Preregistration: Increasing Reproducibility and Transparency in Biomedical Research

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http://cos.io/
Two Modes of Research

Context of Discovery
- Exploration
- Data contingent
- Hypothesis generating
- Postdiction

Context of Justification
- Confirmation
- Data independent
- Hypothesis testing
- 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

Every day, scientists...

Test their ideas

Interpret results and repeat

Create new ideas

But, years later...

Coffee: 4,631
Papers: 0

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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Allows others to assess deviations and their rationale.

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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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2) Following optimization test prediction by replicating experiment

Provides a clear understanding of conditions necessary to obtain a result

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

1) Preregistration of all experiments does not necessarily increase confidence

2) Challenge of multiple comparisons or selective reporting

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Program of research

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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) Education
   1) Webinars
   2) Instructional guides
Advancing opportunity for preregistration

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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/](https://osf.io/29f3t/)

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Questions

Interactive workshop: David Mellor

[cos.io/prereg](http://cos.io/prereg)