Preregistration on the Open Science Framework

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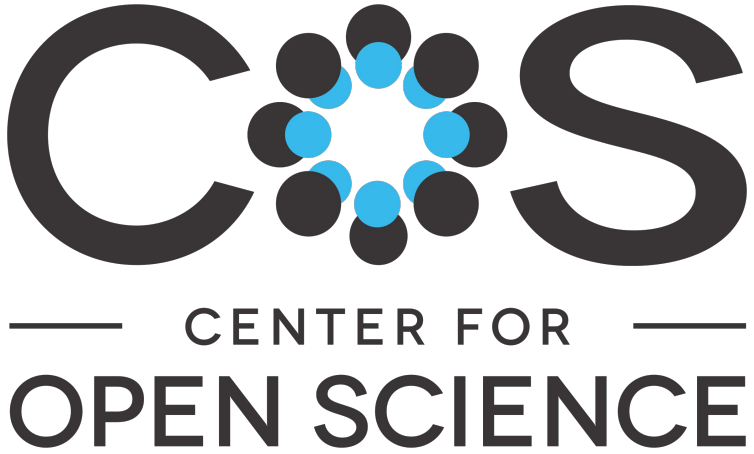

Slides available at https://osf.io/t5bzz/

Scientific Values

- Open sharing of evidence

vs.

Scientific Rewards

- Secrecy

Scientific Values vs. Scientific Rewards

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- Motivated by knowledge and discovery

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Incentives for individual success are focused on getting it published, not getting it right.

Nosek, Spies, & Motyl, 2012

The Garden of Forking Paths

“Does X affect Y?”

Gelman and Loken, 2013

The Garden of Forking Paths

Control for time?

Exclude outliers?

Median or mean?

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A time-stamped, read-only version of your research plan created before the study.

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Study plan:

- Hypothesis
- Data collection procedures
- Manipulated and measured variables

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Analysis plan:

- Statistical model
- Inference criteria

What problems does preregistration fix?

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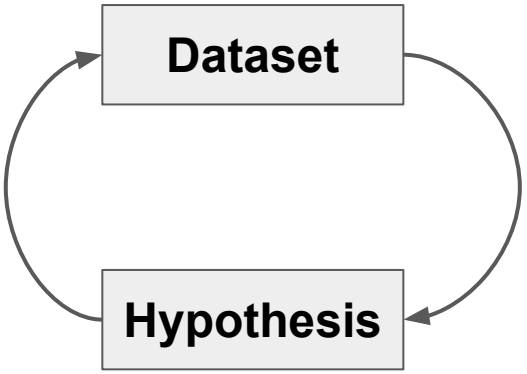
3) **HARKing**: Hypothesizing After Results are Known



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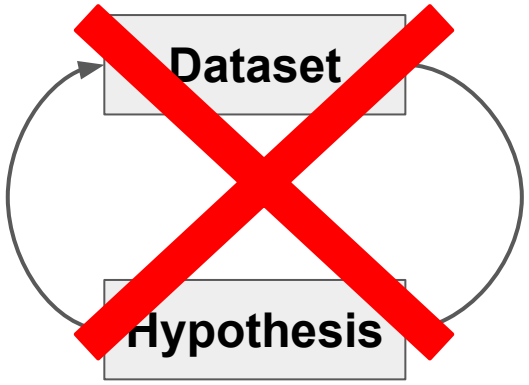

Confirmatory versus exploratory analysis

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Context of confirmation

- Traditional hypothesis testing
- Results held to the highest standards of rigor
- Goal is to minimize false positives
- P-values interpretable

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- Finds unexpected relationships
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Presenting exploratory results as confirmatory increases the publishability of results at the expense of credibility of results.

Three example workflows using preregistration

Start with the level of confidence you have in your theoretical background or a-priori expectations.

Do you have reason to predict a specific result (e.g. a difference, relationship, or interaction?)

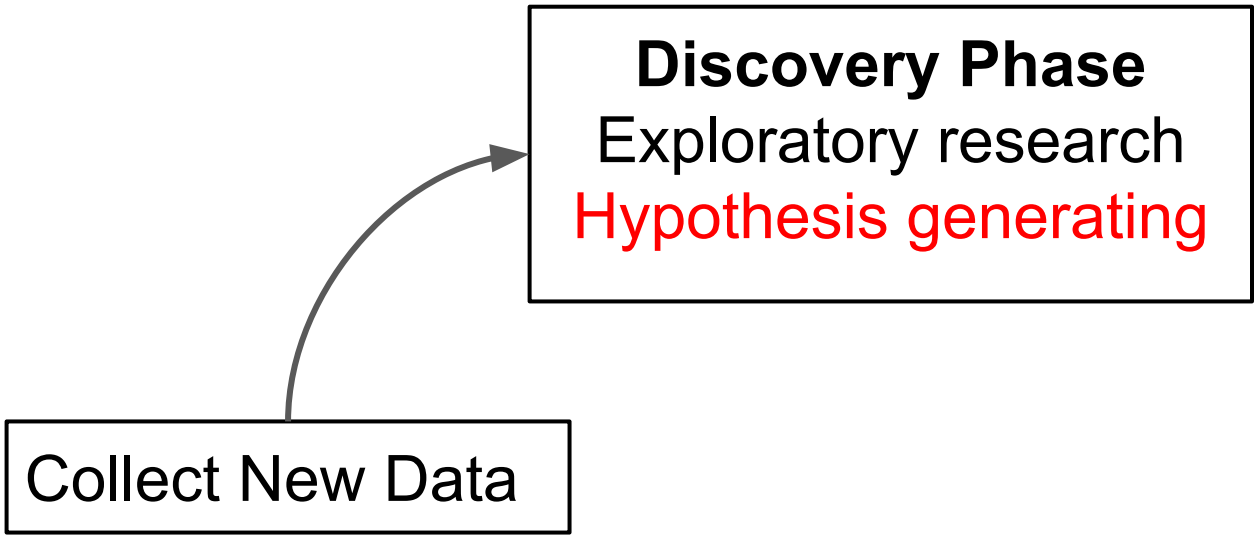
Example Workflow 1

Few a-priori expectations

Collect New Data

Example Workflow 1

Few a-priori expectations



Example Workflow 1

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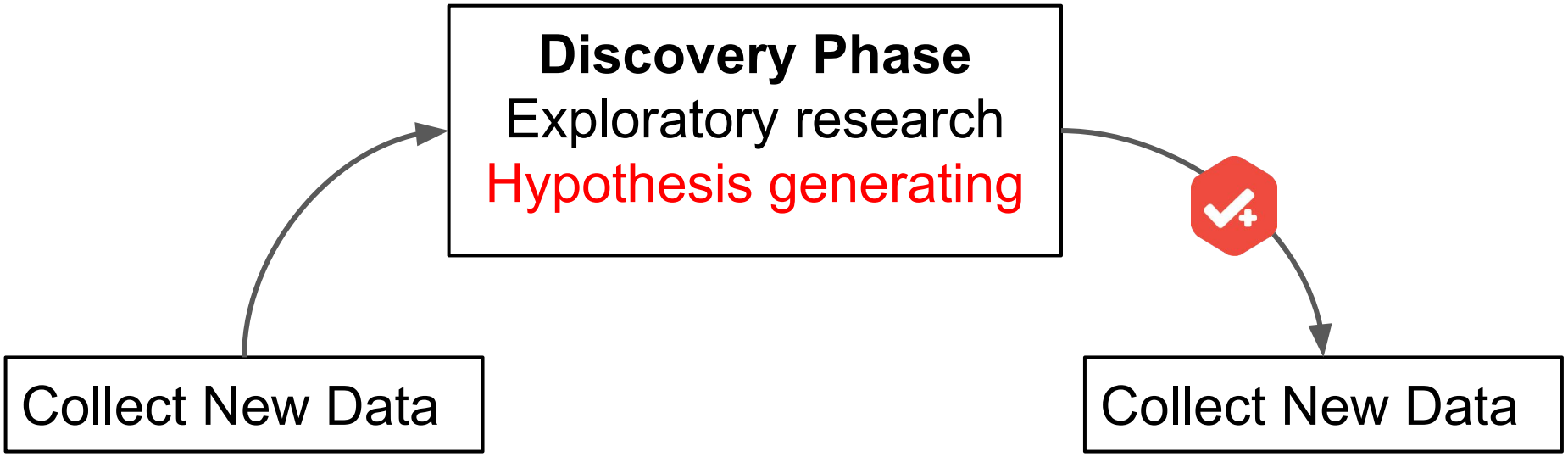

