Lecture 3 - The reform movement in psychological science

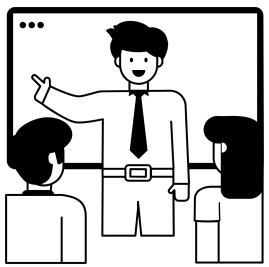
The Social Brain: Critical Perspectives on Science, Society and Neurodiversity

Richard Ramsey

Today

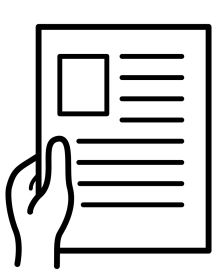
Part 1

- The reform movement in psychological science



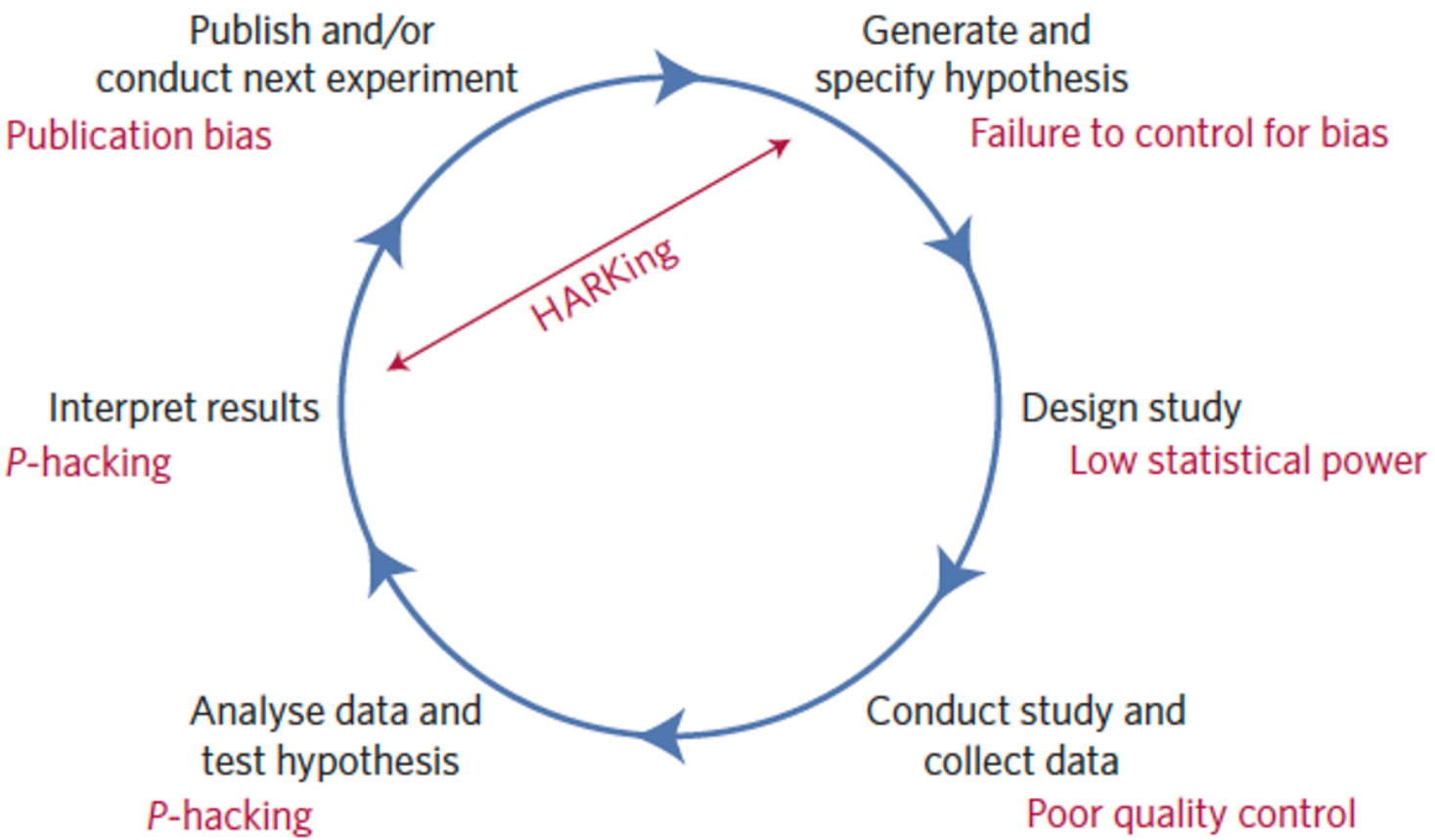
Part 2

- Read articles and discuss



Recap last week

Where are we now?



