success

Psychological Science July 2015 26: 1071-1083, first published on June 5, 2015
doi:10.1177/0956797615581493

Abstract Full Text Full Text (PDF) Request Permissions

Helen Colby, Jeff DeWitt, and Gretchen B. Chapman

Grouping Promotes Equality: The Effect of Recipient Grouping on Allocation of Limited Medical Resources

Psychological Science July 2015 26: 1084-1089, first published on June 15, 2015
doi:10.1177/0956797615583978

Abstract Full Text Full Text (PDF) Supplemental Material
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Research Reports

Samantha P. Fan, Zoe Liberman, Boaz Keysar, and Katherine D. Kinzler

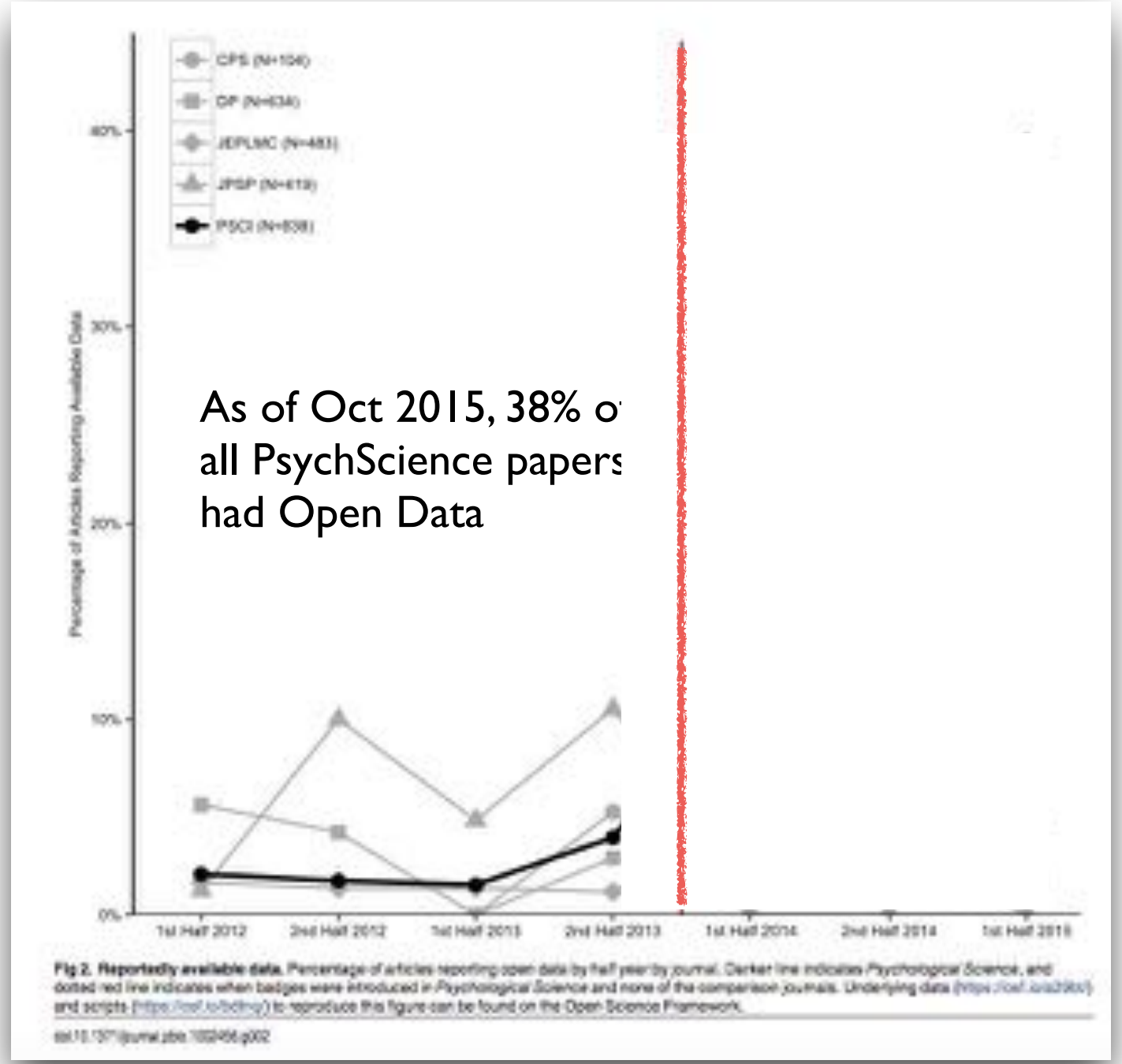
The Exposure Advantage: Early Exposure to a Multilingual Environment Promotes Effective Communication

Psychological Science July 2015 26: 1090-1097, first published on May 8, 2015
doi:10.1177/0956797615574699


OPEN DATA

Open Science Badges

https://osf.io/tvyxz/wiki/home/



Kidwell, M. C., Lazarević, L. B., Baranski, E., Hardwicke, T. E., Piechowski, S., Falkenberg, L.-S., et al. (2016). Badges to Acknowledge Open Practices: A Simple, Low-Cost, Effective Method for Increasing Transparency. PLoS Biology, 14(5), e1002456–15. http://doi.org/10.1371/journal.pbio.1002456

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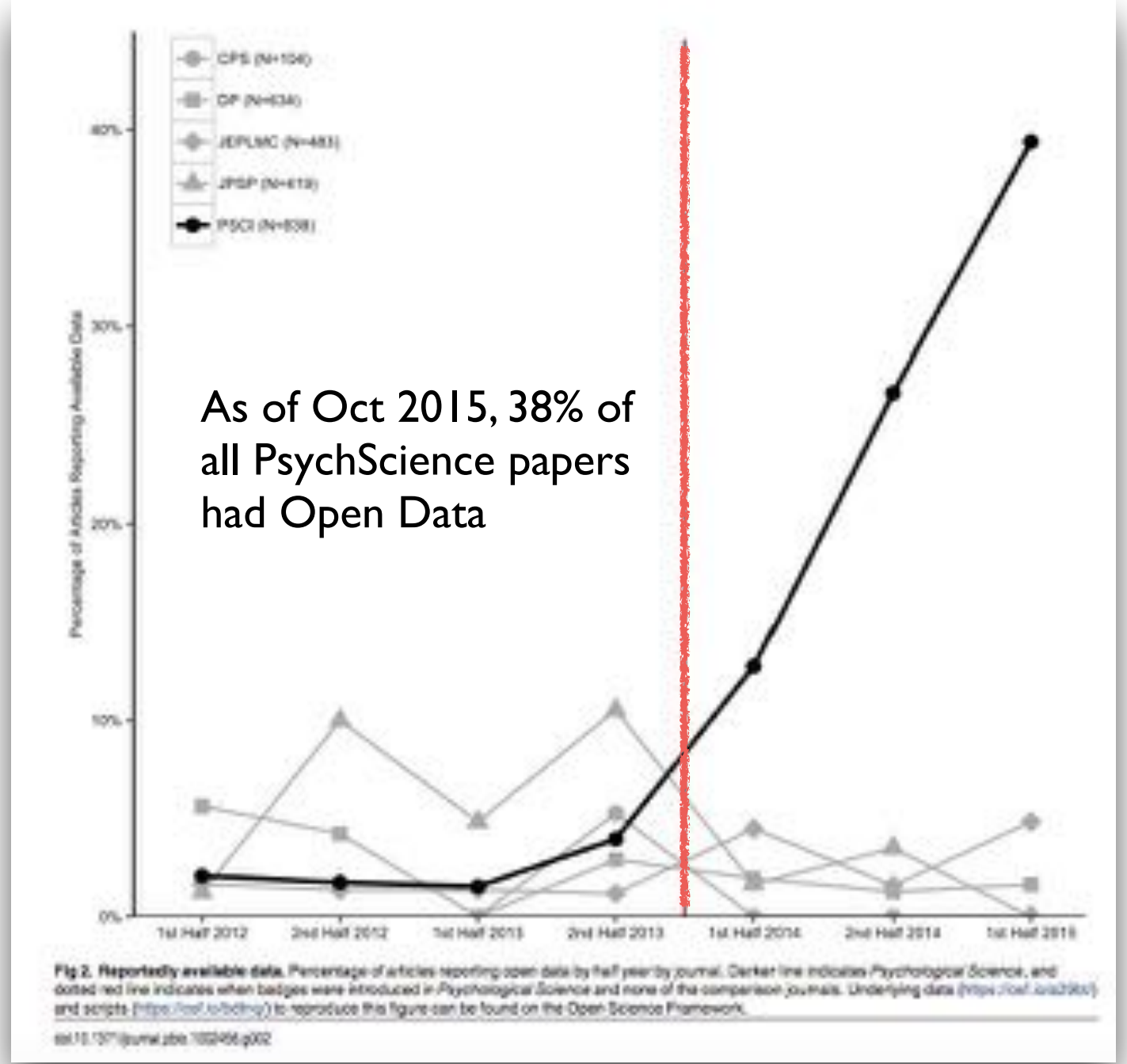

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DFG

OPEN DATA

"dass die Daten unmittelbar nach Abschluss der Forschungen oder nach wenigen Monaten **der Öffentlichkeit frei zur Verfügung gestellt werden**."

Das Engagement […] von Wissenschaftlern und Wissenschaftlerinnen um die Verfügbarmachung von Forschungsdaten sollten bei der **Würdigung von wissenschaftlichen […] Leistungen** zukünftig stärker berücksichtigt werden.

Der Umgang mit Forschungsdaten im Fach Psychologie: Konkretisierung der DFG-Leitlinien

Im Auftrag des DGPs Vorstands (17.09.2016)

Felix Schönbrodt, Mario Gollwitzer und Andrea Abele-Brehm

Die vorliegenden Empfehlungen sollen – als einer von mehreren Bausteinen – zur Qualitätssicherung der psychologischen Forschung beitragen. Sie sind getragen von der Idee einer offenen und transparenten Wissenschaft, en zur disziplinspezifischen Nutzung und Bereitstellung von Forschungsdaten zu entwickeln". Die *Deutsche Gesellschaft für Psychologie* (DGPs) schließt sich den Zielen der DFG und der Allianz der Wissenschaftsorganisationen an

http://dfg.de/download/pdf/foerderung/programme/lis/ua_inf_empfehlungen_200901.pdf, http://www.dfg.de/download/pdf/foerderung/antragstellung/forschungsdaten/richtlinien_forschungsdaten.pdf
http://www.dgps.de/fileadmin/documents/Empfehlungen/Datenmanagement_deu.pdf, http://www.dgps.de/fileadmin/documents/Empfehlungen/Data_Management_eng.pdf

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Consider the GDPR!