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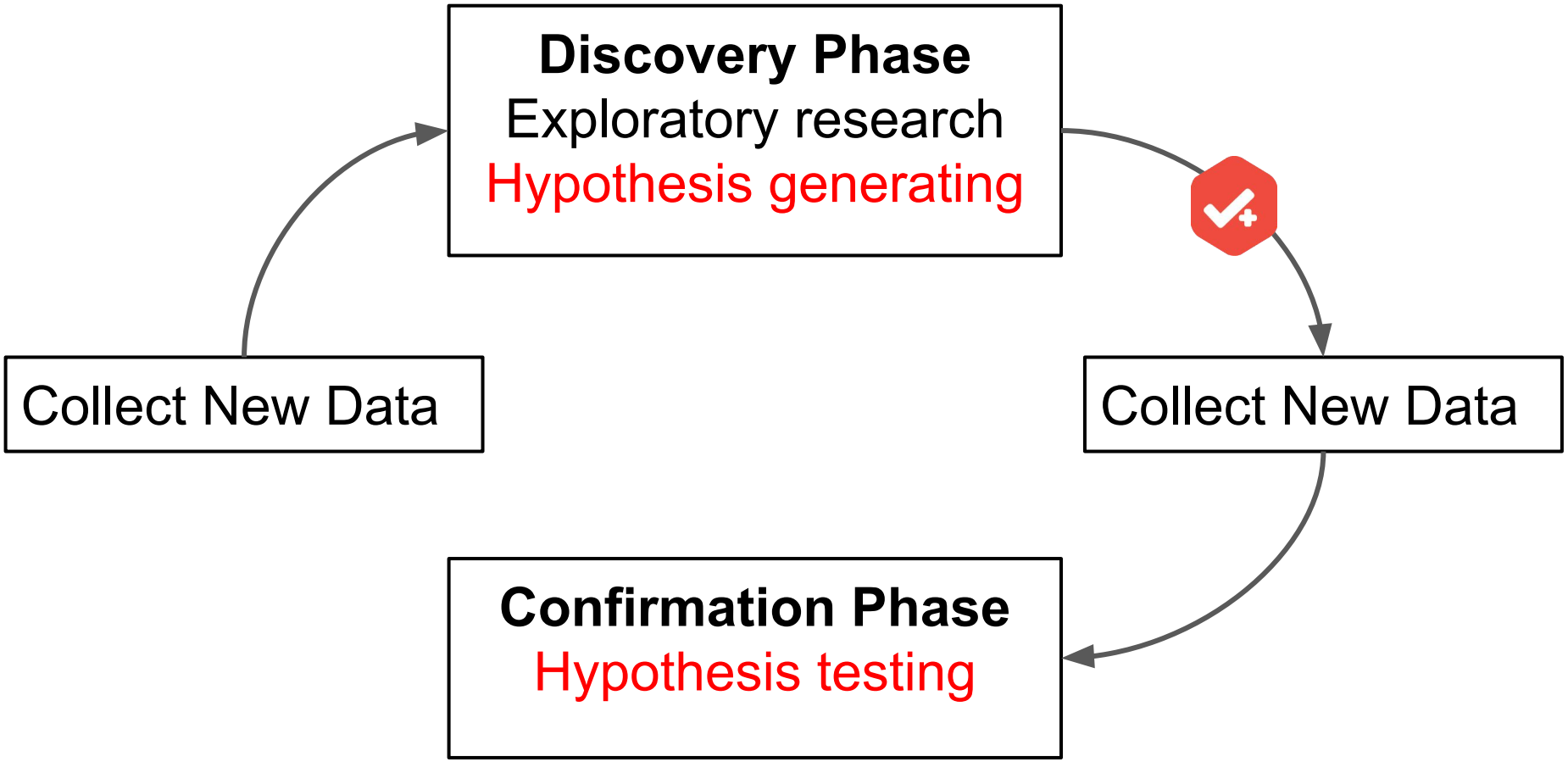

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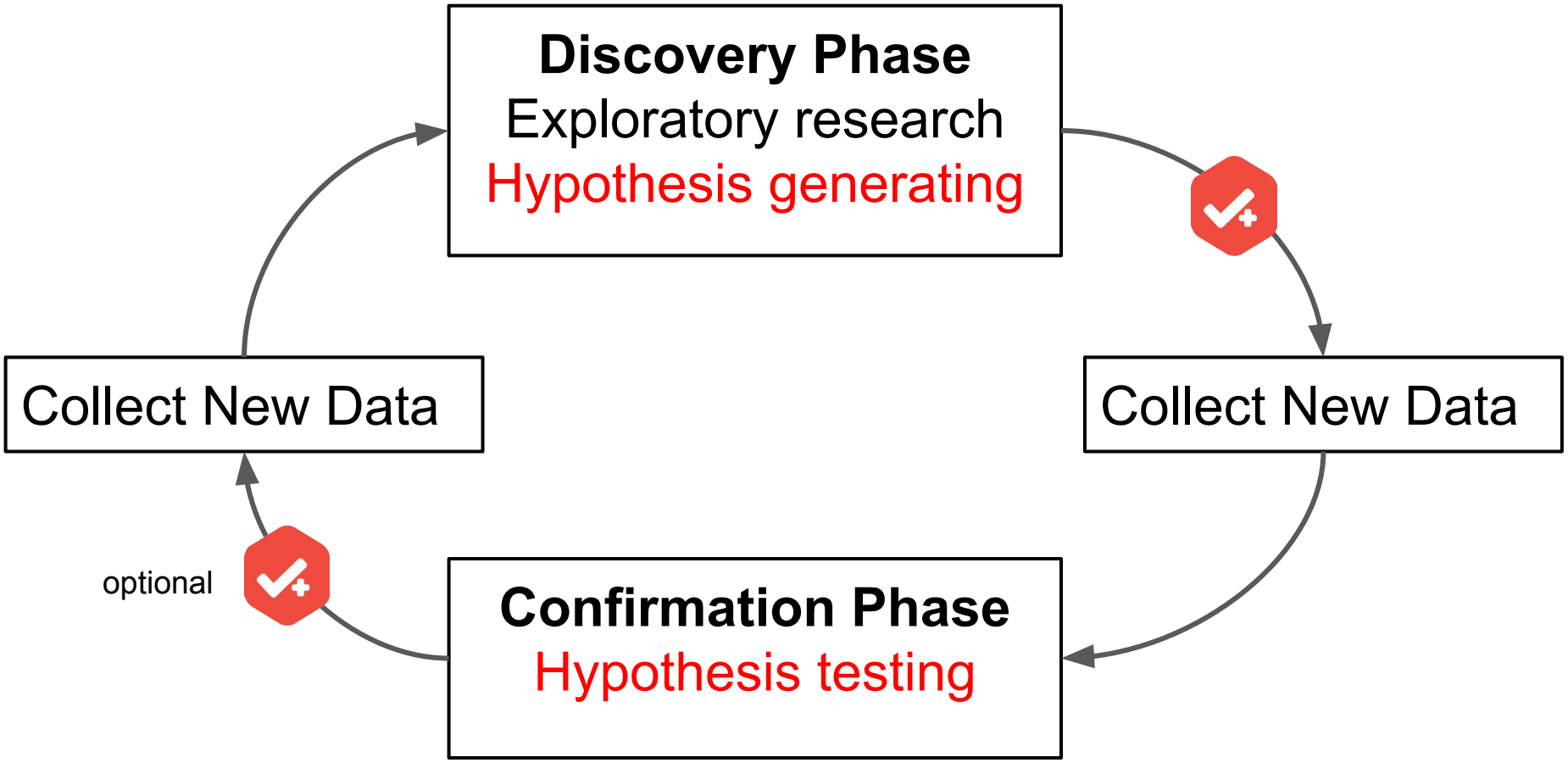
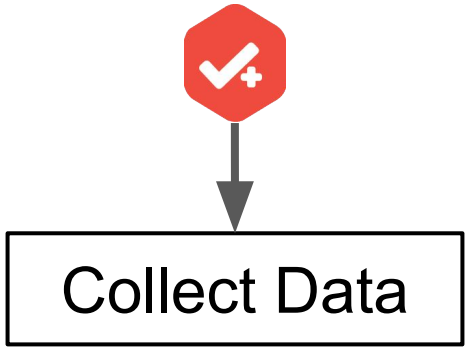


Example Workflow 2

Few a-priori expectations



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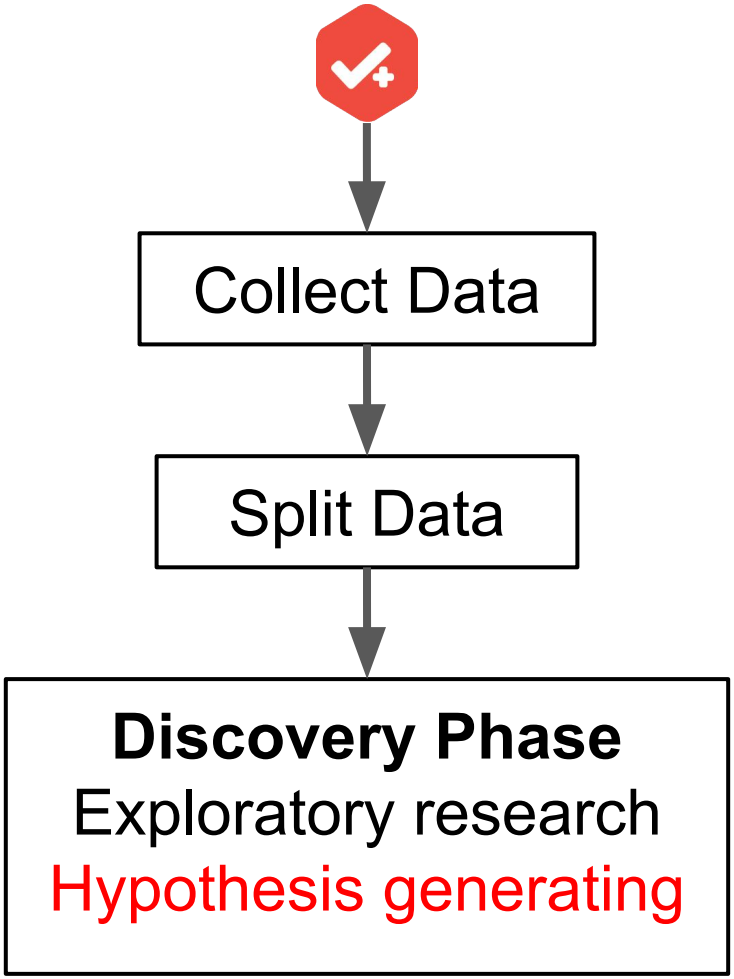