Is psychological science in a crisis?

> Crisis implies we are at a loss for solutions, when in fact we have identified many ways to improve science's credibility

Simine Vazire (2018)

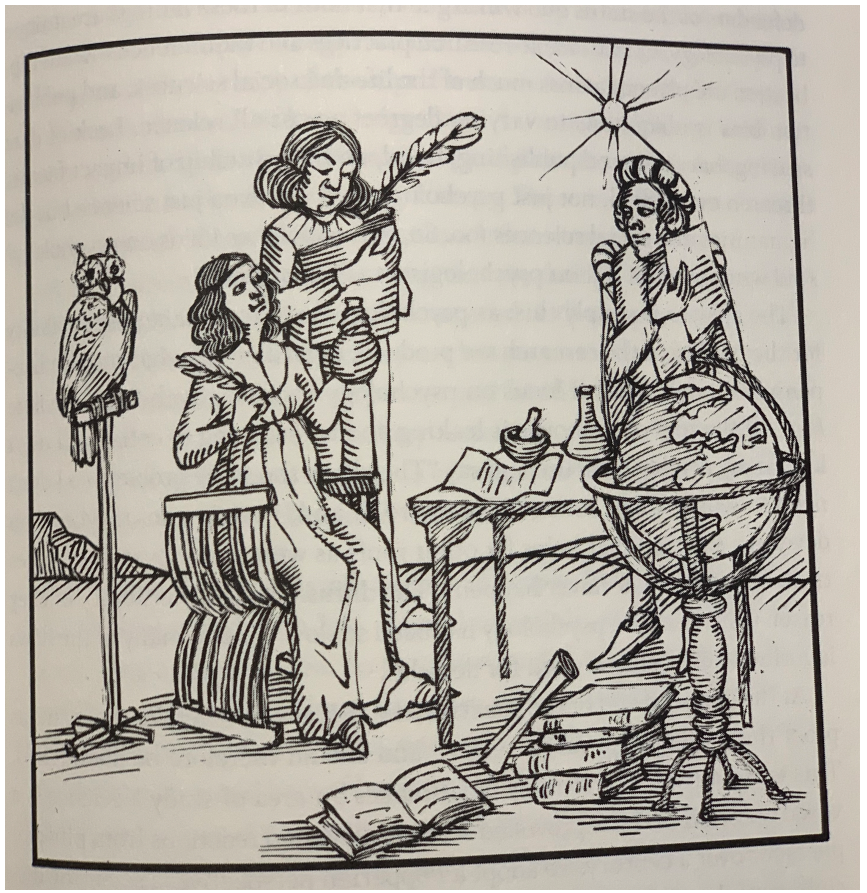
What is the reform movement?

What is the reform movement?

- At a broad level, it is a response to the replication crisis, which involves a group of academics and organisations that aim to improve the quality of psychological science. There are too many to mention, so I'll just outline one to give you the general idea.
- Society for the Improvement of Psychological Science (SIPS) https://improvingpsych.org/

SIPS

Redemption



> The method of science, as stodgy and grumpy as it may seem, is far more important than the findings of science.

Carl Sagan, 1995

Redemption

Solving the Sins of…

- Bias and Hidden Flexibility
- Unreliability
- Data Hoarding
- Corruptibility
- Internment
- Bean Counting

Solving the Sins of Bias and Hidden Flexibility

- Biases:
  - confirmation bias
  - publication bias
  - hindsight bias
- Hidden flexibility: p-hacking until something turns up
- Solution: pre-registration and Registered Reports.

