Preregistration: Increasing Reproducibility and Transparency in Biomedical Research

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http://cos.io/

Two Modes of Research

Context of Discovery	Context of Justification
Exploration	Confirmation
Data contingent	Data independent
Hypothesis generating	Hypothesis testing
Postdiction	Prediction

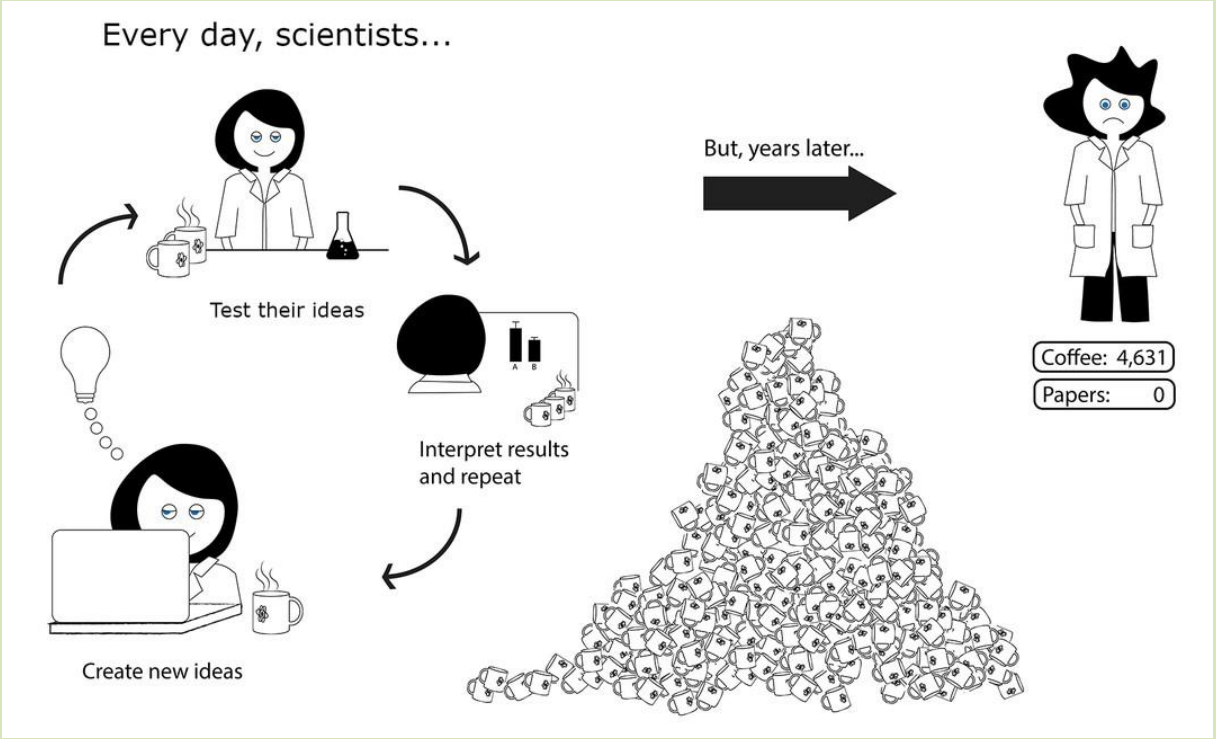
Why does it matter?

- Can lead to overconfidence in post-hoc explanations
- Inflate likelihood of believing there is evidence for a finding when there is not
- Mistaking exploratory as confirmatory *increases publishability* and *decreases credibility* of results
- Ultimately, this decreases reproducibility

Preregistration

Purposes:

1. Discoverability: Study exists



Goyal & Akin, 2017

Preregistration

Purposes:

1. Discoverability: Study exists

2. Interpretability
    1. Distinguish exploratory and confirmatory approaches
    2. Clear answers require clear questions
    3. Exploratory research is allowed and encouraged

What is preregistration?