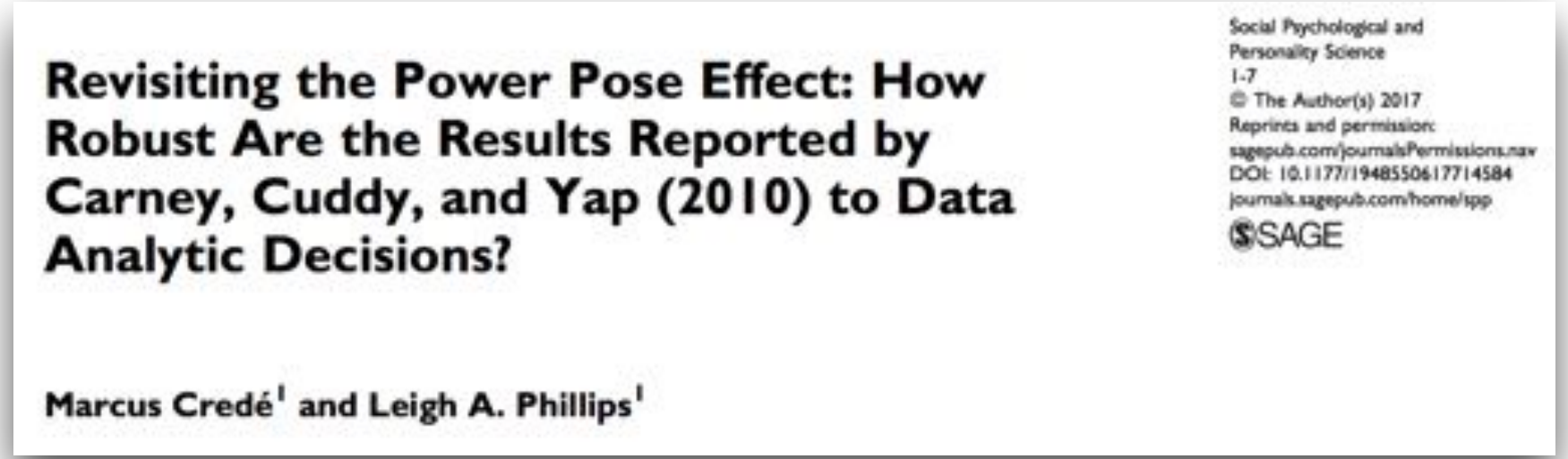
Open data and analytical flexibility: New methodological approaches

Many names for the same idea …

- Sensitivity/ robustness analysis
- Multiverse analysis (Steegen et al., 2016)
- Specification curve (Simonsohn et al., 2015)
- Vibration of effects (Patel et al., 2015)
- Ensemble approach (e.g. climatology)

  ➞ use a set of models with the same input data to produce a range of outcomes

cf. Boulesteix, Elsas, & Schönbrodt (in prep)



Revisiting the Power Pose Effect: How Robust Are the Results Reported by Carney, Cuddy, and Yap (2010) to Data Analytic Decisions?

Marcus Credé[1] and Leigh A. Phillips[1]

Social Psychological and Personality Science
1-7

DOI: 10.1177/1948550617714584
journals.sagepub.com/home/spp
SAGE

- A "multiverse analysis" (Steegen, Tuerlinchx, Gelman, & Vanpaemel, 2016): Report results for all plausible analytical decisions
- Check robustness of results: Do several analytical paths lead to comparable conclusions?
- Based on open data by Carney et al. (2010)

Table 1. Multiverse Analysis for the Effect of Power Posing on Testosterone.

		Outlier Identification: Entire Sample ($N = 39$)		Outlier Identification: Test. Conditioned on Gender ($N = 41$)		Outlier Identification: Multivariate or No Exclusion ($N = 42$)	
Gender Effect	Control Variables	DV: T2 Test.	DV: Δ in Test.	DV: T2 Test.	DV: Δ in Test.	DV: T2 Test.	DV: Δ in Test.
Combined	Gender		.047 ($p = .19$)		.019 ($p = .39$)		.036 ($p = .23$)
Combined	Gender and T1 test.	.029 ($p = .31$)		.042 ($p = .21$)		.055 ($p = .15$)	
Combined	Gender and T1 cort.		.045 ($p = .21$)		.017 ($p = .43$)		.018 ($p = .42$)
Combined	Gender, T1 test., and T1 cort.	.037 ($p = .26$)		.040 ($p = .23$)		.043 ($p = .21$)	
Combined	T1 cort. and T2 cort.		.089 ($p = .07$)		.038 ($p = .23$)		.037 ($p = .24$)
Combined	Gender, T1 test., T1 cort., and T2 cort.	**.123 ($p = .04$)**		.099 ($p = .06$)		.102 ($p = .051$)	
Men only	No controls		.192 ($p = .13$)		.047 ($p = .44$)		.096 ($p = .24$)
Men only	T1 test.	.000 ($p = .96$)		.073 ($p = .35$)		.101 ($p = .25$)	
Men only	T1 cort.		.184 ($p = .17$)		.121 ($p = .22$)		.063 ($p = .37$)
Men only	T1 test. and T1 cort.	.026 ($p = .64$)		.104 ($p = .28$)		.083 ($p = .32$)	
Men only	T1 cort. and T2 cort.		.162 ($p = .22$)		.141 ($p = .21$)		.057 ($p = .41$)
Men only	T1 test., T1 cort., and T2 cort.	.026 ($p = .66$)		.125 ($p = .26$)		.086 ($p = .33$)	
Women only	No controls		.005 ($p = .73$)		.005 ($p = .73$)		.005 ($p = .73$)
Women only	T1 test.	.019 ($p = .51$)		.019 ($p = .51$)		.019 ($p = .51$)	
Women only	T1 cort.		.005 ($p = .75$)		.005 ($p = .75$)		.005 ($p = .75$)
Women only	T1 test. and T1 cort.	.023 ($p = .48$)		.023 ($p = .48$)		.023 ($p = .48$)	
Women only	T1 cort. and T2 cort.		.077 ($p = .19$)		.077 ($p = .19$)		.077 ($p = .19$)
Women only	T1 test., T1 cort., and T2 cort.	.167 ($p = .053$)		.167 ($p = .053$)		.167 ($p = .053$)	

Note. Entries are partial η^2 values and (in parentheses) the associated p value. The entry in boldface is the effect for the analyses originally reported in the Carney, Cuddy, and Yap (2010) paper. Blank entries mean that the analyses would not be recommended for reasons described in the text. The number of women was constant across the three outlier strategies. DV = dependent variable; Test. = testosterone; cort. = cortisol; T1 = premanipulation; T2 = postmanipulation.

Of 54 plausible analyses exactly ***one*** was significant.
Guess which has been reported in the original paper?

Open Letter by Dana Carney (2016)

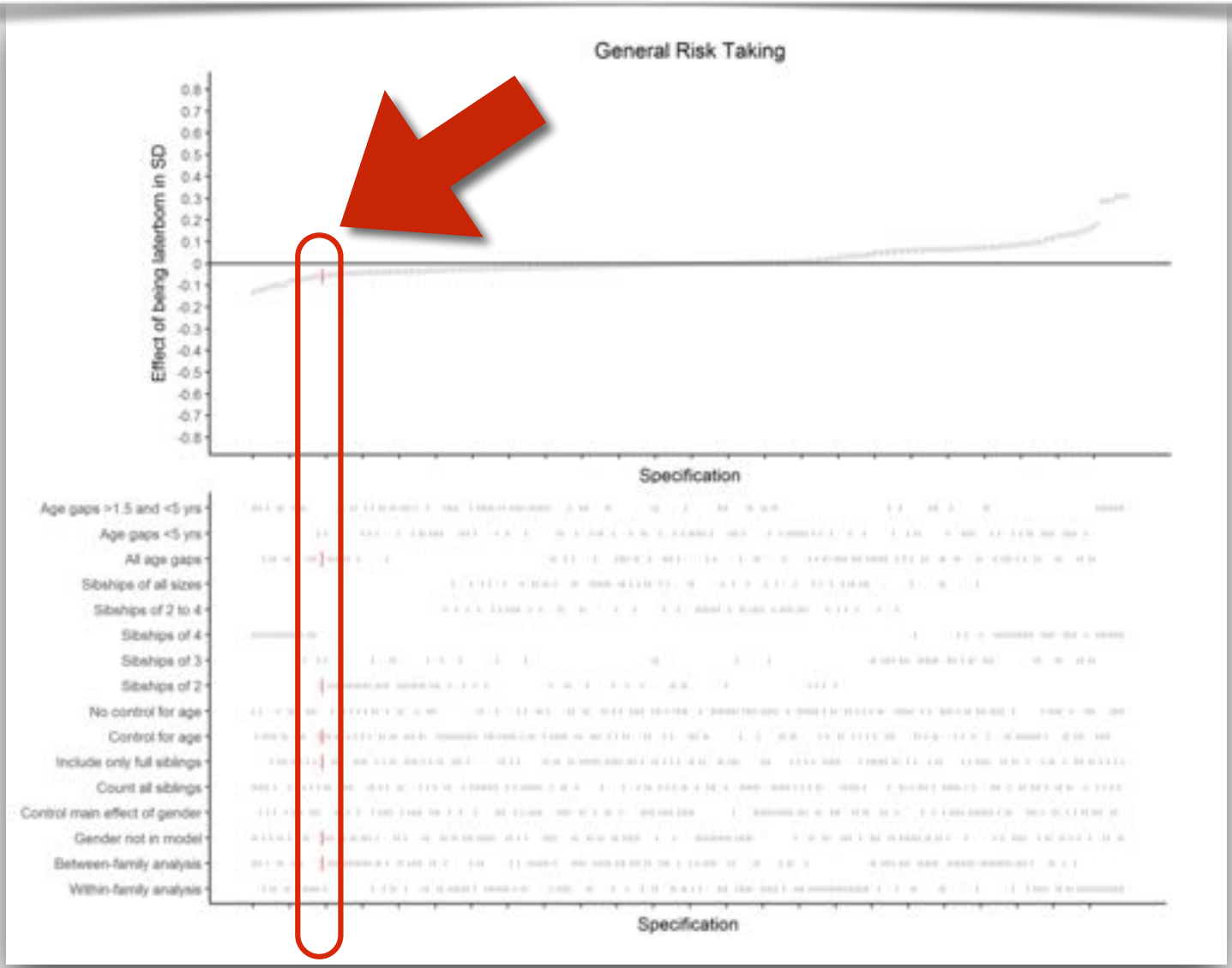
5. Initially, the primary DV of interest was risk-taking. We ran subjects in chunks and checked the effect along the way. It was something like 25 subjects run, then 10, then 7, then 5. Back then this did not seem like p-hacking. It seemed like saving money (assuming your effect size was big enough and p-value was the only issue).
6. Some subjects were excluded on bases such as "didn't follow directions." The total number of exclusions was 5. The final sample size was $N = 42$.
7. The cortisol and testosterone data (in saliva at that point) were sent to Salimetrics (which was in State College, PA at that time). The hormone results came back and data were analyzed.
8. For the risk-taking DV: One p-value for a Pearson chi square was .052 and for the Likelihood ratio it was .05. The smaller of the two was reported despite the Pearson being the more ubiquitously used test of significance for a

10. The self-report DV was p-hacked in that many different power questions were asked and those chosen were the ones that "worked."