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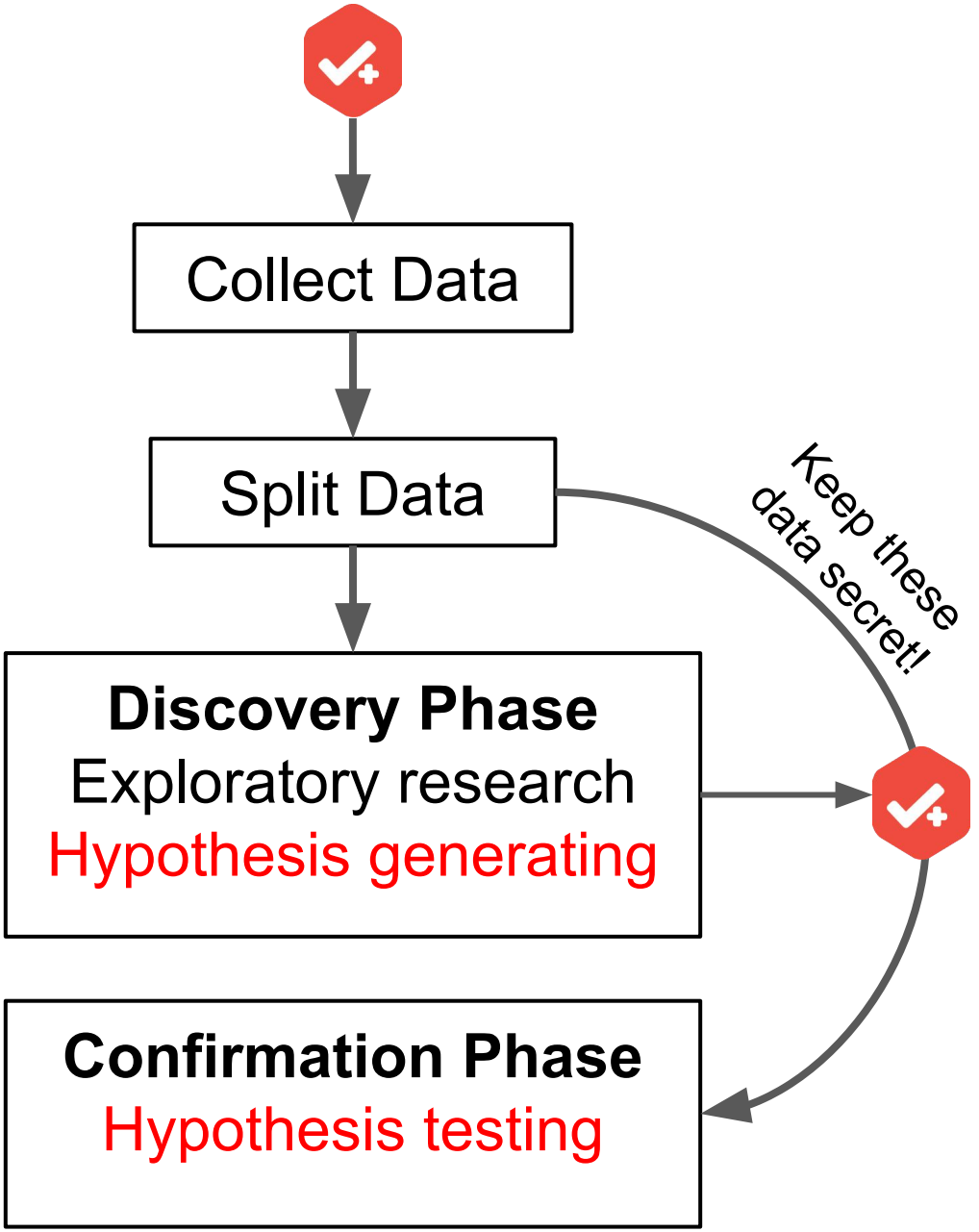
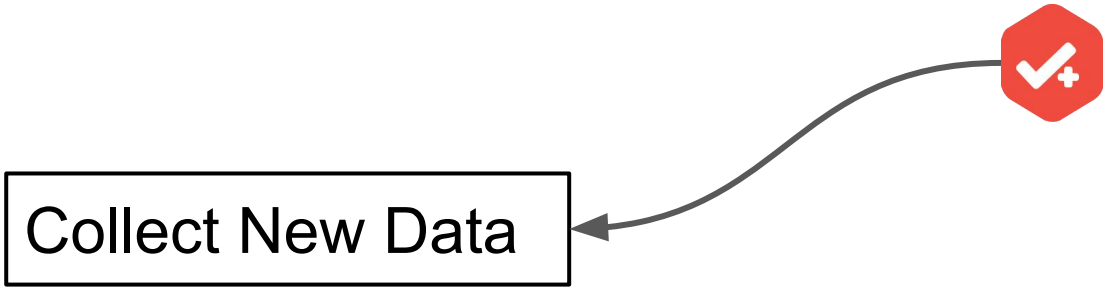


Example Workflow 3

Strong a-priori expectations



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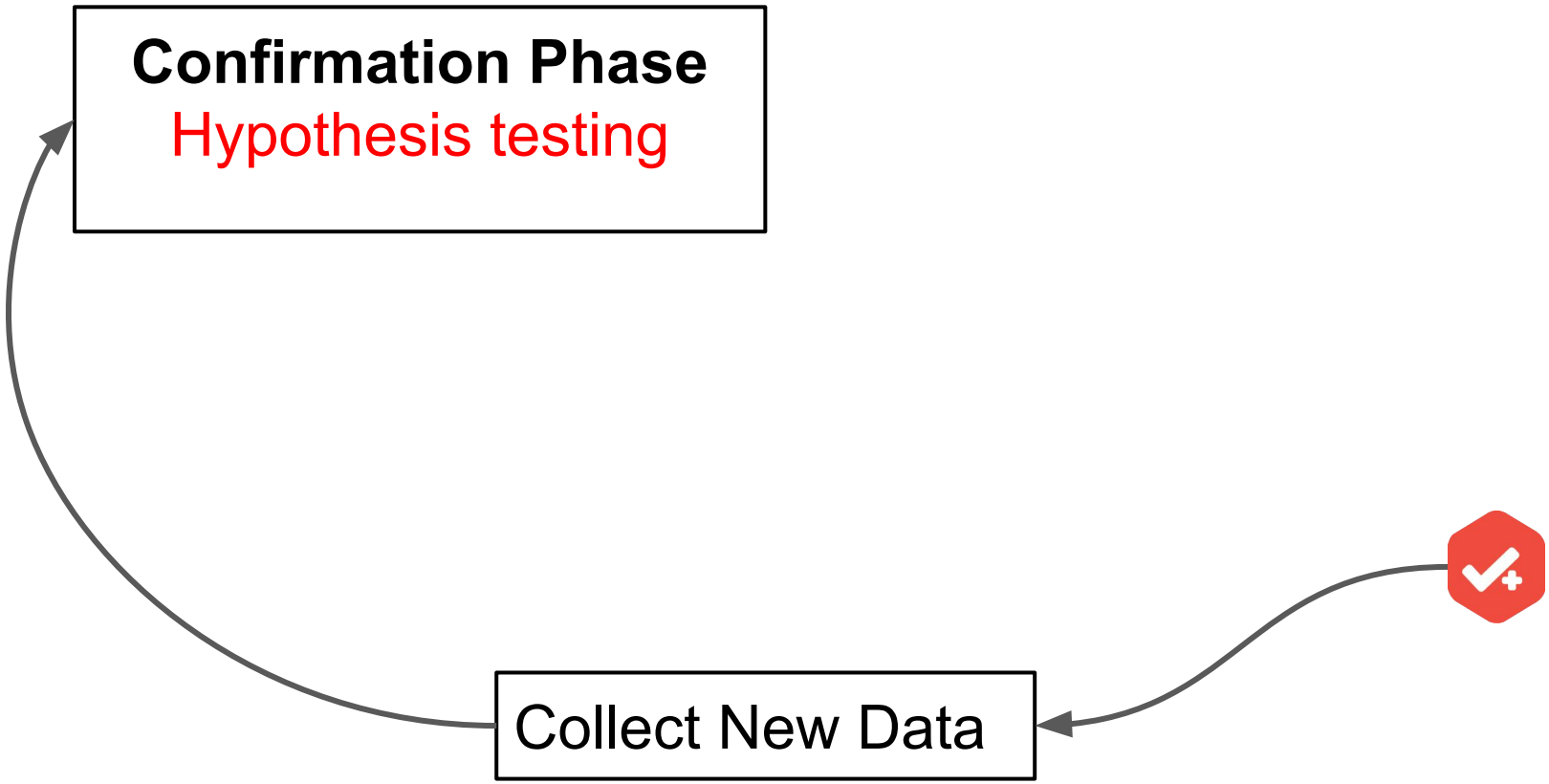