Time-stamped, read-only version of research plan

1. Hypotheses
2. Sampling plan
3. Variables
4. Design plan
5. Analysis

Preregistration in practice

1) Changes to procedure during study
2) Many experiments
3) Program of research
4) Few a priori expectations
5) Data are pre-existing
6) Longitudinal studies; large, multivariate data
7) Assumption violations during analysis
8) Competing predictions
9) Narrative inferences and conclusions

Nosek et al, 2017; https://osf.io/2dxu5/

Changes to research during study

Deviations are common:

1) Update preregistration if outcomes not observed

2) Transparently report changes and why

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Changes to research during study

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Allows others to assess deviations and their rationale.

Nosek et al, 2017; https://osf.io/2dxu5/

Multiple experiments

Specific changes to a common procedure:

1) Preregistration as a tool to define and document changes

2) Following optimization test prediction by replicating experiment

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Provides a clear understanding of conditions necessary to obtain a result

Nosek et al, 2017; https://osf.io/2dxu5/

Program of research

Multiple different experiments:

1) Preregistration of all experiments does not necessary increase confidence

2) Challenge of multiple comparisons or selective reporting

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To achieve benefit all preregistrations and results need to be permanently preserved and accessible

Nosek et al, 2017; https://osf.io/2dxu5/

Advancing opportunity for preregistration

1) Registries
    1) Domain-specific (i.e. ClinicalTrials.gov)
    2) Domain-general (i.e. osf.io/registries)

OSF Registries

- Make registrations discoverable across all registries
- Provide tool for communities to create and manage their own registry.

https://osf.io/registries

Advancing opportunity for preregistration

1) Registries
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    2) Domain-general (i.e. osf.io/registries)
2) Education
    1) Webinars
    2) Instructional guides

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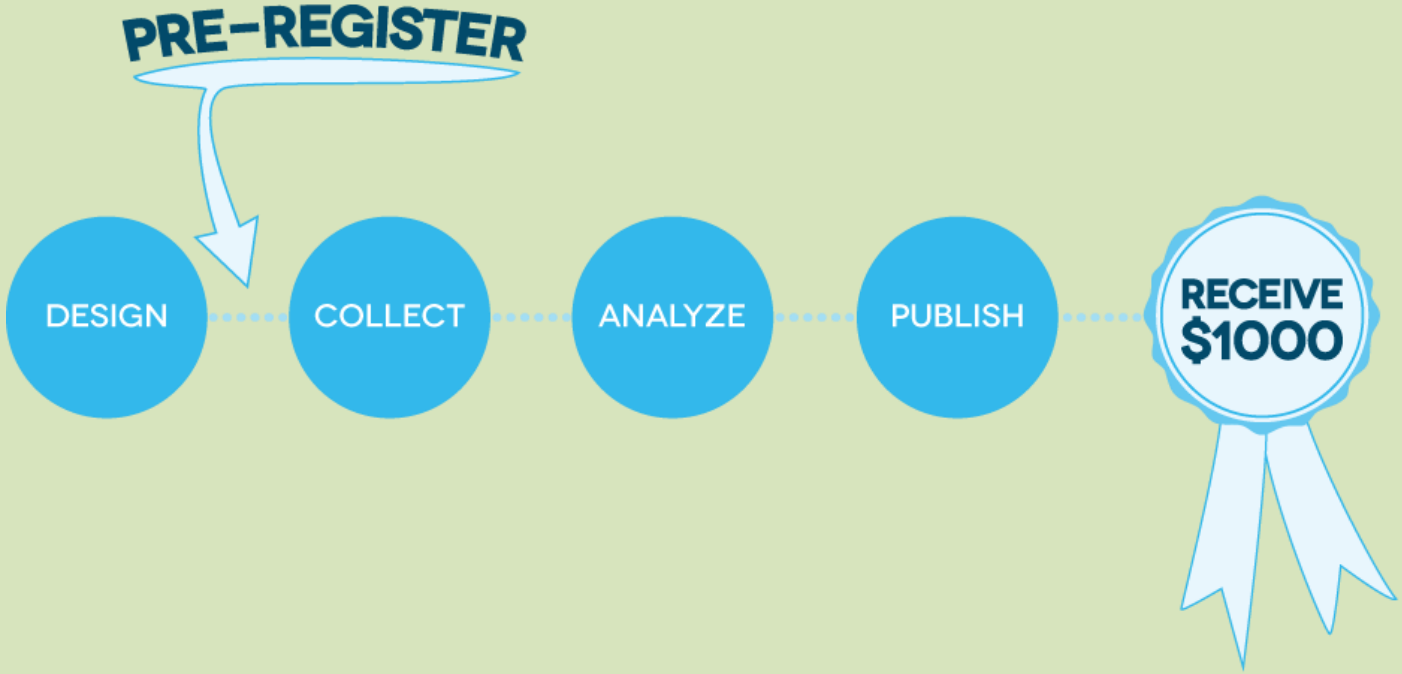
2) Education
    1) Webinars
    2) Instructional guides
3) Incentives
    1) Journal/funder policy and encouragement
    2) Awards (i.e. Preregistration Challenge)