Solving Bias and Hidden Flexibility

Normal publishing cycle:

- Do all the work first (plan, data collection, analysis, write-up) and **THEN** submit to a journal

Peer review happens here at the en

Solving Bias and Hidden Flexibility

Pre-registration is different:

- You first write down and publish in a time-stamped manner **EXACTLY** what you are going to do. Then you do it.

Solving Bias and Hidden Flexibility

- An example of pre-registration from my lab https://aspredicted.org/uh5m5.pdf
- And the subsequently published paper.

Solving Bias and Hidden Flexibility

Pre-registration

AsPredicted

Wharton Credibility Lab, University of Pennsylvania

Body size and trait judgements under cognitive load (#29294)

Created: 10/16/2019 07:09 AM (PT)
Public: 09/05/2023 02:56 AM (PT)

Author(s)
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1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
Higher cognitive load will increase the link between trait-based character judgements and body-size judgements, as indexed by a reaction time difference between compatible and incompatible trials.

3) Describe the key dependent variable(s) specifying how they will be measured.
Participants will categorise visually presented images of bodies as either slim or overweight and reaction time and accuracy data will be collected. These body-size judgments will be situated within an interference paradigm, which pairs bodies of different sizes (slim or overweight) with compatible or incompatible trait adjectives relating to either health or extraversion. The interference score (incompatible minus compatible) will be calculated for reaction time.

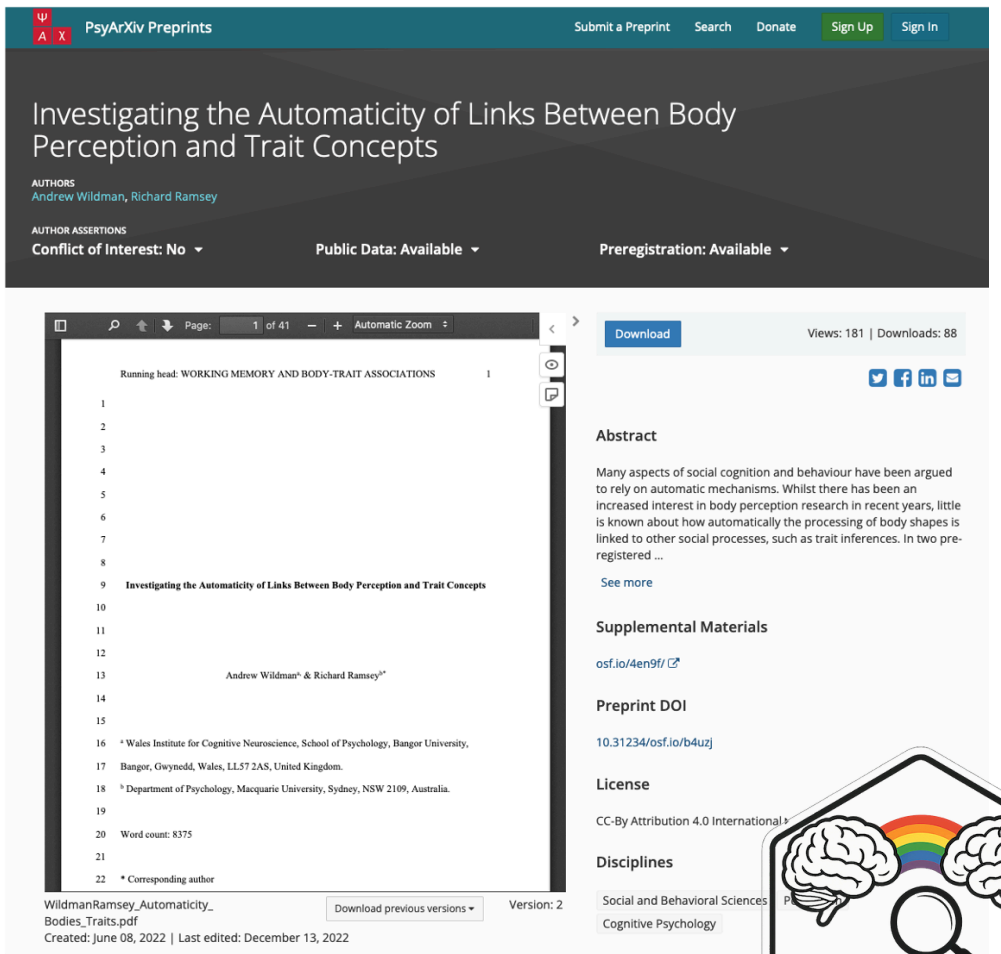
4) How many and which conditions will participants be assigned to?
8 within-participant conditions: Slim or overweight body, compatible or incompatible trait, and high or low cognitive load.