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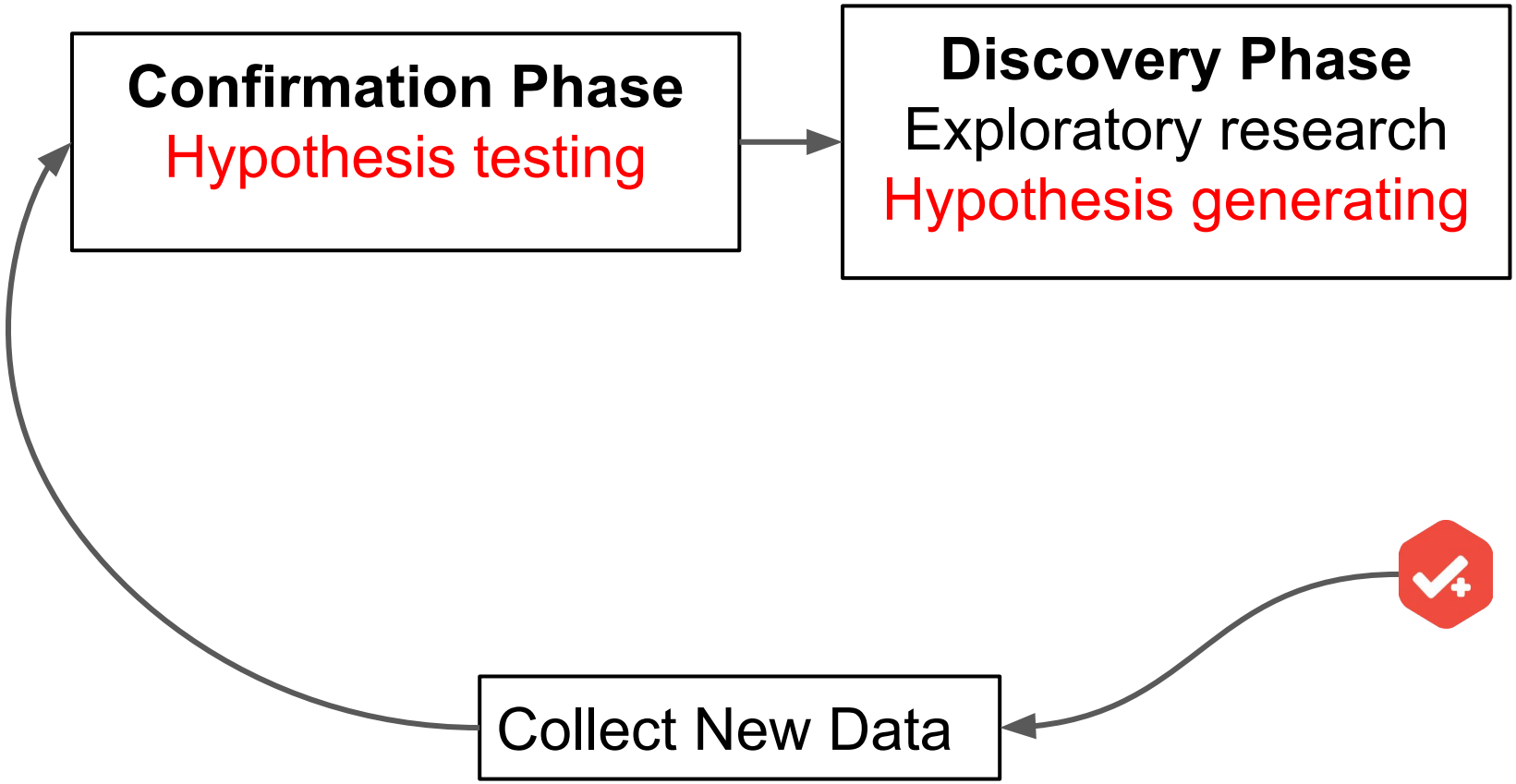
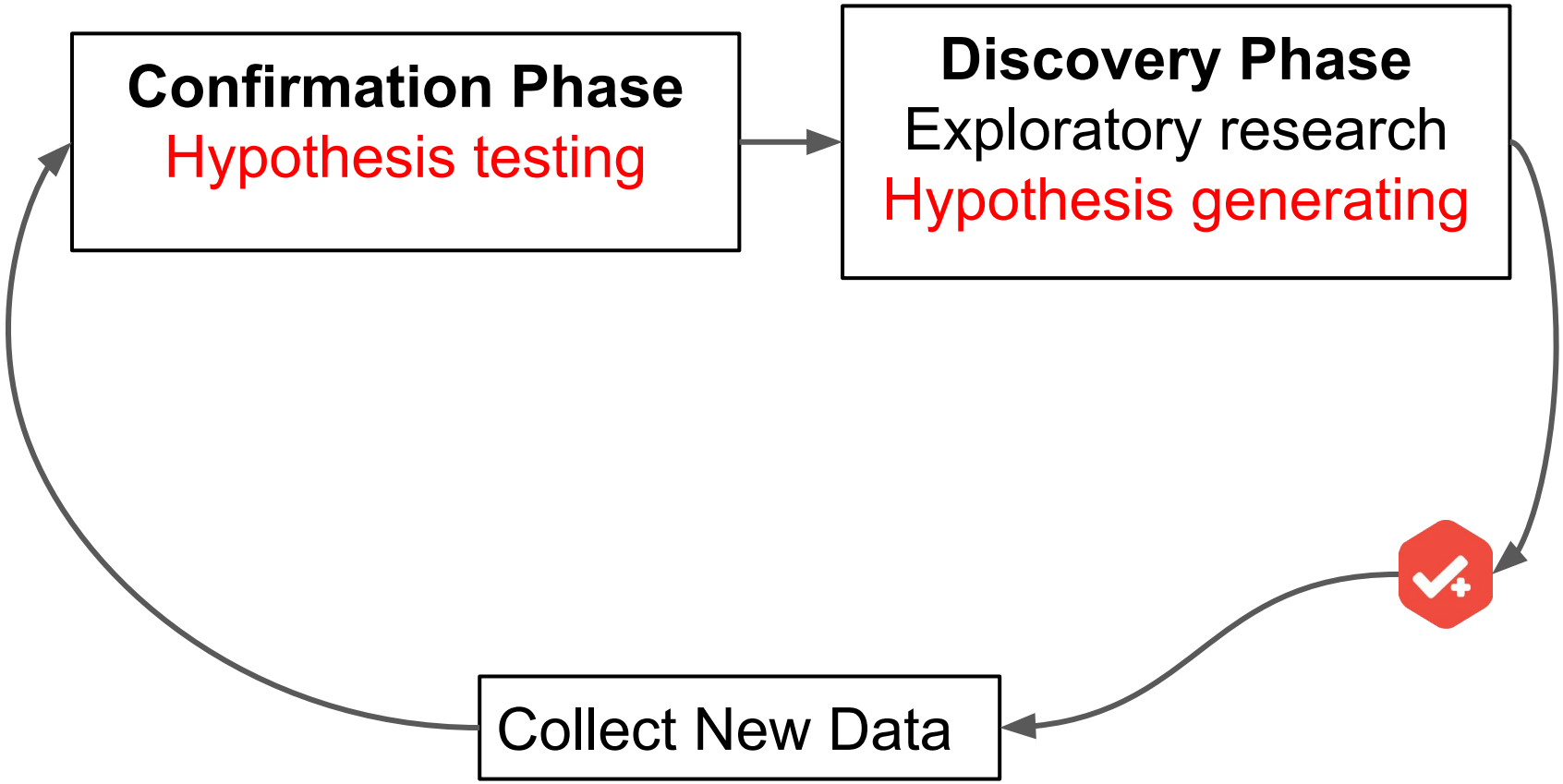


Example Workflow 3

Strong a-priori expectations



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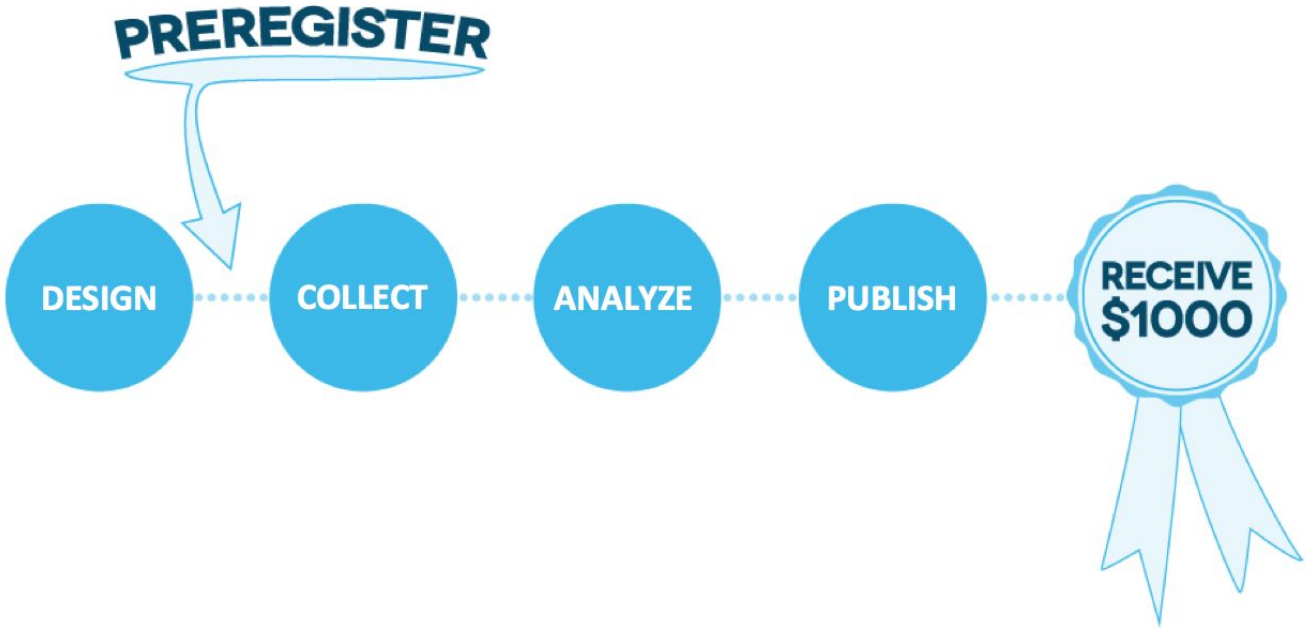
- Helps you to create your next experimental designs. (Hmm… the effect is only significant if I control for X, I wonder if that is really important. Let's test it!)
- It could save time. You're more likely to spot errors when you do more of the work upfront.

The Preregistration Challenge



cos.io/prereg

How do you preregister?

The $1,000,000 Preregistration Challenge

Preregistration increases the credibility of hypothesis testing by confirming in advance what will be analyzed and reported.

Begin a Preregistration

For the Preregistration Challenge, one thousand researchers will win $1,000 each for publishing results of preregistered research. All it takes is a single experiment and its analysis to be eligible.

Share this handout for a brief overview and links to more information, and begin your preregistration today!

Tweet #PreRegChallenge

Welcome to the Prereg Challenge!

