



# Open science and Pre-registration

SIPPS 2022  
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# What is open science?

*movement to make scientific research, data, and dissemination open to all levels of an inquiring society*



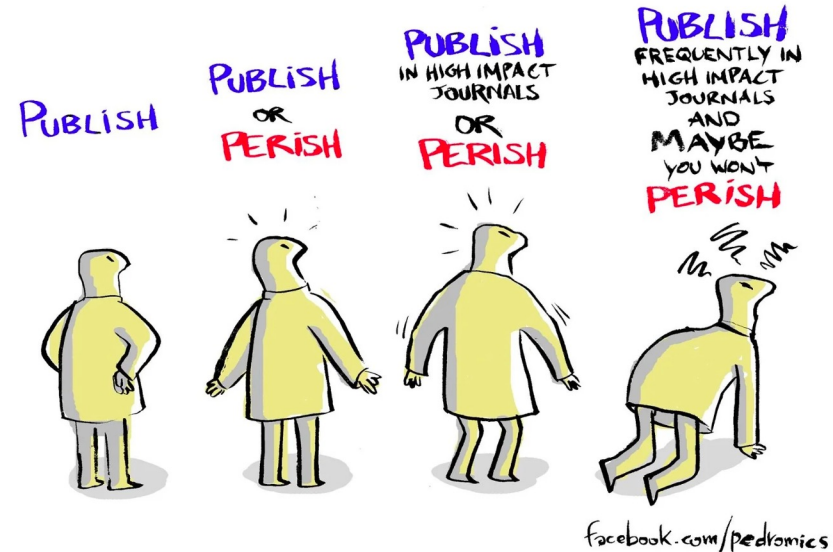
# Why did the open science movement start?

- Academic incentive structures to “publish or perish”
  - Plus tendency for journals to publish “positive” results

# Academic incentive structures

- Published work is important for
  - Getting a job
  - Getting tenure
  - Being awarded grants
  - Being viewed favorably in the field
- “Rat race” culture develops
  - Trying to publish as much as you can
- Balancing desire to be truthful with to publish

## THE EVOLUTION OF ACADEMIA



... can result in researchers taking shortcuts or sometimes worse ...

# Why did the open science movement start?

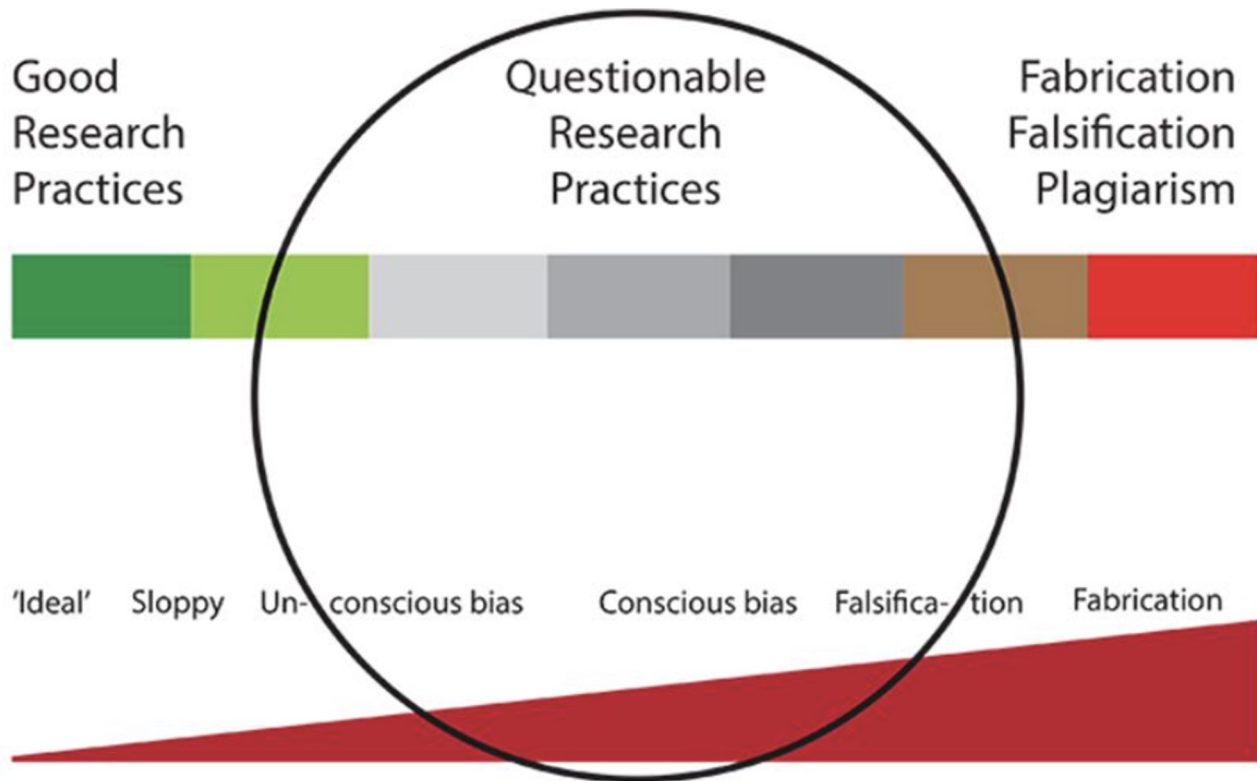
- Academic incentive structures to “publish or perish”
  - Plus tendency for journals to publish “positive” results
- Research misconduct