The load manipulation will involve holding either 1 (low load) or 6 letters (high load) in memory while performing the main task.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Based on the compatibility factor, a reaction time interference score (incompatible minus compatible) will be calculated for each of four conditions (both levels of body size and cognitive load). This will be analysed using a 2 (Body Size: Slim, Overweight) x 2 (Load: Low, High) repeated measures ANOVA. We hypothesise that higher cognitive load will increase the compatibility effect for both body sizes, and therefore expect a main effect of Load. If cognitive load has differential effects on the two body sizes, we would expect a Load*Body Size interaction.

In addition to the ANOVA, we will also calculate point and interval estimates for our main effects of interest, which are the interference effects at each level of the design. To do so, we will report the size of the group-average mean difference and associated 95% confidence interval. We will also report the standardised effect size using Cohen's dz.

Pre-print



Solving Bias and Hidden Flexibility

Registered Reports are even better:

Stage 1 Peer Review

In-principle acceptance

(the paper is accepted **BEFORE** data collection)

Stage 2 Peer Review

Reviewers evaluate whether the stated protocol was followed and if the conclusions are warranted

Solving Bias and Hidden Flexibility

Stage 1 Review:

- The significance of the research questions
- The logic, rationale, plausibility of the proposed hypotheses.
- The soundness and feasibility of the methodology and analaysis pipeline (including statistical power analysis).
- Whether clarity and degree of methodological detail would be sufficient to replicate exactly the proposed experimental procedures and analysis pipeline.
- Whether the authors provide a sufficiently clear and detailed description of the methods to prevent undisclosed flexibility in the experimental procedures or analysis pipeline.
- Whether the authors have considered sufficient outcome-neutral conditions (e.g. absence of floor or ceiling effects; positive controls) for ensuring that the results are able to test the stated hypotheses.

Solving Bias and Hidden Flexibility

Stage 2 Review:

- Whether the data are able to test the authors' proposed hypotheses by passing the approved outcome-neutral criteria (such as absence of floor or ceiling effects).
- Whether the introduction, rationale and stated hypotheses are the same as the approved Stage 1 submission (required).
- Whether the authors adhered precisely to the registered experimental procedures
- Whether any unregistered post hoc analyses added by the authors are justified, methodologically sound, and informative.
- Whether the authors' conclusions are justified given the data

Solving the Sin of Unreliability

Unreliability: lack of replication, lack of power, vague and nonreplicable methods, misuse of statistics, failure to retract papers.

Solutions:

- Registered Reports
- Reproducibility Index
- Pottery Barn rule by journals and funders
- Regular multi-centre replication initiatives

Solving the Sin of Data Hoarding

Data hoarding: a widespread lack of data sharing

Solutions:

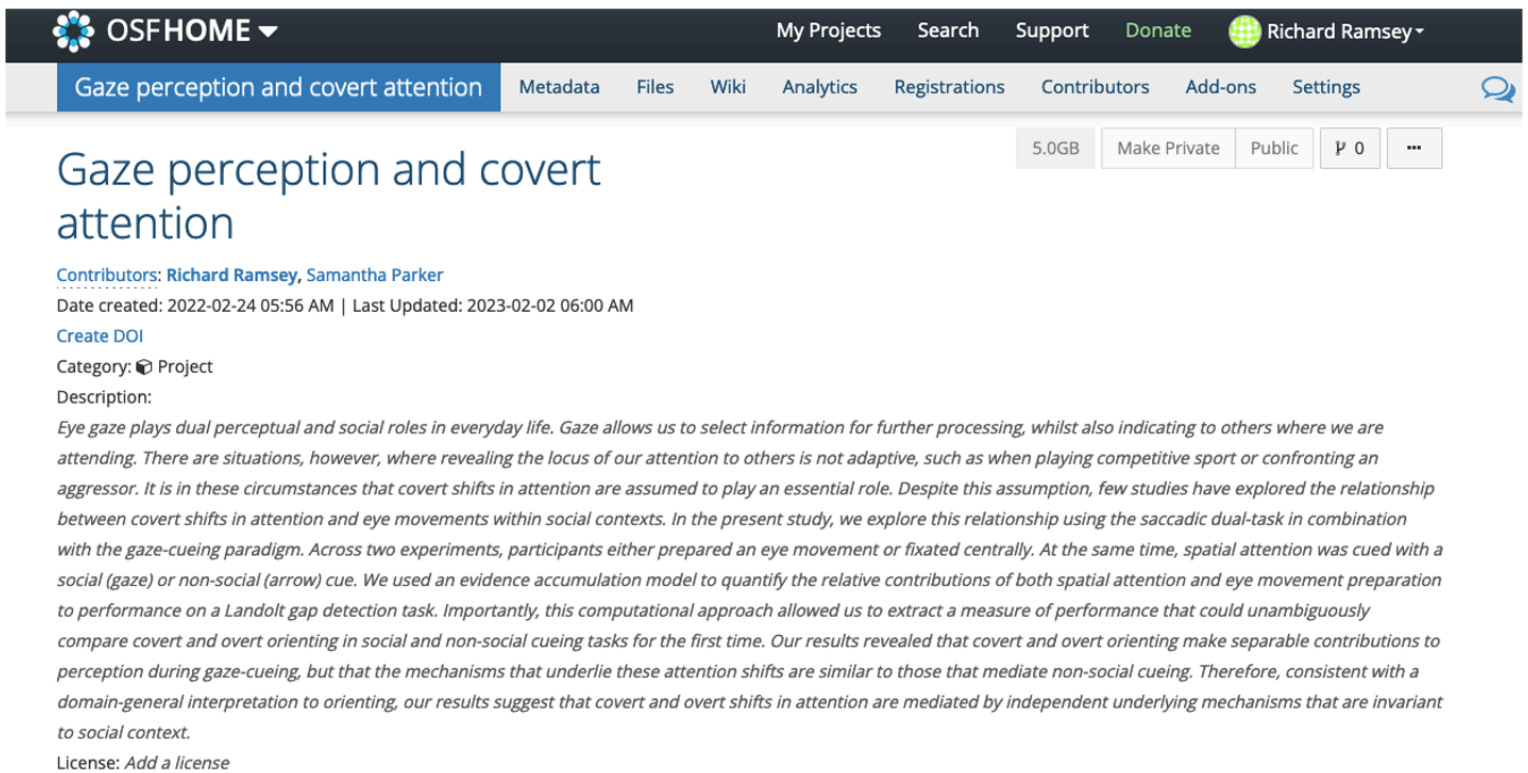
- Peer Reviewers' Openness (PRO) initiative (https://www.opennessinitiative.org/)
- Transparency and Openness Promotion (TOP) guidelines (https://www.cos.io/initiatives/top-guidelines)
- Centre for Open Science is a very useful platform (https://youtu.be/9YuNGB3vNOw)
- Git and GitHub (and other version control systems and code repositories)