The process of preregistration your plans is beneficial to both the scientific field and to you, the scientist. By writing out detailed data collection methods, analysis plans, and rules for excluding or missing data, you can make important decisions that affect your workflow earlier, without the biases that occur once the data are in front of you.

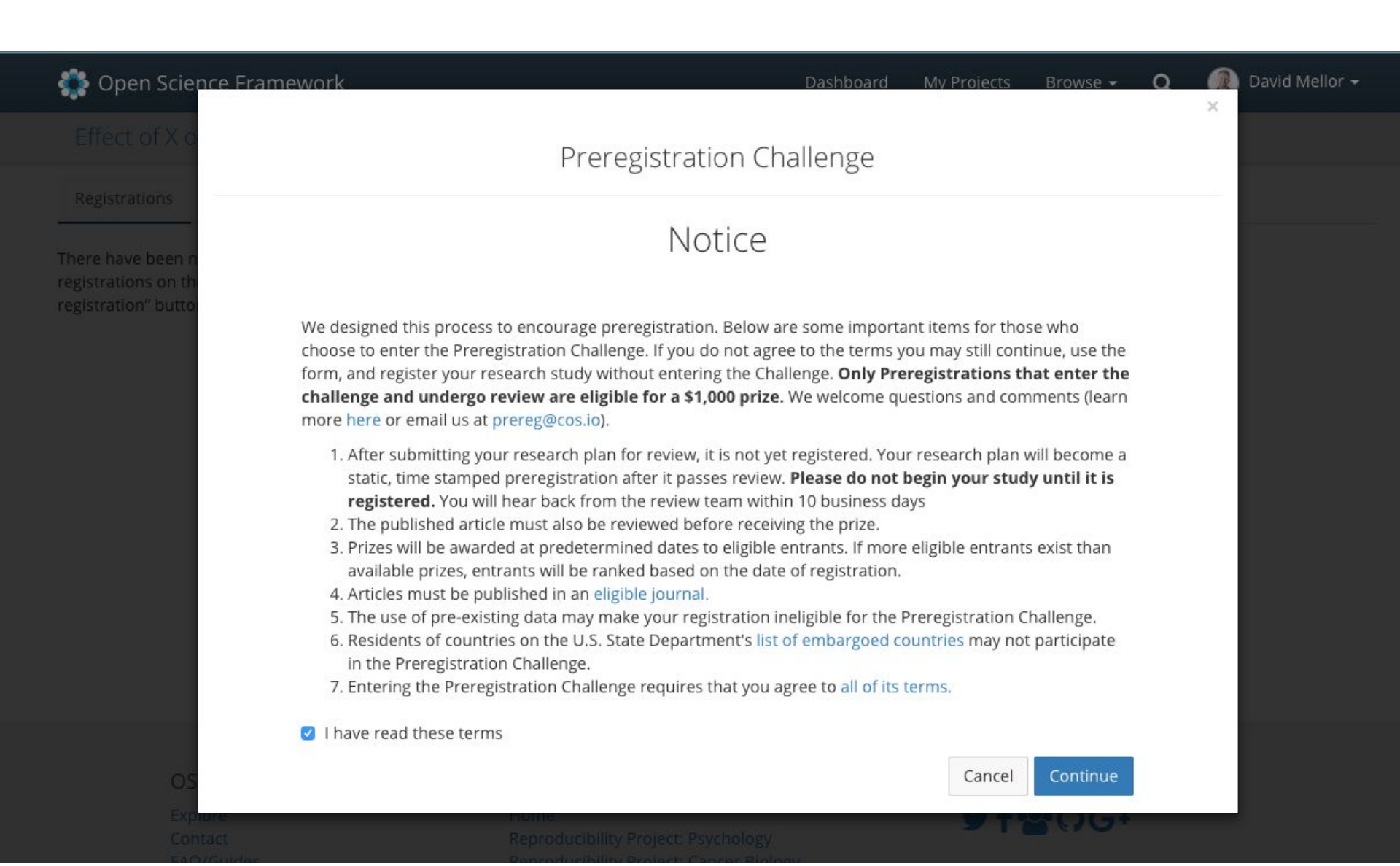
Ready for the challenge? Please follow these steps:

1. Specify all your study and analysis decisions prior to investigating your data
2. Publish your study in an eligible journal
3. Receive $1,000

Start a new preregistration

Continue working on an existing preregistration

Make a preregistration for a project you already have on the OSF


Open Science Framework
Dashboard
My Projects
Browse
David Mellor
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Preregistration Challenge
Notice
We designed this process to encourage preregistration. Below are some important items for those who choose to enter the Preregistration Challenge. If you do not agree to the terms you may still continue, use the form, and register your research study without entering the Challenge. Only Preregistrations that enter the challenge and undergo review are eligible for a $1,000 prize. We welcome questions and comments (learn more here or email us at prereg@cos.io).
1. After submitting your research plan for review, it is not yet registered. Your research plan will become a static, time stamped preregistration after it passes review. Please do not begin your study until it is registered. You will hear back from the review team within 10 business days
2. The published article must also be reviewed before receiving the prize.
3. Prizes will be awarded at predetermined dates to eligible entrants. If more eligible entrants exist than available prizes, entrants will be ranked based on the date of registration.
4. Articles must be published in an eligible journal.
5. The use of pre-existing data may make your registration ineligible for the Preregistration Challenge.
6. Residents of countries on the U.S. State Department's list of embargoed countries may not participate in the Preregistration Challenge.
7. Entering the Preregistration Challenge requires that you agree to all of its terms.
I have read these terms
Cancel
Continue
Explore
Contact
Reproducibility Project: Psychology

Edit draft registration

Title (required)

Provide the working title of your study. It is helpful if this is the same title that you submit for publication of your final manuscript, but it is not a requirement.

Show Example

Effect of X on Y

Authors (required)

The author who submits the preregistration is the recipient of the award money and must also be an author of the published manuscript. Additional authors may be added or removed at any time.

Show Example

David Mellor

Add +

Research Questions (required)

Please list each research question included in this study.

Show Example

Does increasing X change Y?

Hypotheses (required)

For each of the research questions listed in the previous section, provide one or multiple specific and testable hypotheses. Please state if the hypotheses are directional or non-directional. If directional, state the direction. A predicted effect is also appropriate here.

Show Example

If we increase X by 10%, Y will decrease by 30%

Edit draft registration

> In this section we'll ask you to describe how you plan to collect samples, as well as the number of samples you plan to collect and your rationale for this decision. Please keep in mind that the data described in this section should be the actual data used for analysis, so if you are using a subset of a larger dataset, please describe the subset that will actually be used in your study.

Existing Data (required)

Preregistration is designed to make clear the distinction between confirmatory tests, specified prior to seeing the data, and exploratory analyses conducted after observing the data. Therefore, creating a research plan in which existing data will be used presents unique challenges. Please select the description that best describes your situation. Please do not hesitate to contact us if you have questions about how to answer this question (prereg@cos.io).

- (•) **Registration prior to creation of data**
- ( ) **Registration prior to any human observation of the data**
- ( ) **Registration prior to accessing the data**
- ( ) **Registration prior to analysis of the data**
- ( ) **Registration following analysis of the data**

Explanation of existing data (required)

If you indicate that you will be using some data that already exist in this study, please describe the steps you have taken to assure that you are unaware of any patterns or summary statistics in the data. This may include an explanation of how access to the data has been limited, who has observed the data, or how you have avoided observing any analysis of the specific data you will use in your study. The purpose of this question is to assure that the line between confirmatory and exploratory analysis is clear.

Show Example

NA

Sample size (required)

Describe the sample size of your study. How many units will be analyzed in the study? This could be the number of people, birds, classrooms, plots, interactions, or countries included. If the units are not individuals, then describe the size requirements for each unit. If you are using a clustered or multilevel design, how many units are you collecting at each level of the analysis?

Show Example

That

Sample size rationale (required)

This could include a power analysis or an arbitrary constraint such as time, money, or personnel.

Show Example

20

Stopping rule (required)

If your data collection procedures do not give you full control over your exact sample size, specify how you will decide when to terminate your data collection.

Show Example

NA

Last auto-saved: Wed Jan 04 2017 10:06:10 GMT-0500 (EST)

Save as Draft

Next Page

Edit draft registration

> In this section you can describe all variables (both manipulated and measured variables) that will later be used in your confirmatory analysis plan. In your analysis plan, you will have the opportunity to describe how each variable will be used. If you have variables which you are measuring for exploratory analyses, you are not required to list them, though you are permitted to do so.

Manipulated variables (required)

Describe all variables you plan to manipulate and the levels or treatment arms of each variable. For observational studies and meta-analyses, simply state that this is not applicable.

Show Example

2 condititions

You may attach up to 5 files to this question. You may attach files that you already have in this OSF project, or upload a new file from your computer. Uploaded files will automatically be added to this project so that they can be registered.

File(s) selected for upload:
Attach File

Measured variables (required)

Describe each variable that you will measure. This will include outcome measures, as well as any predictors or covariates that you will measure. You do not need to include any variables that you plan on collecting if they are not going to be included in the confirmatory analyses of this study.

Edit draft registration

> You may describe one or more confirmatory analysis in this preregistration. Please remember that all analyses specified below must be reported in the final article, and any additional analyses must be noted as exploratory or hypothesis-generating.
>
> A confirmatory analysis plan must state up front which variables are predictors (independent) and which are the outcomes (dependent), otherwise it is an exploratory analysis. You are allowed to describe any exploratory work here, but a clear confirmatory analysis is required.

Statistical models (required)

What statistical model will you use to test each hypothesis? Please include the type of model (e.g. ANOVA, multiple regression, SEM, etc) and the specification of the model (this includes each variable that will be included as predictors, outcomes, or covariates). Please specify any interactions that will be tested and remember that any test not included here must be noted as an exploratory test in your final article.