## **Scientific misdeeds (15%)**

- Misappropriation of ideas
- Impropriety of authorship
- Improper or misleading reporting of results
- Not disclosing ties to commercial interests

## **Scientific fraud (1-2%)**

- Fabrication
- Falsification
- Plagiarism



# Different types of bad research practices

Peeking at the data as  
you're collecting it and  
stopping when the results  
are significant





# Different types of bad research practices

Excluding participants for various reasons (i.e. performance) until an effect is significant



# Different types of bad research practices

Hypothesizing after results are known (HARKing)



# Different types of bad research practices

Garden of forking paths:  
Issues arise when you  
report the analysis that  
best fits the hypothesis  
as strong evidence



# Research misconduct

## Andrew Wakefield and the MMR vaccine



### THE

The Lancet, Volume 35  
doi:10.1016/S0140-

This article was re

### RETRACTED pervasive

Dr [AJ Wakefield](#) FRCP  
MRCPath [a](#), [MA Thor](#)

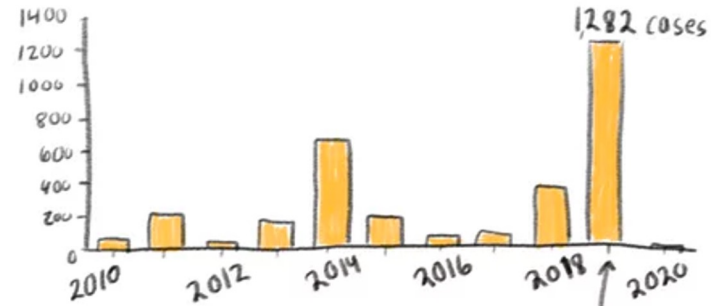
### Summary

**Background**  
We investigated a c

**Methods**  
12 children (mean a  
followed by loss of a  
neurological, and de  
(MRI), electroencep  
Biochemical. haema

Measles outbreaks in New York and California lead those two states to prohibit all religious and philosophical exemptions to vaccines.

# of measles cases reported by year



credit: CDC

s, and

FRCPsych [s](#), [AP Dhillon](#)

mal development  
nterological,  
ic-resonance imaging  
done where possible.

# Why did the open science movement start?

- Academic incentive structures to “publish or perish”
  - Plus tendency for journals to publish “positive” results
- Research misconduct
- Lack of replication in results

# Lack of replication

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## HALF OF CANCER STUDIES FAIL HIGH-PROFILE REPLICATION TEST

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Barriers to reproducing preclinical results included unhelpful author communication.

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Article | [Published: 20 May 2020](#)

### Variability in the analysis of a single neuroimaging dataset by many teams

[Rotem Botvinik-Nezer](#), [Felix Holzmeister](#), ... [Tom Schonberg](#)  [+ Show authors](#)

[Nature](#) 582, 84–88 (2020) | [Cite this article](#)

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Believe it or not: how much can we rely on published data on potential drug targets?

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*Florian Prinz, Thomas Schlange and Khusru Asadullah*

### Replication, falsification, and the crisis of confidence in social psychology

*Brian D. Earp<sup>1,2\*</sup> and David Trafimow<sup>3</sup>*

# Is there really a replication “crisis”?

- Unknown differences between studies
  - Sample or design specific reasons for non-replication
  - Boundary effects
  - Quality differences
- Researchers cherry pick studies due to a personal / intellectual ax to grind
- Exploratory research is important for scientific discovery
- Scientific literature is not made up of one study, it is an overall body of work
- Science is naturally self-correcting

# Open science as a proposed solution







- Pre-registration
- Share study materials
- Deposit data and analysis scripts

# What is preregistration?

- Specify your research plan in advance of your study
- Submit plan to a registry
- Separates hypothesis-generating (exploratory) from hypothesis-testing (confirmatory) research
  - Both are important in science



# Forms of preregistration

Input requirements

**Open-Ended Registration:** no requirements. You will be asked to write a summary description of the project.

**OSF-Standard Pre-Data Collection Registration:** Questions: 1. Data already collected? 2. have you already looked at data?

**AsPredicted.org:** Online input mask with 9 questions: hypothesis; dependent variables; conditions; Data analysis; outliers & exclusion criteria; sample size (power analysis); type of study

**OSF Preregistration:** 25 subject areas that need to be answered. Preregistration Prize (\$1,000 prize, by December 31, 2018)

**Registered Report:** Preregistration is reviewed via a journal (peer-review process) and labelled with "IPA" (in-principle acceptance). If the study is carried out correctly, it is guaranteed that it will be published, regardless of the result. (see also <https://cos.io/rr>).