The Preregistration Challenge



One thousand scientists will win $1,000 each for publishing the results of their preregistered research

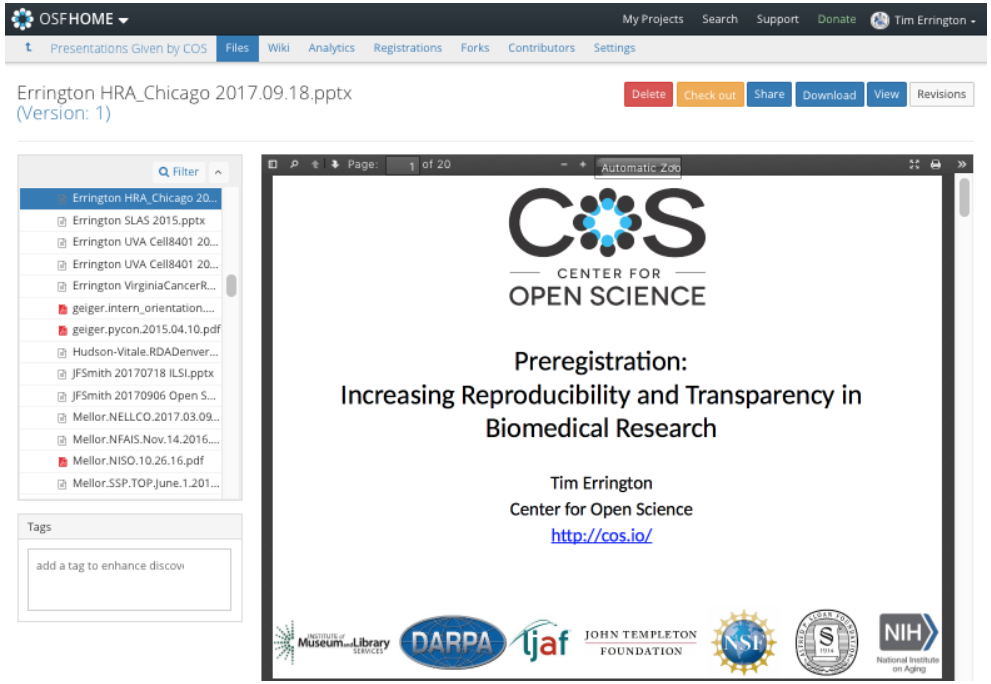
https://cos.io/prereg

What can funders do

1) Increase awareness
   - Newsletter; webinar
   - Registries; Preregistration Challenge
2) Encourage
   - Optional field in grant applications
   - As an interim research product in progress reports
3) Require
   - As a condition of distributing funds
4) Training
   - Dissertation proposals for students

Find this presentation at: **https://osf.io/29f3t/**

Contact me at: **tim@cos.io**



Questions

Interactive workshop: David Mellor

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