Show Example

Repeated measures 1 X 4 ANOVA

You may attach up to 5 files to this question. You may attach files that you already have in this OSF project, or upload a new file from your computer. Uploaded files will automatically be added to this project so that they can be registered.

File(s) selected for upload:
analysis_script.R
Attach File

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File(s) selected for upload:
analysis_script.R

Attach File

Upload | Create Folder | Download as zip | Filter | i

Name

- Effect of X on Y
  - OSF Storage
    - analysis_script.R

Register

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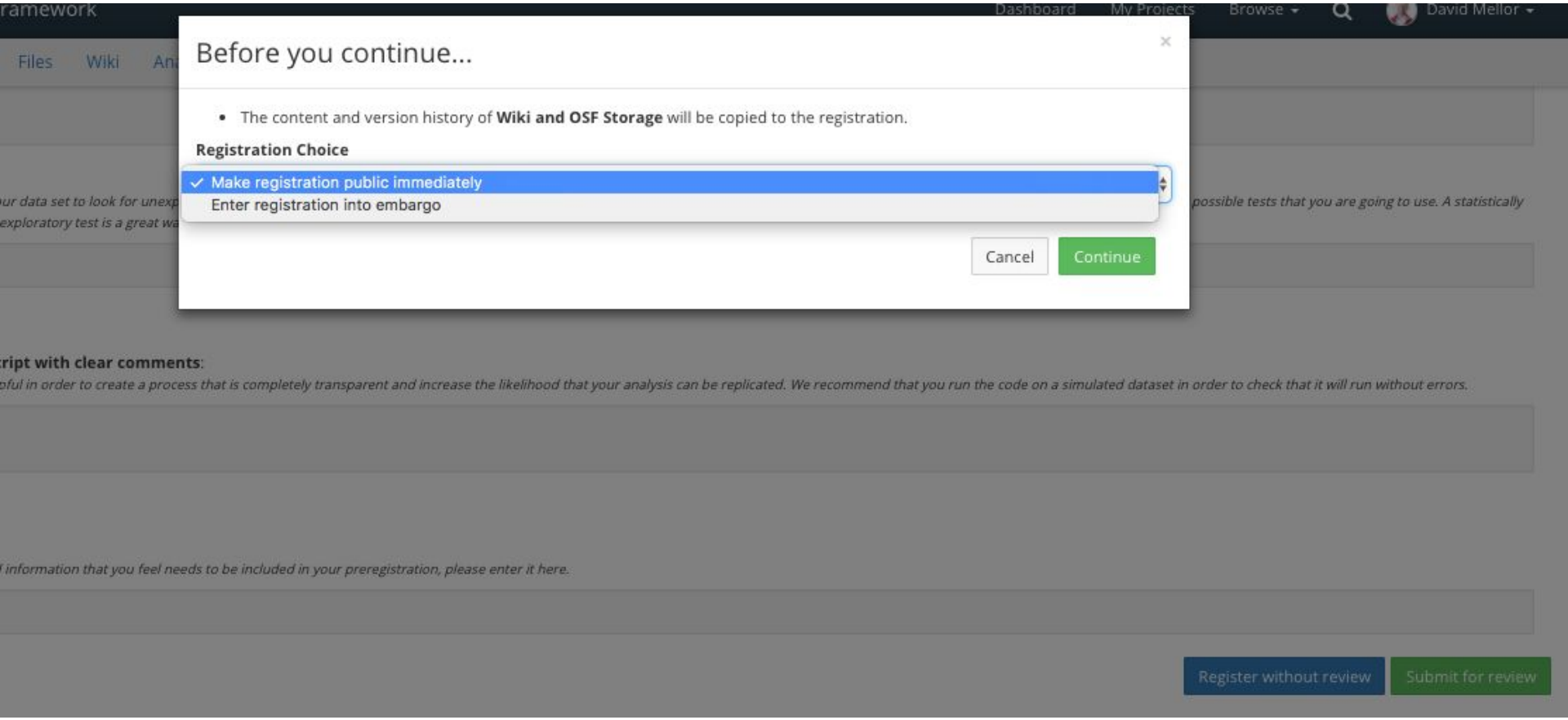
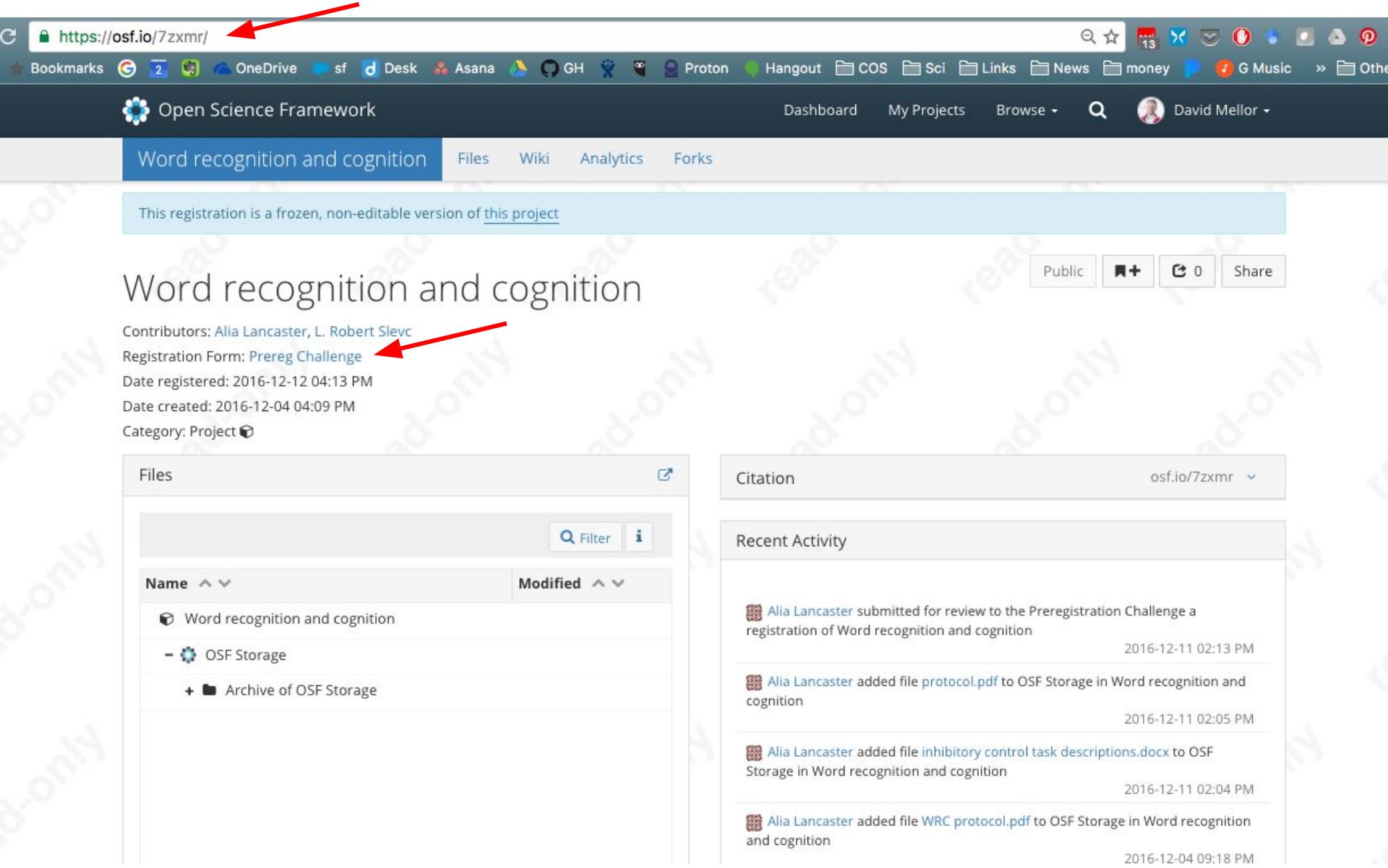
Sampling Plan


ramework
Dashboard
My Projects
Browse
David Mellor
Files
Wiki
Before you continue...
The content and version history of **Wiki and OSF Storage** will be copied to the registration.
Registration Choice
Make registration public immediately
Enter registration into embargo
Cancel
Continue
possible tests that you are going to use. A statistically
ript with clear comments:
oful in order to create a process that is completely transparent and increase the likelihood that your analysis can be replicated. We recommend that you run the code on a simulated dataset in order to check that it will run without errors.
information that you feel needs to be included in your preregistration, please enter it here.
Register without review
Submit for review


https://osf.io/7zxmr/
Open Science Framework
Dashboard
My Projects
Browse
David Mellor
Word recognition and cognition
Files
Wiki
Analytics
Forks
This registration is a frozen, non-editable version of this project
Word recognition and cognition
Public
0
Share
Contributors: Alia Lancaster, L. Robert Slevc
Registration Form: Prereg Challenge
Date registered: 2016-12-12 04:13 PM
Date created: 2016-12-04 04:09 PM
Category: Project
Files
Filter
Name
Modified
Word recognition and cognition
OSF Storage
Archive of OSF Storage
Citation
osf.io/7zxmr
Recent Activity
Alia Lancaster submitted for review to the Preregistration Challenge a registration of Word recognition and cognition
2016-12-11 02:13 PM
Alia Lancaster added file protocol.pdf to OSF Storage in Word recognition and cognition
2016-12-11 02:05 PM
Alia Lancaster added file inhibitory control task descriptions.docx to OSF Storage in Word recognition and cognition
2016-12-11 02:04 PM
Alia Lancaster added file WRC protocol.pdf to OSF Storage in Word recognition and cognition
2016-12-04 09:18 PM

This registration is a frozen, non-editable version of this project

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Word Recognition and Cognition

Authors

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Alia Lancaster, L. Robert Slevc

Research Questions

What do I need to do when writing up my article?