125 journals already participate: [https://docs.google.com/spreadsheets/d/1D4\\_k-8C\\_UENTRtbPzXfhjEyu3BfLxdOsn9j-otrO870/edit#gid=0](https://docs.google.com/spreadsheets/d/1D4_k-8C_UENTRtbPzXfhjEyu3BfLxdOsn9j-otrO870/edit#gid=0)

Preregistration Templates: <https://osf.io/zab38/wiki/home/>

# Pre-prints as a way to get science out faster

- Anyone can post a pre-print of work that is “finished” but not yet peer-reviewed
- Helps facilitate rapid dissemination of research



bioRxiv

# Open science or #bropen science?

Amy Cuddy's work on the power pose



- Study limitations
  - Psychophysiology portions of study didn't replicate
  - Possible p-hacking as shown by p-curves?
- Online vigilantes attacked career, income, ambition, characterize, and intelligence
- Gave up on getting tenure

# Open science or #bropen science?

Roxanne Felig (PhD student) published a paper ... and got attacked by mostly White men.



**Nick Brown**

@sTeamTraen

Follow

🇬🇧 🇮🇹 🇪🇺 in 🇪🇸. PhD in psychology & self-appointed data police cadet.

Interested in the lower tail of many distributions. Not yet disabled.



**Nick Brown** @sTeamTraen · Nov 9, 2021

It's 2021 and social psychologists are still publishing papers like this: Women wearing not much clothing on a night out don't get cold because they believe that they "look hot" (geddit?) 🤔🙄🙄  
@EJWagenmakers @RolfZwaan @lakens twitter.com/LivEchonevs/st...

The moderation model was significant,  $F(4,181) = 2.91$ ,  $R = .25$ ,  $R^2 = .06$ ,  $p = .02$ , supporting our hypothesis (See Figure 2). Whereas skin exposure ( $p = .16$ ), and self-objectification ( $p = .93$ ) were not significant predictors of feeling cold, the interaction between skin exposure and self-objectification was significant,  $b = -.11$ ,  $t(181) = -2.11$ ,  $p = .04$ , 95% CI  $[-0.22, -0.01]$ , and the addition of the interaction term was a significant change to the model,  $F(1,181) = 4.46$ ,  $p = .04$ ,  $\Delta R^2 = .02$  (Table 2). A simple slopes analysis shows that at one standard deviation below the mean level of self-objectification (in this case 0.94 units below the mean of 3.75) the relationship between skin exposure and how cold women report feeling was positive and significant,  $b = .18$ ,  $t(181) = 2.47$ ,  $p = .01$ , 95% CI  $[0.04, 0.32]$ , indicating that for women low in self-objectification, as amount of skin exposure increased, they reported feeling colder. This relationship tapered off and was no longer significant for the mean level of self-objectification,  $b = .07$ ,  $t(181) = 1.40$ ,  $p = .16$ , 95% CI  $[-0.03, 0.18]$ , and as predicted, for women one standard deviation above the mean level of self-objectification, there was no relationship between skin exposure and feeling cold,  $b = -.03$ ,  $t(181) = -0.43$ ,  $p = .67$ , 95% CI  $[-0.18, 0.11]$ .

Examining the Johnson-Neyman significance regions, the positive relationship between skin exposure on perception of coldness is significant only for women who scored a 3.43 or lower on the measure of self-objectification, which corresponds to .32 units below the average level of self-objectification,  $b = .11$ ,  $t(181) = 1.97$ ,  $p = .05$ , 95% CI  $[0.00, 0.22]$  (Figure 3). These results suggest that only women low in self-

# #Bropen science article

- Take 10 min to skim the following article and take a few notes that stand out the most to you: <https://thepsychologist.bps.org.uk/volume-33/november-2020/bropenscience-broken-science>
- Discuss as a group

# #bropenscience is broken science

- Vigilantism
- Problematic
  - Condesce
  - Aggressiv
  - Lacking ki
- More likely to
  - Male, Whit
- Targets often

“PSYCHOLOGICAL SCIENCE, AS PRACTICED IN THE UNITED STATES, WAS BUILT BY, FOR, AND ABOUT WHITE, AFFLUENT, MALE PEOPLE AND THEIR PERSPECTIVES.”

-  
LEDGERWOOD ET AL., 2021

groups  
al, English-speaking  
men researchers



# Is open science promoting diversity, equity, and inclusivity in science?

- Increased access to data and research tools
- Value in transparency, but comes at a cost
- Imposes impractical constraints
- Open science movement seems to work better for some than others
- Reflection of societal power structures and privileges
- Complications arise when working with sensitive populations
- Difficult to practice with qualitative data
- Online vigilantism often targeting people who have less power (women, POC)
- Open science badges ranking and monitoring researchers

# Thank you!

- Thank you to Anna Vannucci and Hannah Tarder-Stoll for their contributions on these slides!