TOP guidelines

	Not Implemented	Level I	Level II	Level III
Citation Standards	No mention of data citation.	Journal describes citation of data in guidelines to authors with clear rules and examples.	Article provides appropriate citation for data and materials used consistent with journal's author guidelines.	Article is not published until providing appropriate citation for data and materials following journal's author guidelines.
Data Transparency	Journal encourages data sharing, or says nothing.	Article states whether data are available, and, if so, where to access them.	Data must be posted to a trusted repository. Exceptions must be identified at article submission.	Data must be posted to a trusted repository, and reported analyses will be reproduced independently prior to publication.
Analytic Methods (Code) Transparency	Journal encourages code sharing, or says nothing.	Article states whether code is available, and, if so, where to access it.	Code must be posted to a trusted repository. Exceptions must be identified at article submission.	Code must be posted to a trusted repository, and reported analyses will be reproduced independently prior to publication.
Research Materials Transparency	Journal encourages materials sharing, or says nothing.	Article states whether materials are available, and, if so, where to access them.	Materials must be posted to a trusted repository. Exceptions must be identified at article submission.	Materials must be posted to a trusted repository, and reported analyses will be reproduced independently prior to publication.
Design and Analysis Transparency	Journal encourages design and analysis transparency, or says nothing.	Journal articulates design transparency standards.	Journal requires adherence to design transparency standards for review and publication.	Journal requires and enforces adherence to design transparency standards for review and publication.
Study Preregistration	Journal says nothing.	Article states whether preregistration of study exists, and, if so, where to access it.	Article states whether preregistration of study exists, and, if so, allows journal access during peer review for verification.	Journal requires preregistration of studies and provides link and badge in article to meeting requirements.
Analysis Plan Preregistration	Journal says nothing.	Article states whether preregistration of study exists, and, if so, where to access it.	Article states whether preregistration with analysis plan exists, and, if so, allows journal access during peer review for verification.	Journal requires preregistration of studies with analysis plans and provides link and badge in article to meeting requirements.
Replication	Journal discourages submission of replication studies, or says nothing.	Journal encourages submission of replication studies.	Journal encourages submission of replication studies and conducts results blind review.	Journal uses Registered Reports as a submission option for replication studies with peer review prior to observing the study outcomes.