1. Include a link to your preregistration
   a. (e.g. https://osf.io/f45xp)

2. Report the results of ALL preregistered analyses

3. ANY unregistered analyses must be transparent

The effects of exposure to objective coherence on perceived meaning in life: a preregistered direct replication of Heintzelman, Trent & King (2013)

Kaylin Ratner, Anthony L. Burrow, Felix Thoemmes

Published 23 November 2016. DOI: 10.1098/rsos.160431

Abstract

Having a sense of meaning in life (MIL) has been acknowledged as a catalyst to psychological flourishing. As such, understanding ways to promote MIL represents a worthy goal for those interested in bolstering positive outcomes. This study sought to replicate the findings of Heintzelman, Trent & King (2013 *Psychol. Sci.* **24**, 991–998 (doi:10.1177/0956797612465878)), who found that MIL could be influenced by external stimulation. Their findings suggest that exposure to coherent stimuli produces significantly higher MIL scores than exposure to incoherent stimuli. Using materials and methodology provided by the corresponding author of the original paper, this study attempted to directly test this manipulation under conditions with increased statistical power. All tests, however, failed to replicate. Possible explanations for these discrepant findings are discussed, and potential future directions for this area of the literature are proposed.

4. Results

4.1. Replication of Heintzelman *et al.* [11] Study 2: trees in seasonal change

4.1.1. Data cleaning

Of the variables relevant to this study's analyses, checks for missingness revealed no missing values on any predictor, covariate or outcome. A check of the univariate boxplot for the outcome measure, MIL, revealed no outlying data points. Finally, it was found that four individuals failed the attention check. In accordance with our preregistered procedures, these individuals were excluded from all study analyses. Our final sample for the preregistered analyses therefore contained 478 valid observations. Descriptive statistics (for both aggregate values, and values split according to condition) can be found in table 1.

Table 1.

View inline | View popup

Descriptive statistics for Study 2 replication, aggregate and by experimental condition. MIL, meaning in life; EPA, explicit positive affect; ENA, explicit negative affect; IPA, implicit positive affect; INA, implicit negative affect.

Diagnostic plots were generated to check the assumptions of the impending linear models to test our effects of interest. It is important to note, diagnostic plots of the residual values of Study 2's adjusted linear model showed evidence that suggested some model misspecification. As data probing for potential model misspecification did not appear to be a part of the original procedure, it was not preregistered as a part of this direct replication. To explore this potential misspecification, we performed a relatively exhaustive probing of the data. Our best solutions and conclusions can be found in the 'Unregistered exploratory analyses' section that follows our preregistered analyses.

4.2. Preregistered analyses: unadjusted and adjusted effects

4.2.1. Frequentist

4.5. Unregistered exploratory analyses

In our preregistration of the analyses, we described using the sum of all times that participants look at the stimuli as a covariate. However, it later occurred to us that the original authors probably used average time (across all stimuli). Using a mean instead of a sum is a simple linear transformation (sums divided by number of stimuli), and therefore does not have any effect on our analyses. Nevertheless, we reran our models with the average time, which, as expected did not change our results (except the time coefficient which was rescaled, but retained the same inferential statistics).[1]

Second, as foreshadowed in our data cleaning section, we noted that the regression model in Study 2 that included all covariates showed slight, but notable patterns in the residuals. A QQ-plot (**figure 1***a*) suggested slight non-normality of the residuals, and a fitted versus residual plot suggested a very slight deviation from a straight line (**figure 1***b*). To explore the source of this potential violation of regression assumptions, we tried two strategies. First, we fitted a model that included all interactive terms between treatment assignment and the covariates, and all quadratic terms of all covariates. We therefore created a model in which linearity and additive assumptions were related. This model, however, did not yield much better looking residuals. Our second strategy was to perform a Box–Cox transformation of the outcome variable in the full regression. The Box–Cox procedure suggested powering the outcome variable by 1.5. After this transformation, all relationships appeared more linearized, as evidenced by much better looking residuals. The overall model was again found to be significant ($F_{6,449} = 25.19$, $p < 0.001$; $R^2 = 0.25$); however, the weak relationship between contrast-weighted experimental condition and the outcome remained ($B = 0.24$, s.e. = 0.44, $t = 0.56$, $p = 0.579$). Given that powering the outcome by 1.5 does not yield immediately interpretable scores, it suffices to say that even linearizing relationships did not alter results.

What if I need to change my research plan?

1) **If you want to change your plans as you see the incoming results: report results of preregistered analyses and then explore dataset with new analyses.**
2) **If you need changes before seeing the data, you can withdraw and create a new plan.**

Where to go for help:

1) If your project has been provisionally accepted for a Registered Report, contact editor.
2) If it's your own preregistration, contact us at prereg@cos.io
3) Use your colleagues, this process is new to many outside of clinical sciences and norms are being developed.

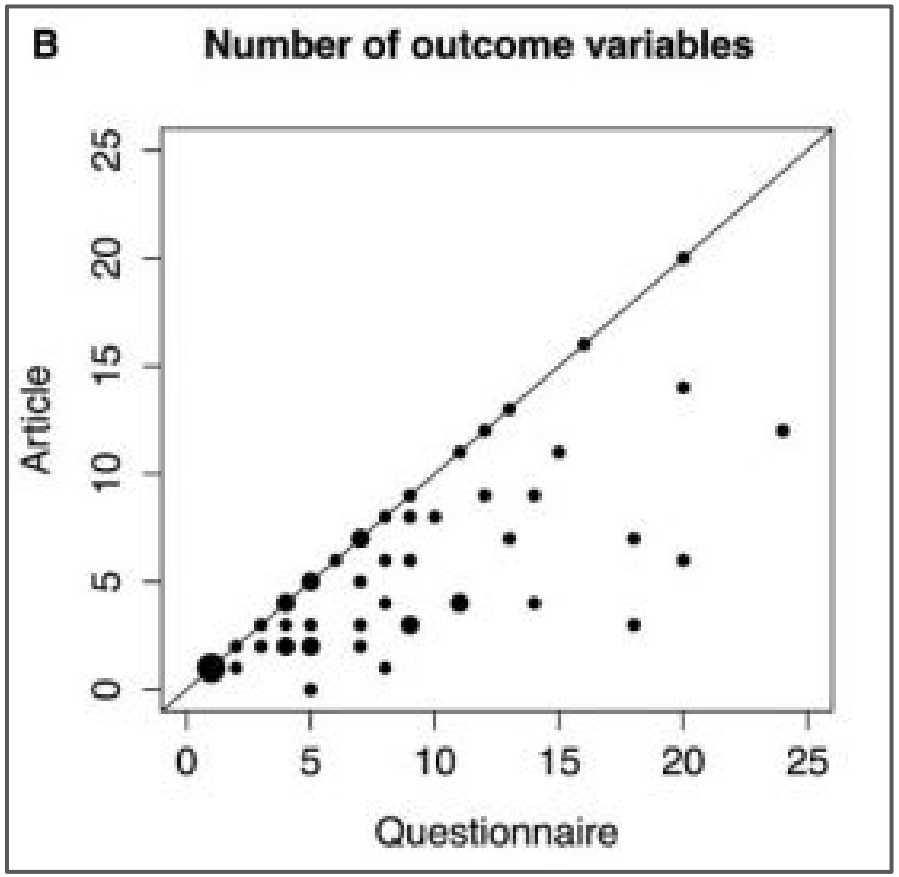
Will this make my work less publishable?

It does make presenting spurious findings as rigorous confirmatory tests harder.

HOWEVER, it is a strong indicator of credibility for any confirmatory tests, and helps to highlight and unexpected, new, testable hypotheses for you or future scholars.

We expect that work that is NOT preregistered will soon be much more skeptically received, so the risk is hard to quantify- therefore why not error on the side of rigor and credibility?

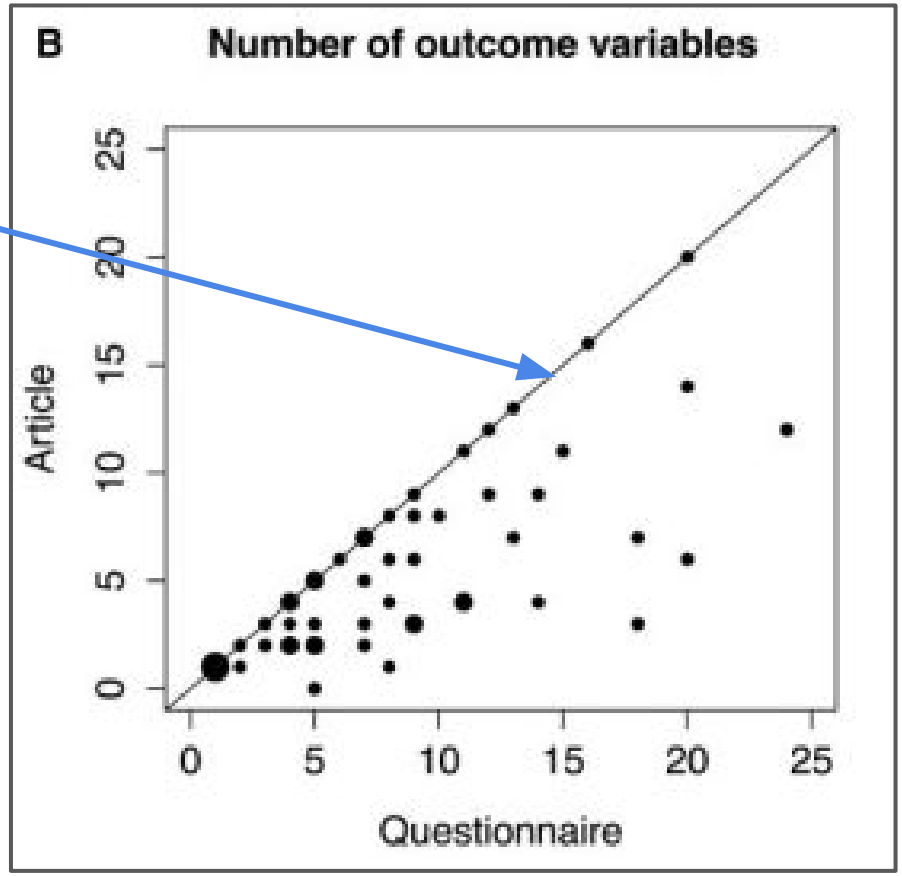
Does preregistration work?