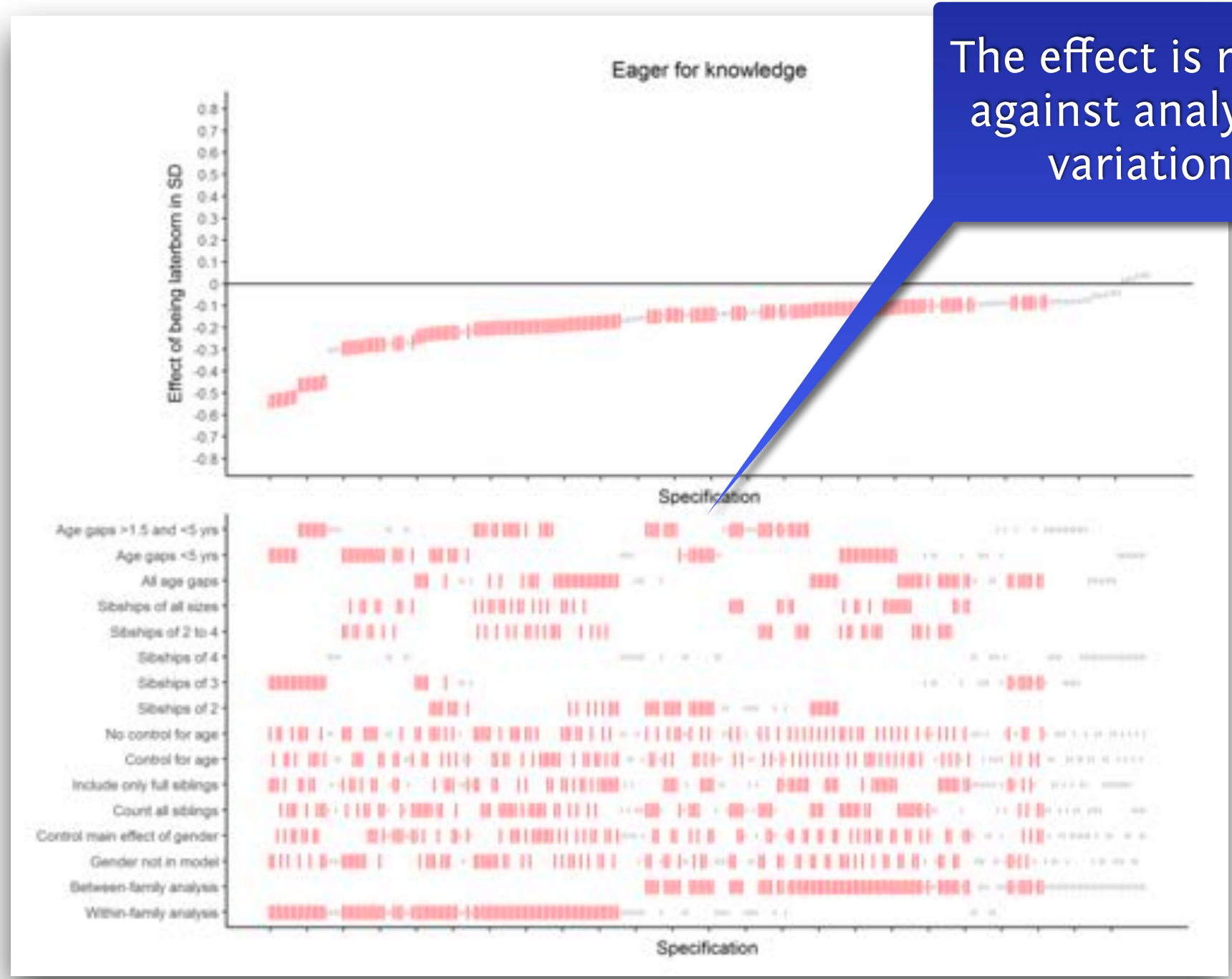
http://faculty.haas.berkeley.edu/dana_carney/pdf_my%20position%20on%20power%20poses.pdf

Probing Birth-Order Effects on Narrow Traits Using Specification Curve Analysis

Julia M. Rohrer[1,2], Boris Egloff[3], Stefan C. Schmukle[2]



Rohrer, J. M., Egloff, B., & Schmukle, S. C. (in press). Probing birth-order effects on narrow traits using Specification Curve Analysis. *Psychological Science. https://osf.io/vg2un/*



The effect is robust against analytical variations

Rohrer, J. M., Egloff, B., & Schmukle, S. C. (in press). Probing birth-order effects on narrow traits using Specification Curve Analysis. *Psychological Science. https://osf.io/vg2un/*

Journals with mandatory open data (or justification why not)

- Advances in Methods and Practices in Psychological Science (AMPPS)
- Archives of Scientific Psychology
- BMC Psychology
- Collabra: Psychology
- Cognition
- Comprehensive Results in Social Psychology
- European Journal of Personality (EJP)
- European Journal of Social Psychology (EJSP)
- Evolution and Human Behavior
- Experimental Psychology
- Journal of Economic Psychology
- Journal of Open Psychology Data (JOPD)
- Journal of Research in Personality
- Judgment and Decision Making
- Journal of Cognition
- Meta-Psychology
- PLOS ONE
- Royal Society Open Science
- Science

For a continuously updated list, see here: https://osf.io/tbkzh/wiki/Psychology%20journals%20with%20mandatory%20open%20data/


PREREGISTERED

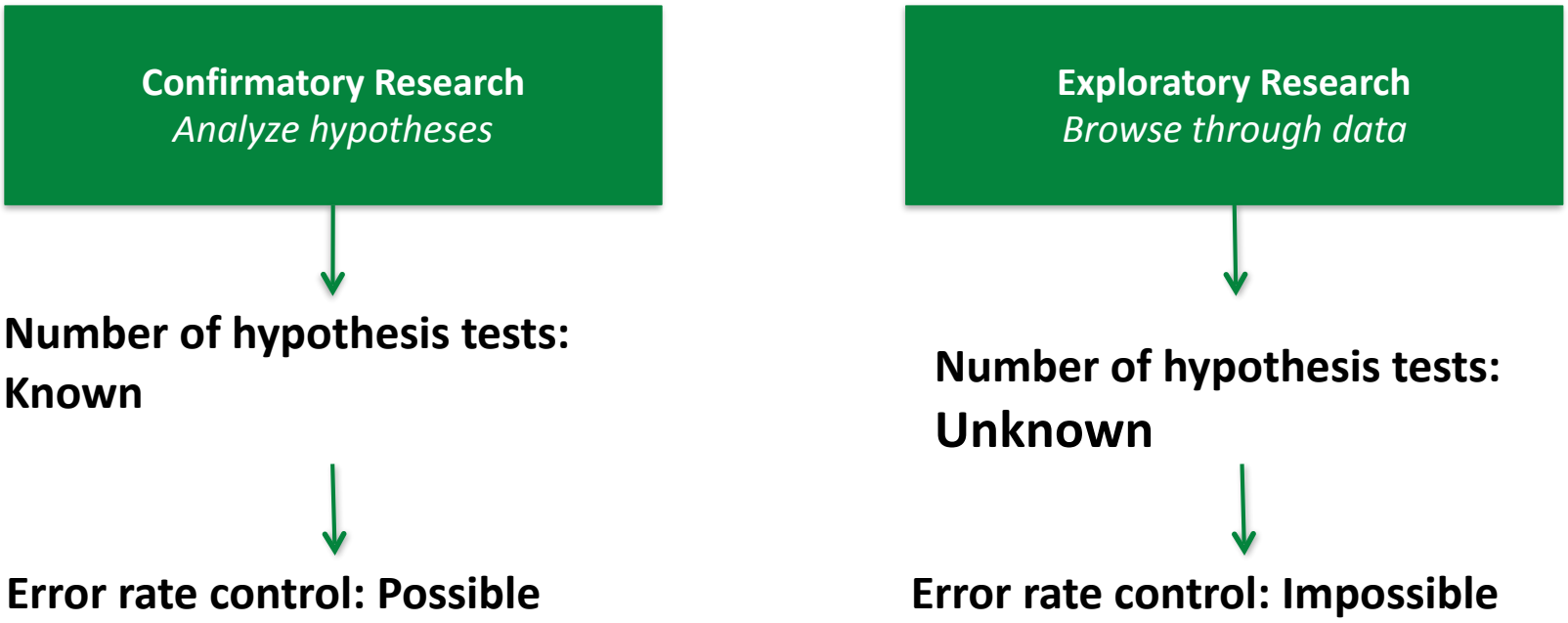
What is a preregistration?

„The specification of a research design, hypotheses, and analysis plan prior to observing the outcomes of a study“

Nosek & Lindsay (2018)

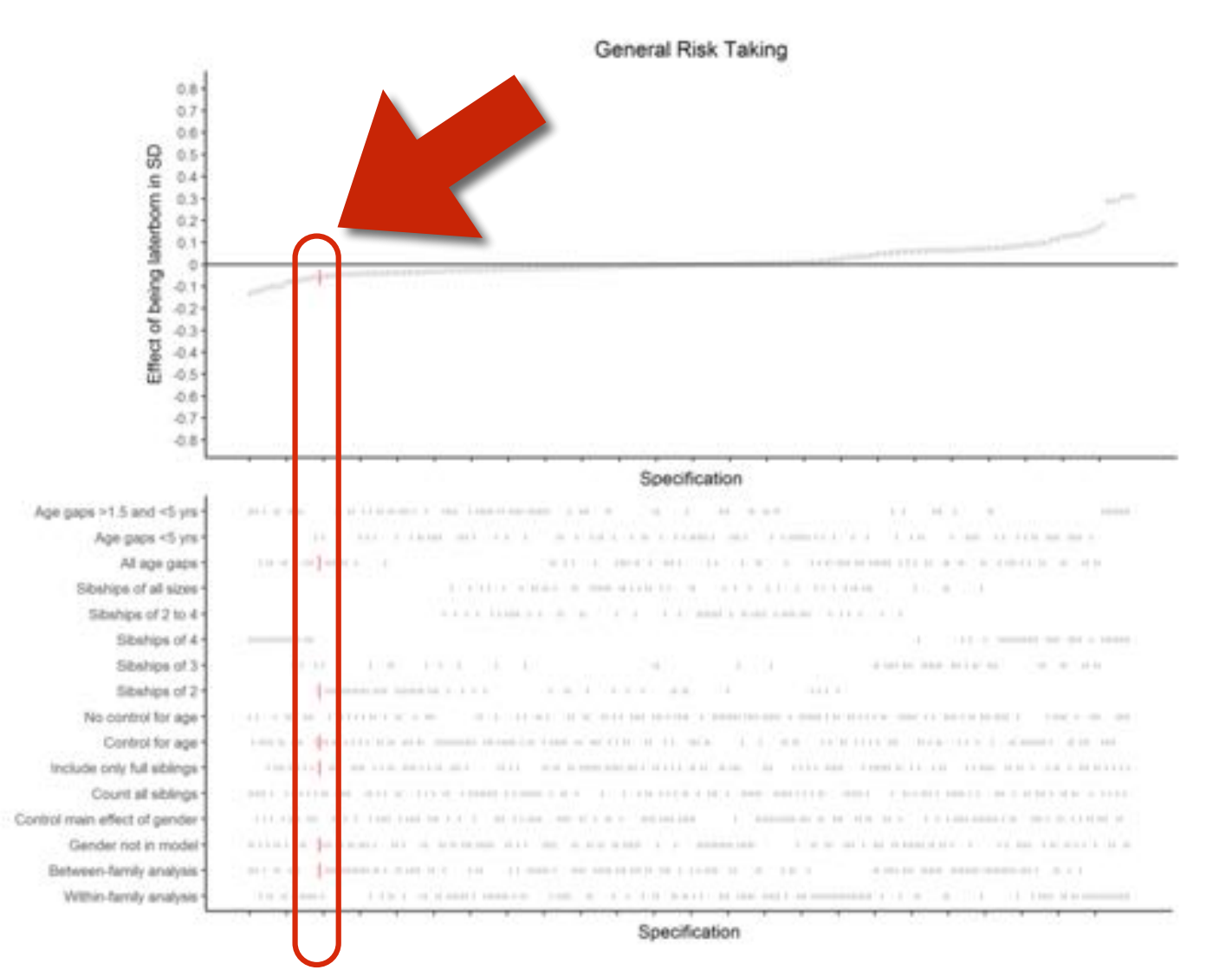
Why preregistration?

1. Clear distinction between confirmatory and exploratory research



Why preregistration?