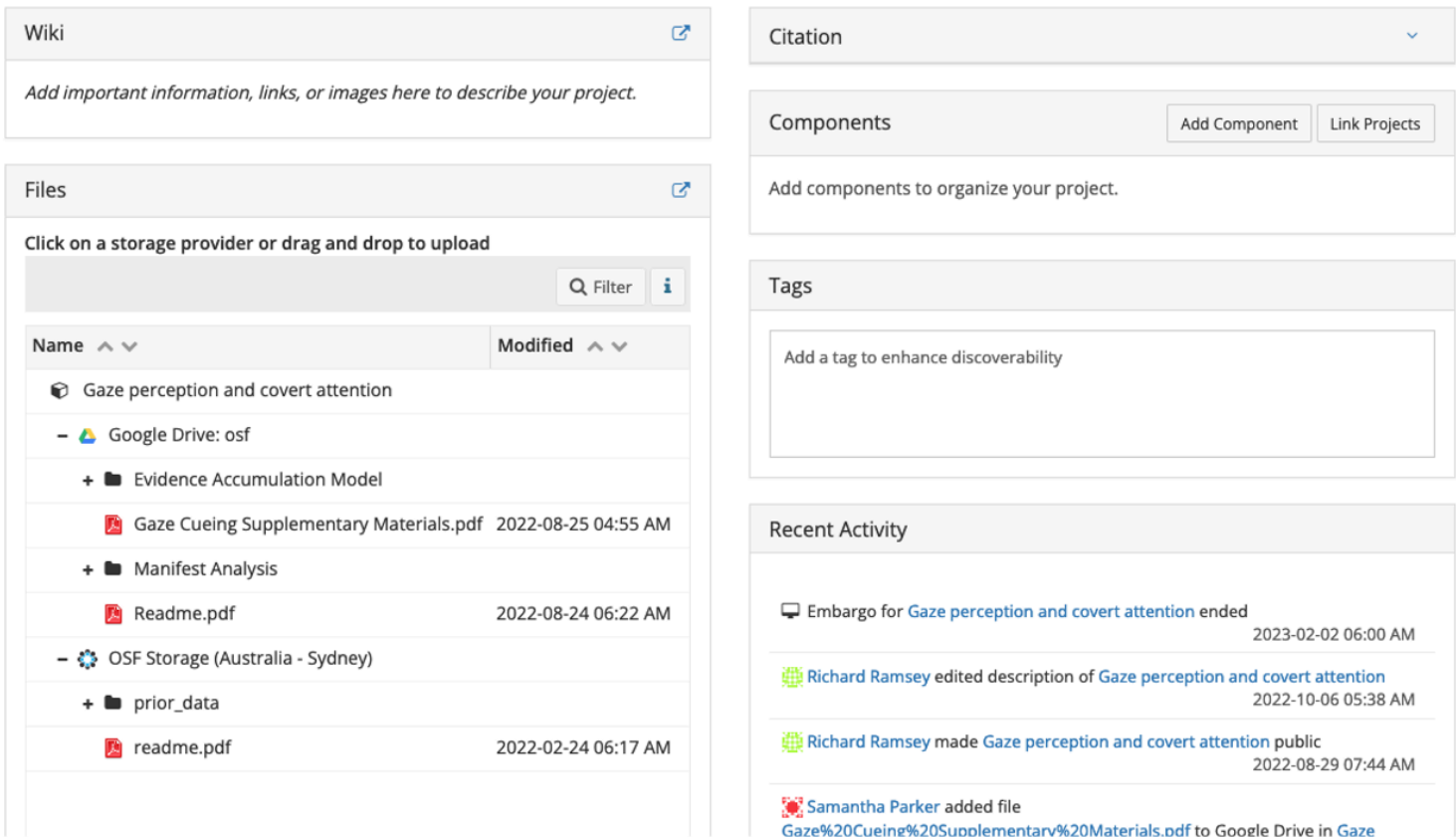
Solving the Sin of Data Hoarding

Open Science Framework



Solving the Sin of Data Hoarding

Open Science Framework



Solving the Sin of Data Hoarding

Git and GitHub


The Social Brain

Solving the Sin of Corruptibility

Fraud

Solutions:

- Required data and code sharing
- Data audits and “data detectives”
- Profiling researchers (not sure about this one!)
- Criminalisation of academic fraud
- Protection and support of whistle-blowers

Solving the Sin of Corruptibility

A recent example

Solving the Sin of Corruptibility

A recent example

Solving the Sin of Internment

Internment: research is “published” behind paywalls making it inaccessible to the public.

Solutions:

- Open Access (OA) publishing by governments and funders
- Alternative publishing models (that side-step traditional journals) and which may be run by university libraries.
- Dorothy Bishop writing in the Guardian newspaper

Solving the Sin of Bean Counting

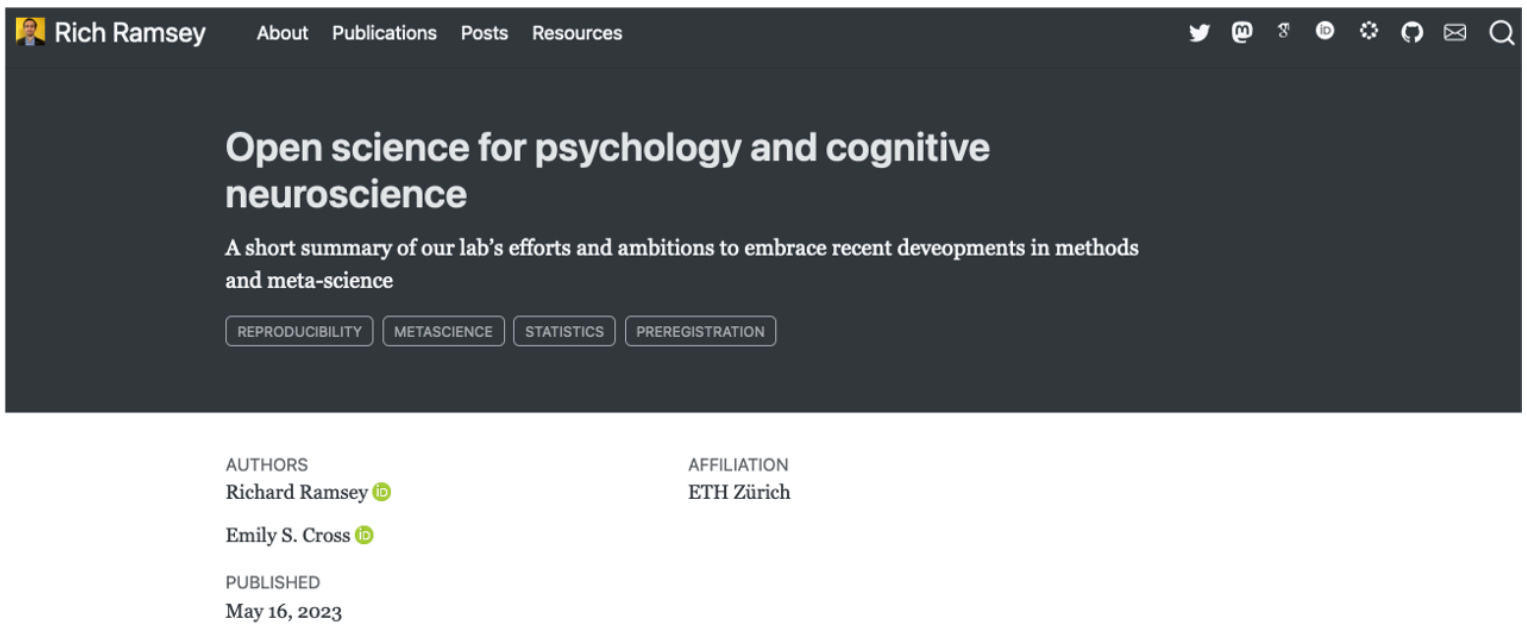
Bean counting: an obsession with superficial metrics to evaluate science and scientists