Underreporting in Political Science Survey Experiments: Comparing Questionnaires to Published Results. Franco, A., Malhotra, N., & Simonovits, G. (2015).

Does preregistration work?

Reported Tests (122)
Median *p*-value = .02
Median effect size (*d*) = .29
% *p* < .05 = 63%

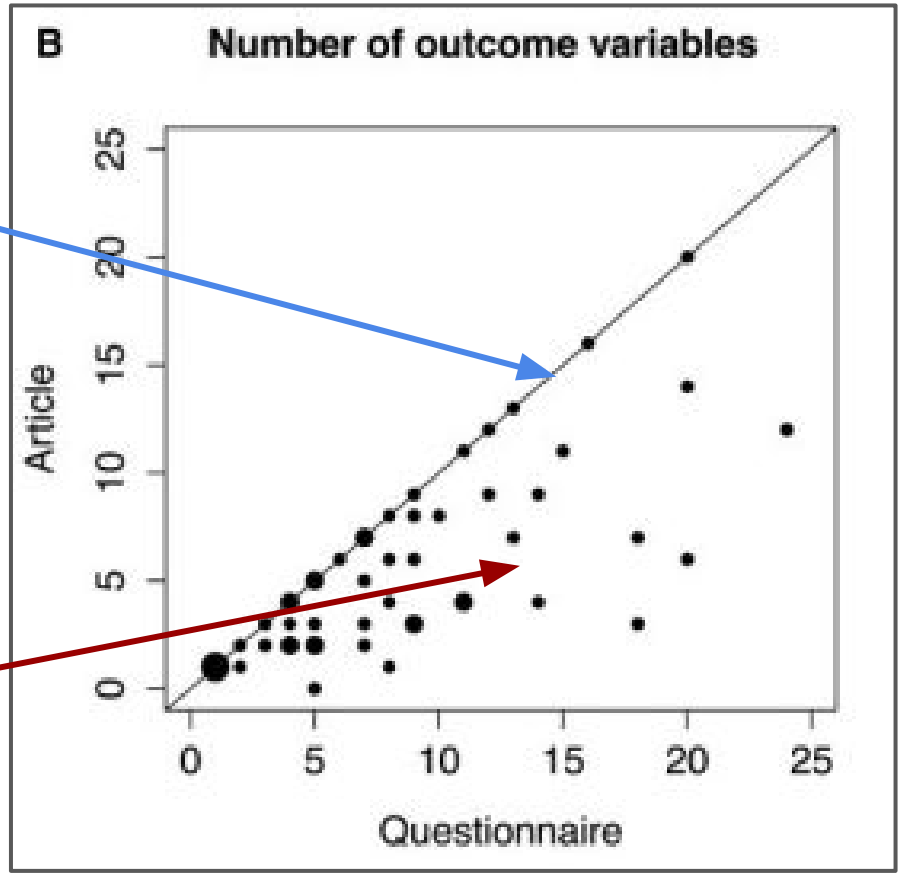


Underreporting in Political Science Survey Experiments: Comparing Questionnaires to Published Results. Franco, A., Malhotra, N., & Simonovits, G. (2015).

Does preregistration work?

Reported Tests (122)
Median *p*-value = .02
Median effect size (*d*) = .29
% *p* < .05 = 63%

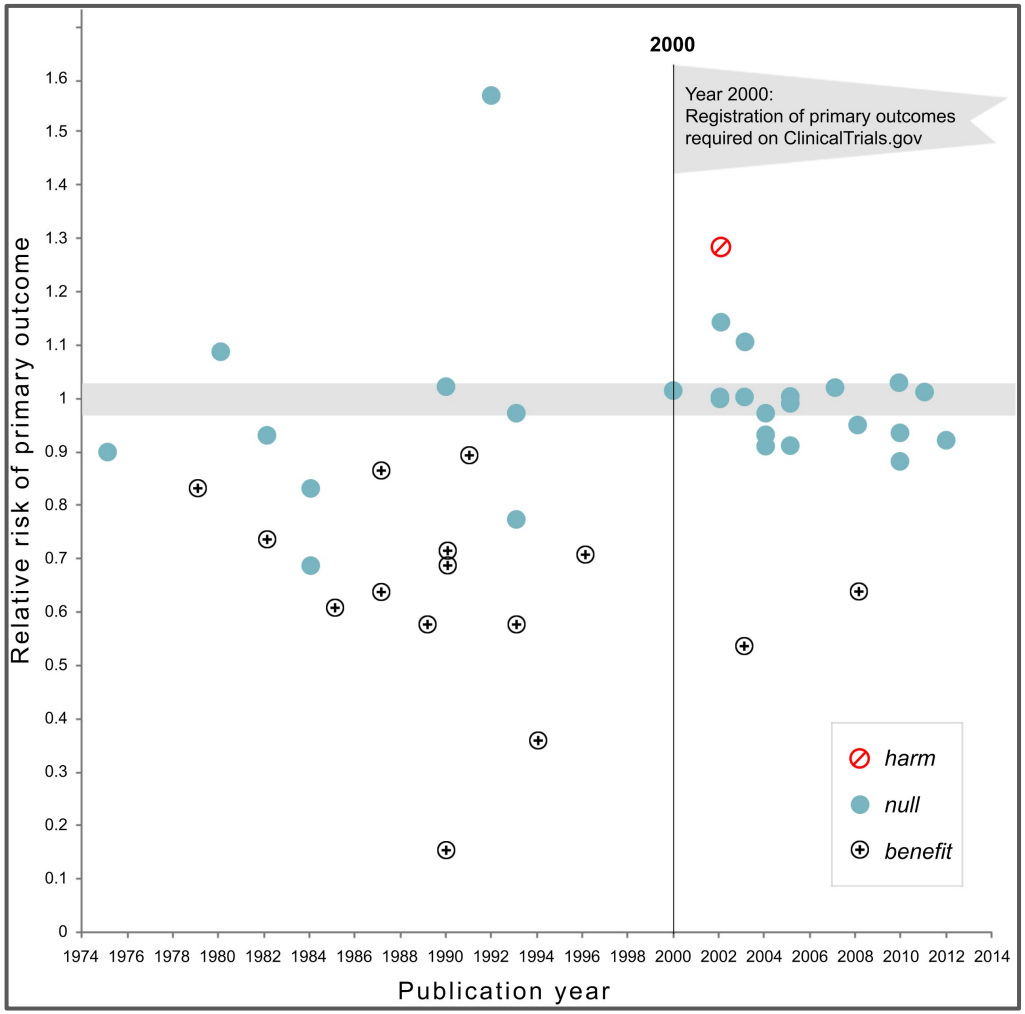
Unreported Tests (147)
Median *p*-value = .35
Median effect size (*d*) = .13
% *p* < .05 = 23%



Underreporting in Political Science Survey Experiments: Comparing Questionnaires to Published Results. Franco, A., Malhotra, N., & Simonovits, G. (2015).

Does preregistration work?

Positive results dropped from 57% to 8% after preregistration required.



Likelihood of Null Effects of Large NHLBI Clinical Trials Has Increased over Time, Robert M. Kaplan , Veronica L. Irvin, 2015

Can’t someone “scoop” my ideas?

Can’t someone “scoop” my ideas?

- Date-stamped preregistrations make your claim verifiable.
- By the time you’ve preregistered, you are ahead of any possible scooper.
- Embargo your preregistration.

Isn’t it easy to cheat?

1) Making a “preregistration” after conducting the study.
2) Making multiple preregistrations and only citing the one that “worked.”

Isn’t it easy to cheat?

1) Making a “preregistration” after conducting the study.
2) Making multiple preregistrations and only citing the one that “worked.”

While fairly easy to do, this makes fraud **harder** to do and **more intentional**.

- Preregistration helps keep you honest to **yourself.**
- Makes fraud more explicit.

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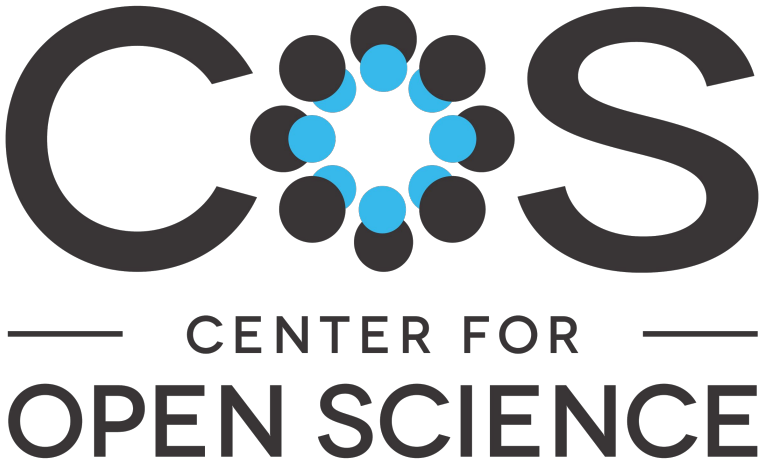

Our mission is to provide expertise, tools, and training to help researchers create and promote open science within their teams and institutions. Promoting these practices within the research funding and publishing communities accelerates scientific progress.

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