2. Prevent *p*-hacking and QRPs



Registered Reports

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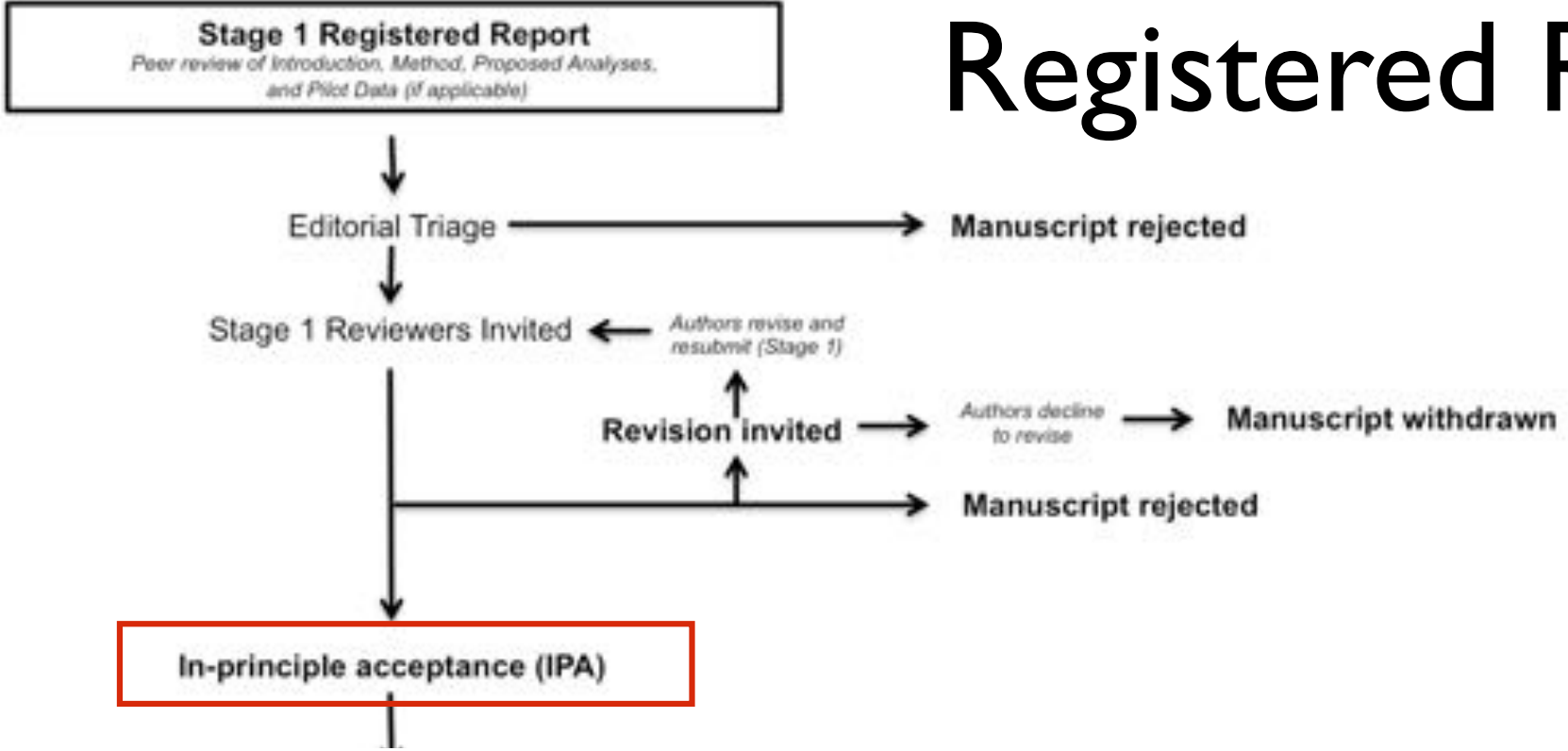

Registered Reports

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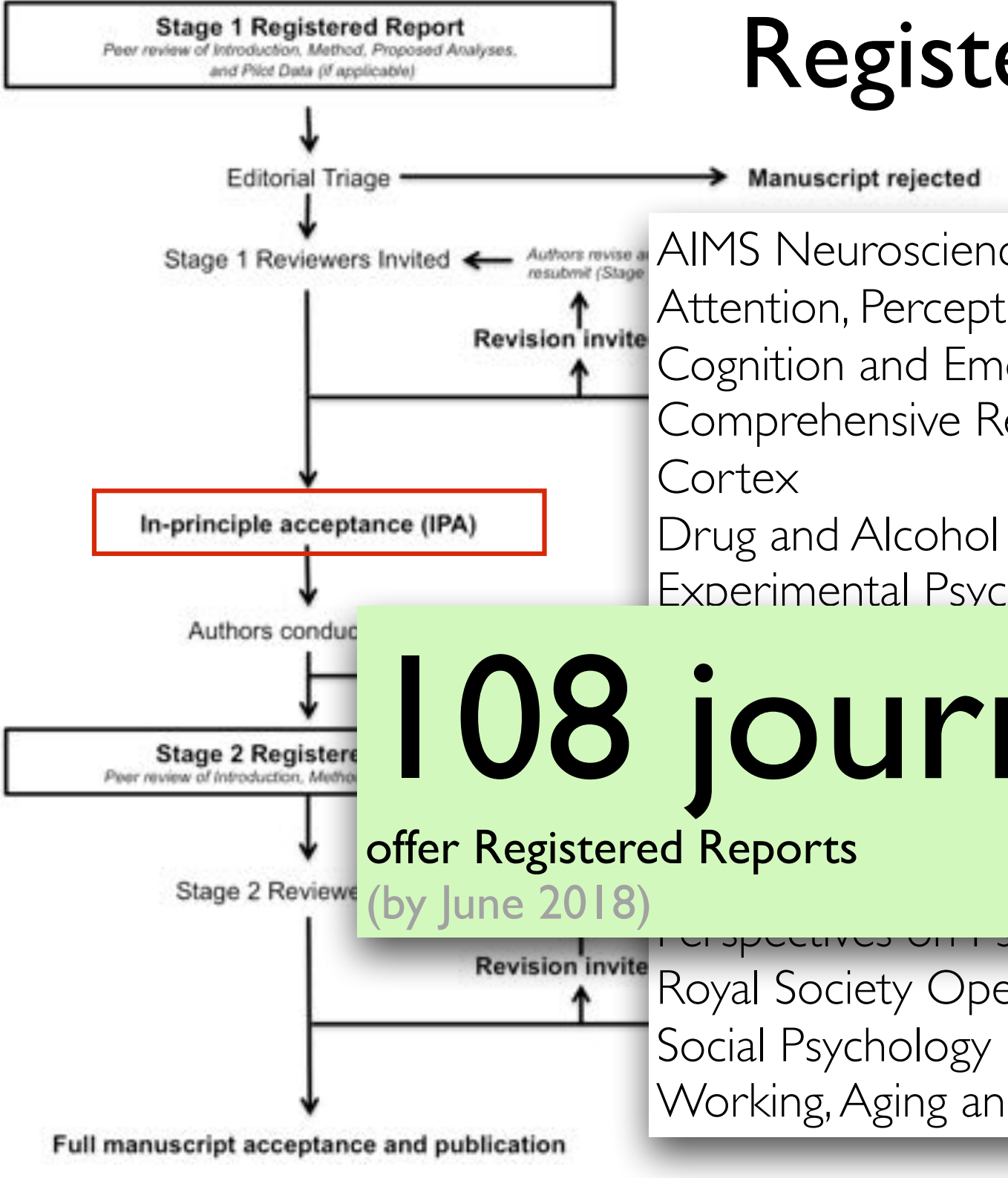

AIMS Neuroscience
Attention, Perception, and Psychophysics
Cognition and Emotion
Comprehensive Results in Social Psychology
Cortex
Drug and Alcohol Dependence
Experimental Psychology

108 journals

offer Registered Reports

(by June 2018)

Royal Society Open Science
Social Psychology
Working, Aging and Retirement

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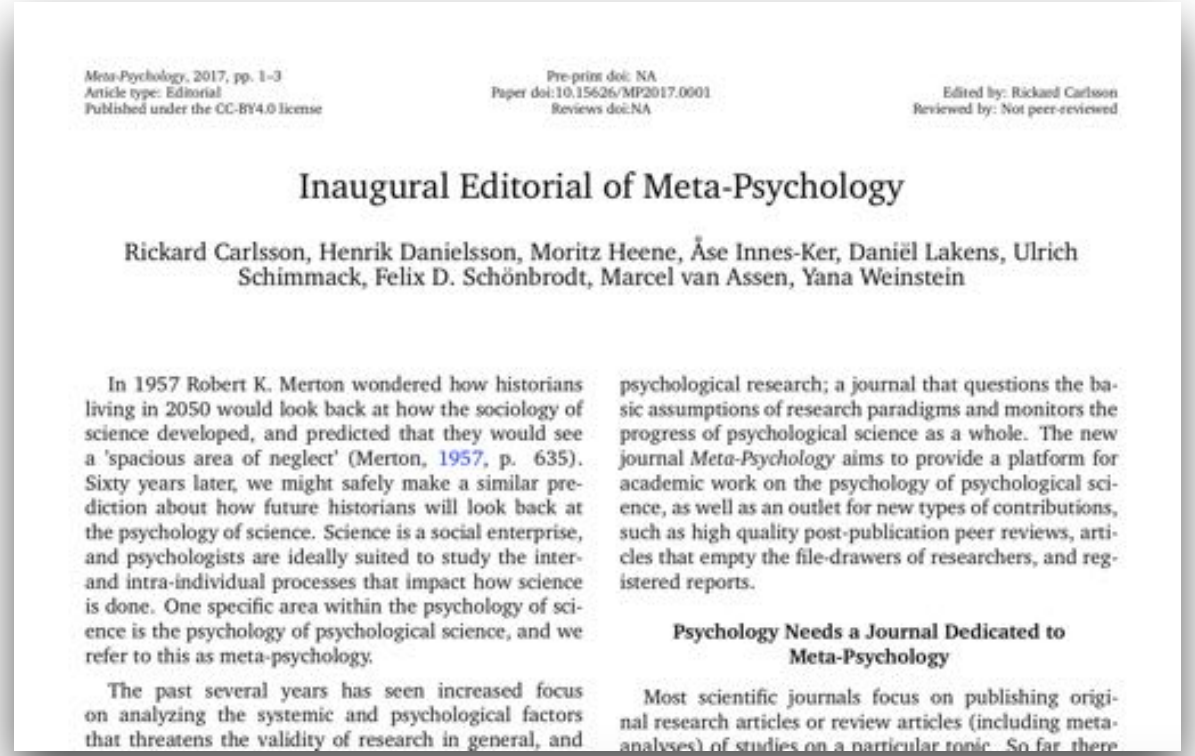

Meta-Psychology, 2017, pp. 1–3
Article type: Editorial
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Pre-print doi: NA
Paper doi:10.15626/MP2017.0001
Reviews doi:NA

Edited by: Rickard Carlsson
Reviewed by: Not peer-reviewed

Inaugural Editorial of Meta-Psychology

Rickard Carlsson, Henrik Danielsson, Moritz Heene, Åse Innes-Ker, Daniël Lakens, Ulrich Schimmack, Felix D. Schönbrodt, Marcel van Assen, Yana Weinstein

In 1957 Robert K. Merton wondered how historians living in 2050 would look back at how the sociology of science developed, and predicted that they would see a 'spacious area of neglect' (Merton, 1957, p. 635). Sixty years later, we might safely make a similar prediction about how future historians will look back at the psychology of science. Science is a social enterprise, and psychologists are ideally suited to study the inter- and intra-individual processes that impact how science is done. One specific area within the psychology of science is the psychology of psychological science, and we refer to this as meta-psychology.