Solutions:

- Formal CRediT system (rather than opague authorship order). https://credit.niso.org/
- More generally, new hiring and promotion guidelines are **BADLY** needed

Solutions that my lab has been trying

- See my blog post on open science here.



A list of resources

- Useful resources can be found here.

Resources

Here is a list of useful resources that my lab has used in the last 5 years. These mainly focus on ways that we can try to improve the quality and transparency of scientific workflows.

Things to read

This selection of journal papers and books provides a brief overview to Open Science and meta-science in general. Together, they motivate why the resources below have become an essential component to my lab's research.

- Journal articles
  - False positive psychology: 2011
  - Scientific Utopia: 2012
  - Estimating reproducibility in psychology: 2015
  - A manifesto for reproducible science: 2017
  - Psychology's Renaissance: 2018
  - Implications for scientific practice: 2018
  - Replicability, Robustness, and Reproducibility in Psychological Science: 2022
- Books
  - The Seven Deadly Sins of Psychology: 2017
  - Science Fictions: 2021

Summary

We need saving from ourselves

- Each belt, shackle and guard may represent:
  - Pre-registration.
  - Statistical power and sample size.
  - Replication.
  - Meta-analysis.
  - Open data, materials and code.
  - Pre-prints.
  - Making more modest claims.

> The first principle is that you must not fool yourself - and you are the easiest person to fool

Richard Feynman (1974)

Scientific reform is difficult

It is overwhelming

Changing behaviour is hard

Take a break

Part 2 - Read and discuss

Discussion material

- break into small groups (~ 5 per group)
- discuss aspects of the lecture: – which solutions do you consider to be most important and why?
- discuss aspects of the journal article: https://www.nature.com/articles/s41562-016-0021
  - can you think of any other solutions?
  - are there any barriers to widespread uptake?

References

Chambers, C. D. (2017). *The Seven Deadly Sins of Psychology: A Manifesto for Reforming the Culture of Scientific Practice*. Princeton University Press.

Feynman, R. P. (1974). Cargo Cult Science. *Engineering and Science*, *37*(7), 10–13.

Munafò, M. R., Nosek, B. A., Bishop, D. V. M., Button, K. S., Chambers, C. D., Percie du Sert, N., Simonsohn, U., Wagenmakers, E.-J., Ware, J. J., & Ioannidis, J. P. A. (2017). A manifesto for reproducible science. *Nature Human Behaviour*, *1*, 0021. https://doi.org/10.1038/s41562-016-0021

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