The past several years has seen increased focus on analyzing the systemic and psychological factors that threatens the validity of research in general, and psychological research; a journal that questions the basic assumptions of research paradigms and monitors the progress of psychological science as a whole. The new journal *Meta-Psychology* aims to provide a platform for academic work on the psychology of psychological science, as well as an outlet for new types of contributions, such as high quality post-publication peer reviews, articles that empty the file-drawers of researchers, and registered reports.

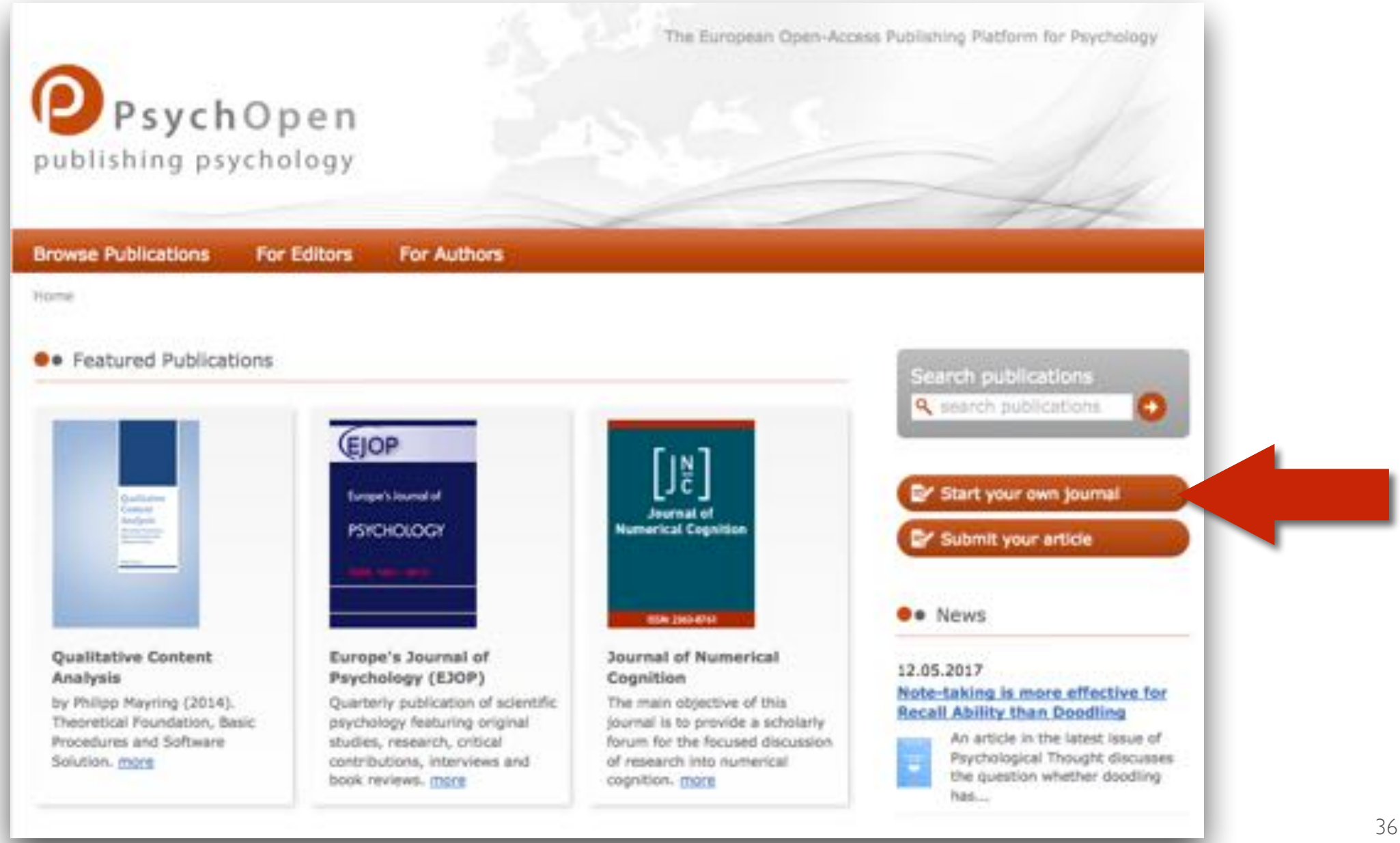
Psychology Needs a Journal Dedicated to Meta-Psychology

Most scientific journals focus on publishing original research articles or review articles (including meta-analyses) of studies on a particular topic. So far, there

- ✓ Full open access, no APCs
- ✓ Non-commercial institutional publisher (Linnaeus U library)
- ✓ Open, citable peer review (with doi)
- ✓ Well-powered null results and direct replications welcomed
- ✓ Registered Reports as option
- ✓ Mandatory open data
- ✓ Open Science badges (including a reproducibility badge)
- ✓ Special article formats, e.g. *„Empty your file-drawer“*

https://www.psychopen.eu/

Psychologie Information
ZPID – Leibniz Institut



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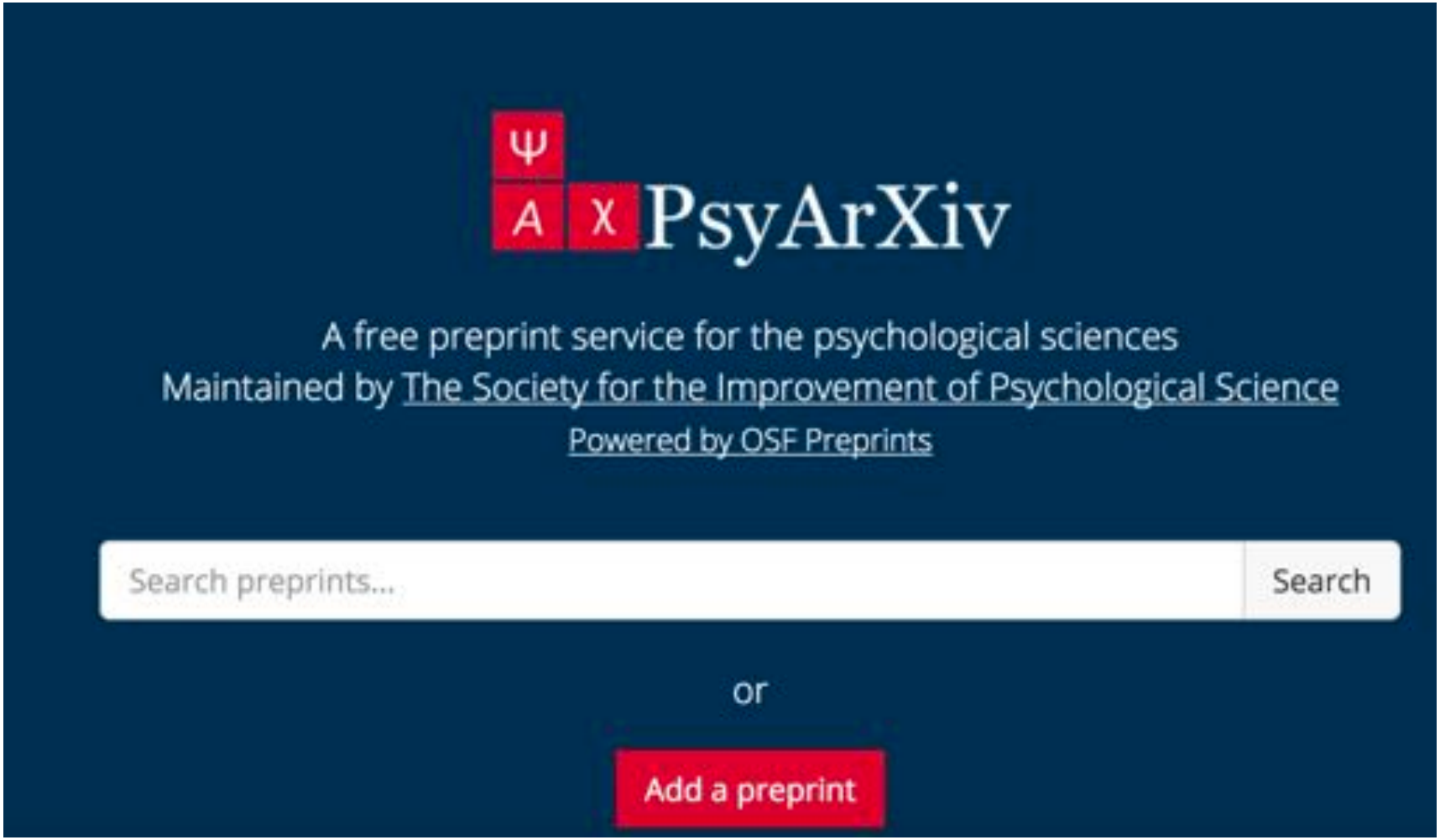

https://psyarxiv.com/

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http://www.researchtransparency.org/

http://www.nicebread.de/a-voluntary-commitment-to-research-transparency/

this week 1

Consider to sign our voluntary commitment to research transparency

https://osf.io/mgwk8/

- So far 12 signatories from 7 universities

Signatories

#	Signatory	Affiliation	Date
1	PD Dr. Felix Schönbrodt	LMU München, Germany	2015/09/07
2	Prof. Dr. Markus Maier	LMU München, Germany	2015/09/07
3	Dr. Vanessa Büchner	LMU München, Germany	2015/09/07
4	Prof. Dr. Moritz Heene	LMU München, Germany	2015/09/07
5	Prof. Dr. Michael Zehetleitner	KU Eichstätt, Germany	2015/09/07
6	Prof. Dr. Stefan Schmukle	Universität Leipzig, Germany	2015/09/08
7	Prof. Dr. Shravan Vasishth	Universität Potsdam, Germany	2015/09/09
8	Prof. Dr. Kyle Ratner	UC Santa Barbara, USA	2015/09/10
9	Dr. Jim Grange	Keele University, UK	2015/09/14
10	Dipl.-Math. Sarah Humberg	WWU Münster, Germany	2015/10/29
11	Prof. Dr. Mitja Back	WWU Münster, Germany	2015/10/30
12	Dr. Katharina Geukes	WWU Münster, Germany	2015/11/13

84

Consider to sign our voluntary commitment to research transparency

http://www.researchtransparency.org/

- 162 signatories from >50 international universities (by June 2018)

Maarten van Zalk from Oxford University
signed on 2016-07-13

Nidhal Selmi from Arizona State University
signed on 2016-07-10

Marcus Mund from Friedrich-Schiller-Universität Jena
signed on 2016-06-29

Ruben Arslan from Georg August Universität Göttingen
signed on 2016-06-17

Oliver Lindemann from University of Potsdam
signed on 2016-06-09

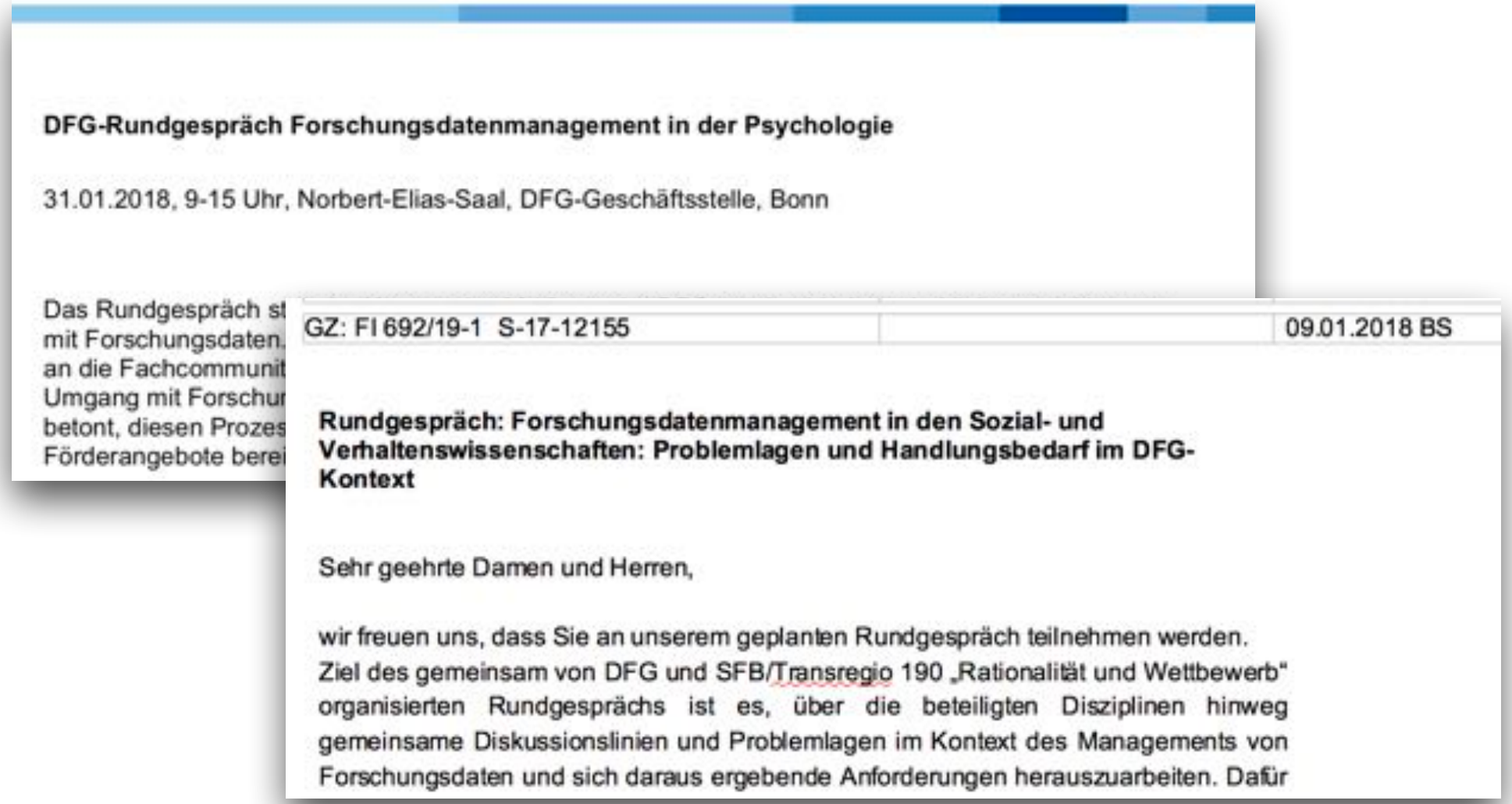
Markus Brauer from University of Wisconsin-Madison
signed on 2016-06-01

Johannes Breuer from University of Cologne
signed on 2016-05-30

Initiatives, Societies & Funders

Netzwerk der Open Science Initiativen: https://osf. io/tbkzh/
12 Standorte

DFG



DFG-Rundgespräch Forschungsdatenmanagement in der Psychologie

31.01.2018, 9-15 Uhr, Norbert-Elias-Saal, DFG-Geschäftsstelle, Bonn

Das Rundgespräch st
mit Forschungsdaten.
an die Fachcommunit
Umgang mit Forschur
betont, diesen Prozes
Förderangebote berei

GZ: FI 692/19-1 S-17-12155		09.01.2018 BS

Rundgespräch: Forschungsdatenmanagement in den Sozial- und Verhaltenswissenschaften: Problemlagen und Handlungsbedarf im DFG-Kontext

Sehr geehrte Damen und Herren,

wir freuen uns, dass Sie an unserem geplanten Rundgespräch teilnehmen werden. Ziel des gemeinsam von DFG und SFB/Transregio 190 „Rationalität und Wettbewerb" organisierten Rundgesprächs ist es, über die beteiligten Disziplinen hinweg gemeinsame Diskussionslinien und Problemlagen im Kontext des Managements von Forschungsdaten und sich daraus ergebende Anforderungen herauszuarbeiten. Dafür

Deutsche Gesellschaft für Psychologie (DGPs)

Psychologie gestaltet

51. DGPs-Kongress
15. bis 20. September 2018 in Frankfurt am Main

Hot Topics

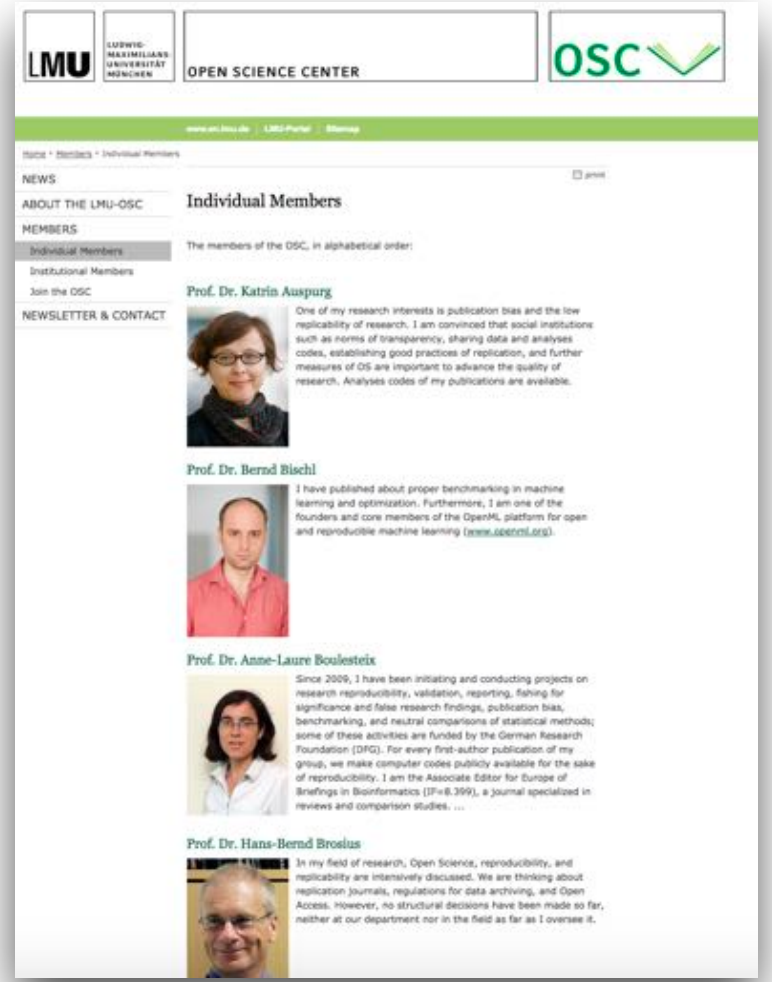
Open Science in Psychology: Recommendations, Experiences, and Best-Practice-Examples


Tom Hardwicke
@Tom_Hardwicke
Folge ich
American Psychological Association seeking Open Science and Methodology Chair to develop best practices for the evolving landscape of open science in psychology
Tweet übersetzen
APA Creates Open Science and Methodology Chair to Deep...
Recruitment to begin this summer.
apa.org
08:37 - 18. Juni 2018

OSC

LMU Open Science Center

- 32 individual members of 11 disciplines:
  Psychology, sociology, computer science, statistics, geography, medicine, veterinary medicine, economics, philosophy of science, …
- 7 institutional members:
  Faculty of Medicine, Faculty of Veterinary Medicine, Faculty of Psychology and Educational Science, Department Psychology, LMU-ifo Economics & Business Data Center (EBDC), University Library, Leibniz Supercomputing Centre
- Mission Statement:
  - Education (from PhD students to professors)
  - Meta-science research
  - Change the incentive structure
- http://www.osc.lmu.de



Let's not rest on our laurels: Current challenges.

1. Blind spots
2. High openness, low quality
3. Empirical evidence for effectiveness of reforms
4. Incentive structures

Let's not rest on our laurels: Current challenges.

1. **Blind spots**
2. High openness, low quality
3. Empirical evidence for effectiveness of reforms
4. Incentive structures

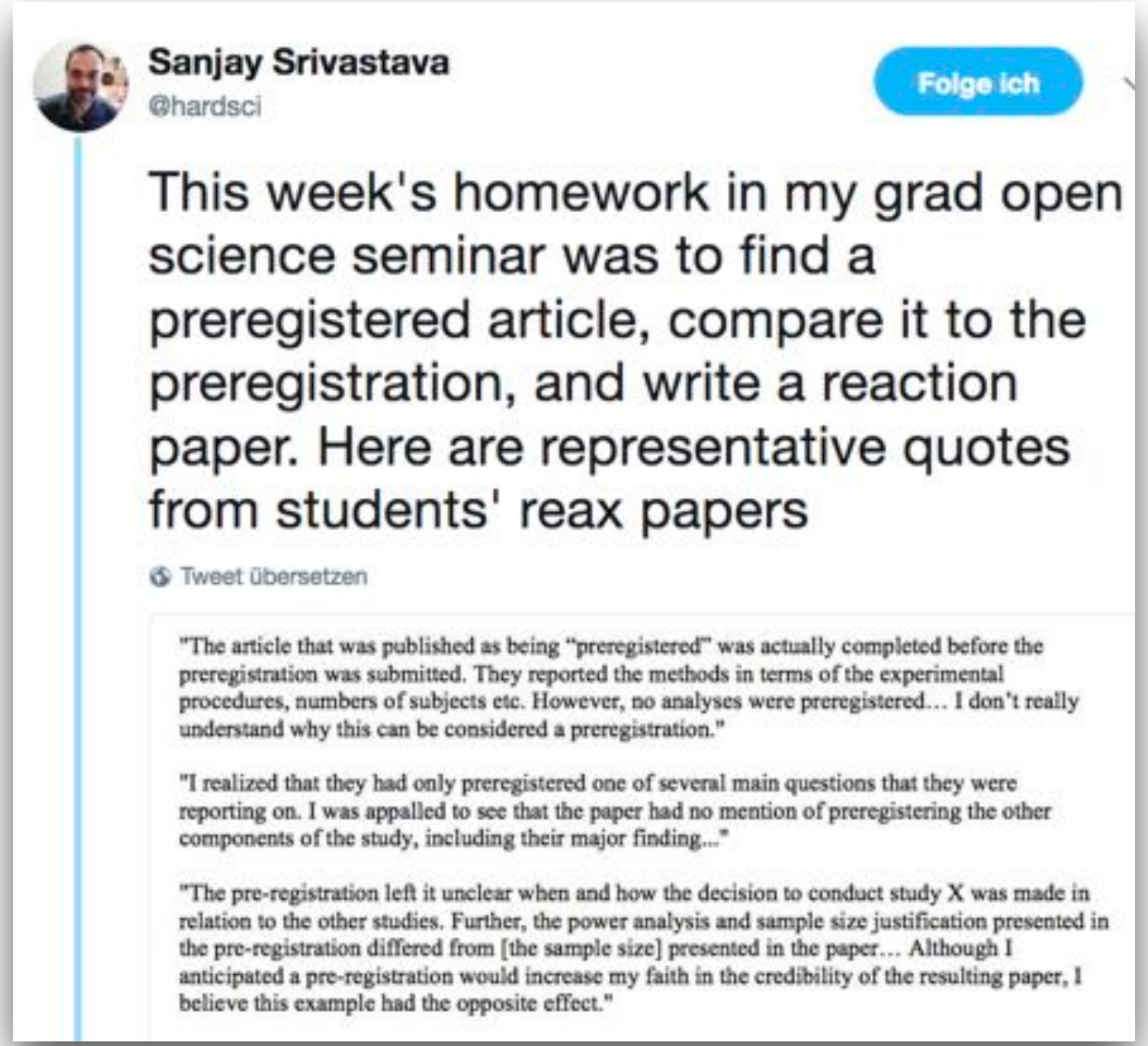
Leave your bubble!

- Blind spots within psychology?
- Project: Analyse conference programs of the subsections of the DGPs („Fachgruppen“) for keywords such as *replication*, *reproducibility*, *open science*.
- Leave your bubble and spread the word to your community.

Let's not rest on our laurels: Current challenges.

1. Blind spots
2. **High openness, low quality**
3. Empirical evidence for effectiveness of reforms
4. Incentive structures

Paper does not match preregistration



Sanjay Srivastava
@hardsci

Folge ich

This week's homework in my grad open science seminar was to find a preregistered article, compare it to the preregistration, and write a reaction paper. Here are representative quotes from students' reax papers

Tweet übersetzen

"The article that was published as being "preregistered" was actually completed before the preregistration was submitted. They reported the methods in terms of the experimental procedures, numbers of subjects etc. However, no analyses were preregistered… I don't really understand why this can be considered a preregistration."

"I realized that they had only preregistered one of several main questions that they were reporting on. I was appalled to see that the paper had no mention of preregistering the other components of the study, including their major finding..."

"The pre-registration left it unclear when and how the decision to conduct study X was made in relation to the other studies. Further, the power analysis and sample size justification presented in the pre-registration differed from [the sample size] presented in the paper… Although I anticipated a pre-registration would increase my faith in the credibility of the resulting paper, I believe this example had the opposite effect."

Open-washing

„However, the analysis plan was posted to OSF but unfortunately not actually registered“

„Also, the Study 3 design was part of the registration, but it did not include an analysis plan.“

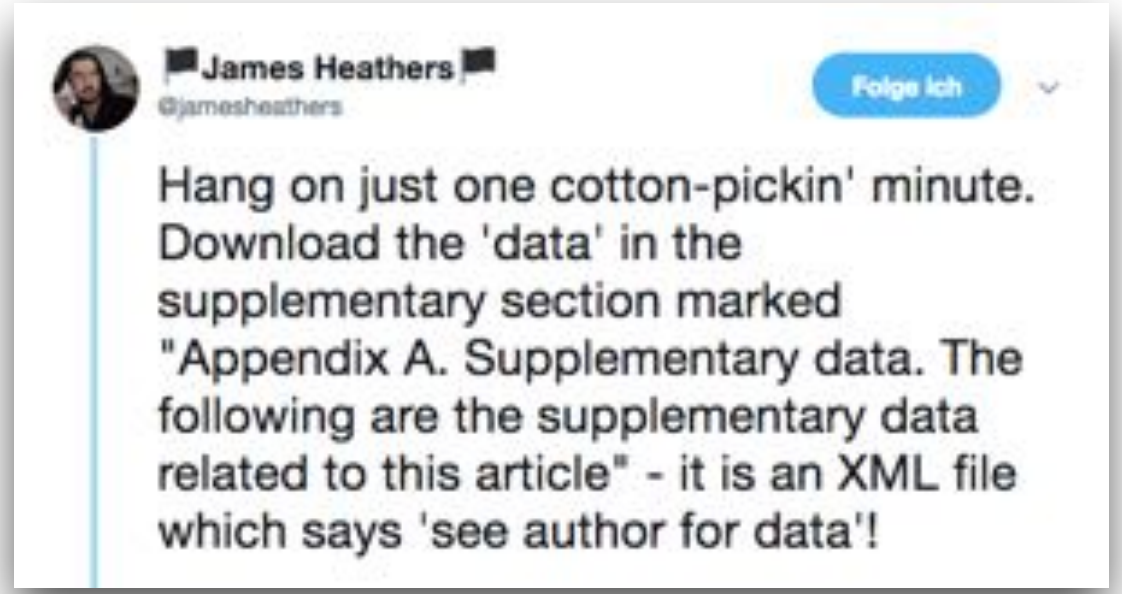
➙ **half-way preregistration?**

„One of the five studies (Study 3) was preregistered“

➙ **Preregister one trivial research question, get the badge for the whole paper?**

https://twitter.com/BrianNosek/status/1003989856643674113

Open-washing




```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
  <data:data>
    <datasets>
      <author>moldham@liverpool.ac.uk</author>
      <type>0</type>
      <dataset>
        <value>1</value>
        <reason>Data will be made available on request
        </reason>
        <comments/>
      </dataset>
```

https://twitter.com/jamesheathers/status/1004330301626208256
https://www.sciencedirect.com/science/article/pii/S0195666317313041

Who is responsible for checking/ enforcing the badges?

- **„Self-disclosure model“**:
  Authors sign the statement „I have a preregistration and my paper matches the prereg“, but verification is left to community (in post-publication peer review)
  ➙ badge means: „This is verifiable *in principle*“
  (but somebody still has to do it)
- **„verification model“**:
  Reviewers and or editors do the verification
  ➙ badge means: „This has been verified and can be trusted“
  (but extra burden for reviewers and editors)
- Registered Reports as a much better model? Preregistration *is* the paper, no mismatch possible. Reviewers check it during stage 1 review.

FAIR data

- **Findable**: Metadata and data should be easy to find for both humans and computers.
- **Accessible**: Once the user finds the required data, she/he needs to know how can they be accessed, possibly including authentication and authorisation.
- **Interoperable**: The data usually need to be integrated with other data. In addition, the data need to interoperate with applications or workflows for analysis, storage, and processing.
- **Reusable**: Metadata and data should be well-described so that they can be replicated and/or combined in different settings.

https://www.go-fair.org/fair-principles/

Open Data vs. FAIR data

- FAIR data can be *not* open
  - e.g., if a data set is findable, reuseable, etc., but only accessible within a closed research group
- Open Data can be *not* FAIR
  - e.g., an undocumented data dump in an uncurated repository, such as OSF, which is neither findable, nor reuseable, nor interoperable
- FAIR dimensions are quality criteria that can be applied to data sets. Ideally, a data set is open and FAIR.

https://ask-open-science.org/1116/what-the-difference-between-fair-data-and-open-data-there-any

Open-Washing =
Hey, let's game the new system!

Endorse open science on Twitter and your CV,
try to get badges with minimum effort,
pretend openness but do not deliver.

Let's not rest on our laurels: Current challenges.

1. Blind spots
2. High openness, low quality
3. **Empirical evidence for effectiveness of reforms**
4. Incentive structures

Meta-Science: Gather empirical evidence

- Hypothesis: Open science practices increase the credibility, the veridicality*, and the replicability of research.
- A critic could say:
  Where is the empirical evidence? You rush implementing all these interventions and reforms without having any evidence that they actually have the desired effect.

* the degree to which a theory or interpretation accurately represents reality

Meta-Science: Gather empirical evidence

Rowhani-Farid *et al. Research Integrity and Peer Review* (2017) 2:4
DOI 10.1186/s41073-017-0028-9

Research Integrity and Peer Review

REVIEW Open Access

What incentives increase data sharing in health and medical research? A systematic review

Anisa Rowhani-Farid*, Michelle Allen and Adrian G. Barnett

Results: Only one incentive (using open data badges) has been tested in health and medical research that examined data sharing rates. The number of opinion pieces ($n = 85$) out-weighed the number of article-testing strategies ($n = 76$), and the number of observational studies exceeded them both ($n = 106$).

Conclusions: Given that data is the foundation of evidence-based health and medical research, it is paradoxical that there is only one evidence-based incentive to promote data sharing. More well-designed studies are needed in order to increase the currently low rates of data sharing.

Let's not rest on our laurels: Current challenges.

1. Blind spots
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4. **Incentive structures**

Richard Horton,
Editor von *The Lancet*

Much of the scientific literature, perhaps half, may simply be untrue.

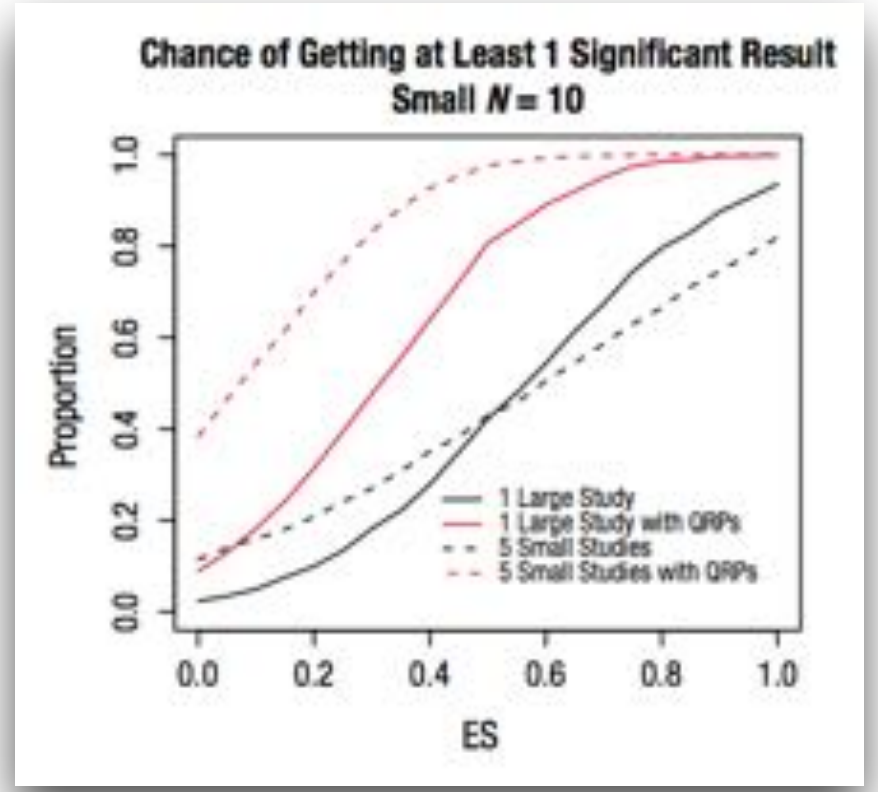
Part of the problem is that no one is incentivised to be **right**.

Quantity, not quality

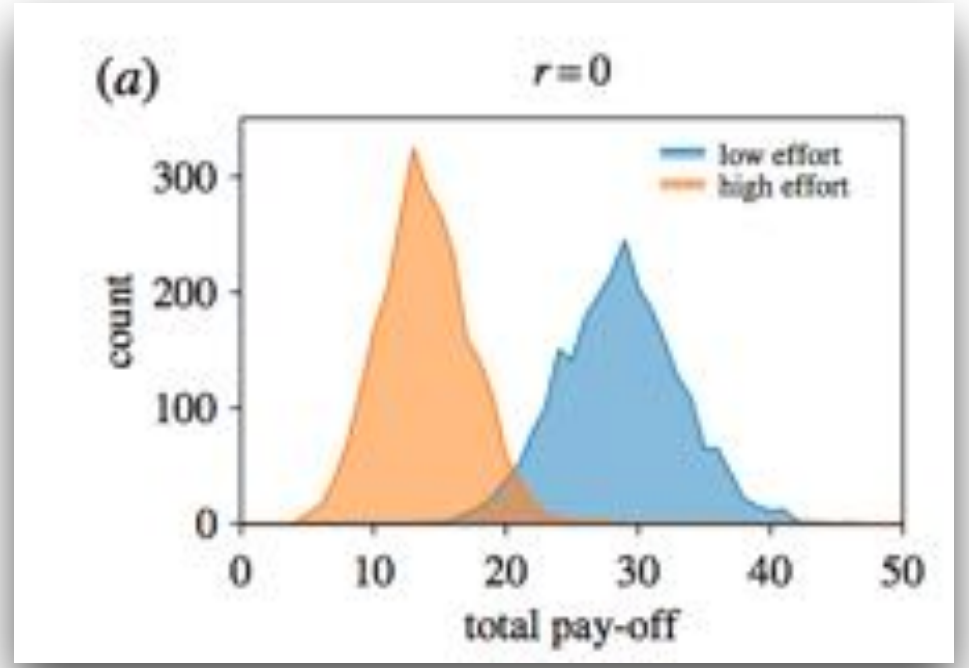
Actual (not desired) relevance at professorship hiring committees:	Rank
Number of peer-reviewed publications	1
Fit of research profile to the advertising institution	2
Quality of research talk	3
Number of publications	4
Volume of acquired third-party funding	5
Number of first authorships	6
…	…

Abele-Brehm, A. E., & Bühner, M. (2016). Wer soll die Professur bekommen? Psychologische Rundschau, 67(4), 250–261. http://doi.org/10.1026/0033-3042/a000335

„The rules of the game“



„Evolution of bad science“



Ideal strategy for a high quantity of publications:
small *n* + many studies + questionable research practices (QRPs), such as *p*-hacking

Bakker, M., van Dijk, A., & Wicherts, J. M. (2012). The Rules of the Game Called Psychological Science. Perspectives on Psychological Science, 7(6), 543–554. http://doi.org/10.1177/1745691612459060

Smaldino, P. E., & McElreath, R. (2016). The natural selection of bad science. *Royal Society Open Science*, *3*(9), 160384–17. http://doi.org/10.1098/rsos.160384

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Actual (not desired) relevance at professorship hiring committees:	Rank
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Volume of acquired third-party funding	5
Number of first authorships	6
…	…
Quality assessment of the best three publications	17
…	…
Indicators of research transparency	**41 (of 41)**

Abele-Brehm, A. E., & Bühner, M. (2016). Wer soll die Professur bekommen? Psychologische Rundschau, 67(4), 250–261. http://doi.org/10.1026/0033-3042/a000335

Quality, not quantity

Job committees

Indicators with the largest discrepancy between „desired“ and „actual“

Abele-Brehm, A. E., & Bühner, M. (2016). Wer soll die Professur bekommen? Psychologische Rundschau, 67(4), 250–261. http://doi.org/10.1026/0033-3042/a000335

Roadmap

Fast adoption vs. High (FAIR) quality?

- Low hurdles, one small step at a time
- Reward small steps
  Sharing something - even badly documented data - is better than sharing nothing.
- Learning by doing
  With increasing practice, hopefully the quality gets better, too.
- But: (Initially) Low quality
  Barely reusable data sets; trying to reproduce a result is a pain in the ass or impossible; data reuse very limited.
- Risk of „open-washing“
  Pretending openness without actual value.

- High hurdles
  Mainly enthusiasts/computer scientists will able and motivated use it
- Reward big steps
  Curated repositories with input quality control.
- Instant high quality
  The data sets which are open are instantly FAIR.

Hiring committees: Make „open science“ a desirable or essential job characteristic

Extra cost for committees	**None** (add a paragraph to job description)
Extra cost for reviewers	**None** (take information into consideration)
Extra cost for applicants	**a few minutes**

An der **Fakultät für Psychologie und Pädagogik** der Ludwig-Maximilians-Universität München ist zum Wintersemester 2016/2017 eine

Professur (W3) für Sozialpsychologie (Lehrstuhl)

. . .

Das Department Psychologie legt Wert auf transparente und replizierbare Forschung und unterstützt diese Ziele durch Open Data, Open Material und Präregistrierungen. Bewerber/innen werden daher gebeten, in ihrem Anschreiben darzulegen, auf welche Art und Weise sie diese Ziele bereits verfolgt haben und in Zukunft verfolgen möchten.

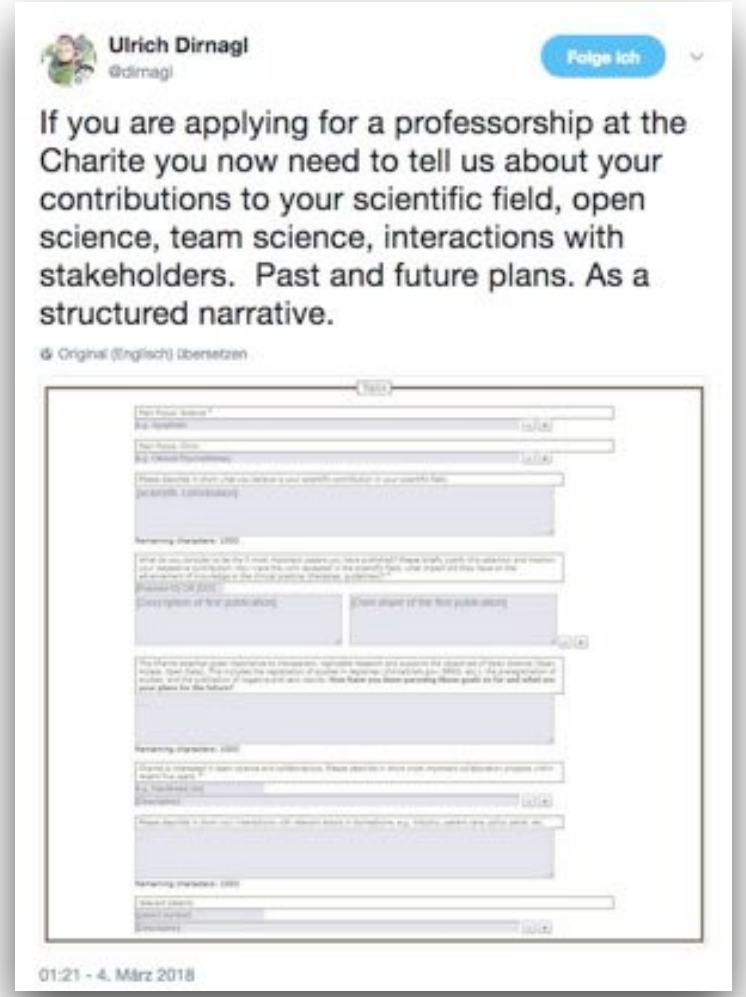
Since 2015: All professorship job descriptions use this requirement

Full Professor (W3)
of Social Psychology

to be filled as soon as possible.

. . .

The Department of Psychology aims for transparent and reproducible research (including Open Data, Open Materials, and Preregistrations). Applicants are asked to illustrate how they have pursued these goals in the past and/or how they plan to do so in the future.



See more such prof job ads at: https://osf.io/7jbnt/

https://docs.google.com/document/d/1ty43Syw0Flkh8ncjW8MZArIkvYe8hLwwhLIlwbtSk_Y/edit?usp=drive_web&ouid=108982640291853577145

http://www.fak11.lmu.de/dep_psychologie/osc/open-science-hiring-policy/index.html

Hiring committees: Require an annotated CV with limited items (e.g., <= 10)

Extra cost for committees	**None** (add a paragraph to job description)
Extra cost for reviewers	**None** (take information into consideration)
Extra cost for applicants	**~ 30 min.**

No journal; JIF is irrelevant or misleading

Paper-level citation metrics

Basic information for judging evidential value

Open science indicators: Judging reproducibility

Data: own collection or reuse?

Authors & title	Year	Cit-ations	Sample size per study	*p*-value per study	Open Science indicators	Data set	Applicants contribution
Doe, John & Smith, Peter	2001	47	$n_1 = 21$ $n_2 = 30$ $n_3 = 19$	$p_1 = .048$ $p_2 = .050$ $p_3 = .023$	☐Open Data ☐Open Material ☐Preregistered	☑Own data collection →URL *NA* ☐Archival data	• Analyzed data • Wrote manuscript
Doe, John	2016	26	$n_1 = 180$ $n_2 = 158$	$p_1 = .012$ $p_2 = .001$	☑ Open Data ☑Open Material ☑Preregistered	☑ Own data collection →URL osf.io/as1cd ☐ Archival data	• Designed study • Wrote manuscript

Dougherty, M. R., Slevc, L. R., & Grand, J. (2018, February 2). Retrieved from psyarxiv.com/48qux

Funders: Add „Public data sets“ as a section to CV templates

Extra cost for funders	**None** (add a few sentences to guidelines)
Extra cost for reviewers	**None** (take information into consideration)
Extra cost for researchers	**~5 min.**

DFG

1.1 Publications list as part of the academic curriculum vitae:

- must be included for each applicant,
- need not directly relate to the proposed project,
- must include up to ten of the most important publications for each applicant,

Suggestion:

„Publications list must include a section with up to 5 of the most impactful public data sets that an applicant provides, the number of reuses, and a one-sentence statement about each data set's specific impact.“

http://www.dfg.de/formulare/1_91/1_91_en.pdf

Funders: Require Transparency and Openness (TOP) statement in final reports

Extra cost for funders	**None** (add a few sentences to guidelines)
Extra cost for reviewers	**None** (take information into consideration)
Extra cost for researchers	**~5 min.**

Are the relevant data from the funded project accessible in an open repository?	
Yes	Provide a persistent, unique identifier and any required instructions
No	Provide justification (short free text)
Not applicable	Provide explanation (short free text)

Have you cited any previously generated data used in this project?
Yes
No
Not applicable

1. Disclose →
2. Require →
3. Verify

Aalbersberg, I. J., Appleyard, T., Brookhart, S., Carpenter, T., Clarke, M.,... Vazire, S. (2018, February 15). Making Science Transparent By Default; Introducing the TOP Statement. Retrieved from osf.io/sm78t; See also https://osf.io/n9mrh/

More things on the roadmap

- Ensure policy translation to practice
  - Open Science Officer (cf. women's officer) who takes care that policies are actually implemented, for example in job committees (HT QUEST@BIHealth, Ulrich Dirnagl
  - Verify preregistrations, open data, open code
- Better science means slower science (both on author side and editor/reviewer's side)

10 easy steps to increase your openness

see also http://www.osc.uni-muenchen.de/toolbox/index.html

1. **Create an account on OSF** (http://osf.io/)
2. **Upload the material for an existing study** (e.g., questionnaires, protocols, maybe reproducible analysis scripts) to an OSF project.
3. Prior to publication, **add an open license to all of your figures** (so that you can reuse them in later publications, blog posts,, or presentations: ,,Figure available under a CC-BY4.0 license at osf.io/XXXX."
4. For the next project: **Change the consent forms** in a way that **open data** would be possible for that project (see https://osf.io/mgwk8/wiki/Consent%20form%20templates%20for%20open%20data/).
5. **Sign the PRO initiative** and expect openness (or a justification why not) if you review another paper (https://opennessinitiative.org/)
6. For the next data analysis: Practice to create **scripts for reproducible data analysis** (e.g., SPSS syntax, R scripts). All analytic steps that lead from raw data to the final results should be reproducible.
7. **Let a master student preregister his/her thesis**. Can be either a ,,local preregisteration", or a proper preregistration at OSF or at https://aspredicted.org/. See this workshop material for how to do a preregistration: https://osf.io/yd487/, https://osf.io/mx7yp/
8. **Do you own first preregistration**; enter the Prereg challenge and get 1000$: https://cos.io/prereg/
9. **Publish your first open data set**: Ensure anonymity, provide a codebook. See here for details: http://econtent.hogrefe.com/doi/pdf/10.1026/0033-3042/a000341
10. Team up with colleagues and **establish a local open science initiative**