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# Workshop Open Science Practices

## Part 1

Preregistration

# Overview

## Time

13:00 – 13:10

13:10 – 13:40

13:40 – 13:55

13:55 – 14:40

14:40 – 14:55

14:55 – 15:40

15:40 – 16:10

16:10 – 16:25

16:25 – 16:40

16:40 – 17:25

17:25 – 17:40

17:40 – 18:00

## Topic

Welcome

Power (Alex)

Discussion

Data Collection (Anne)

Break

P-hacking (Anne)

Publication Bias (Alex)

Discussion

Break

Preregistration (Anne)

Discussion

Wrap Up, Evaluation

OSF

The screenshot shows the OSF project page for 'Open Science Workshop for CRC at TUD'. The header includes the OSFHOME logo and navigation links like 'My Projects', 'Search', 'Support', 'Donate', and a user profile for 'Anne Gärtner'. The project title is 'Open Science Workshop for CRC at TUD' with a file size of 39.0MB, public status, and version 1.0. Contributors listed are Josephine Zerna, Alexander Strobel, and Anne Gärtner. The date created is 2022-03-02 02:53 PM and last updated is 2023-03-08 03:55 PM. The category is 'Project'. The description states: 'This is a project to share the materials that we have created for our Open Science Workshop for PhD students at the faculty of psychology at TU Dresden. The workshop is split into two parts.' The license is 'CC-BY Attribution 4.0 International'. Below the description are sections for 'Wiki', 'Citation', 'Components', and 'Files'. The 'Files' section has a 'Sign up' button. The bottom of the screenshot shows the repository name 'JZerna / OpenScience\_Course' with public status, notifications, forks (0), and stars (0).

Github

The screenshot shows the GitHub repository page for 'OpenScience\_Course' by 'JZerna'. The repository is public. It lists recent commits: 'JZerna wrote Replication chapter' (2 weeks ago, 9 commits), '01\_Material Day 1' (added files from OPAL course, 3 weeks ago), '02\_Material Day 2' (added files from OPAL course, 3 weeks ago), '03\_Handbook' (wrote Replication chapter, 2 weeks ago), and 'README.md' (initial commit, 3 weeks ago). The repository description is: 'A repository for the Open Science course hosted by the Modulgraduiertenkolleg (MGK) of the Collaborative Research Centre 940 at the Technische Universität Dresden.' It shows 0 stars, 2 watchers, and 0 forks. The 'About' section mentions the repository is for the Open Science course hosted by the Modulgraduiertenkolleg (MGK) of the Collaborative Research Centre 940 at the Technische Universität Dresden.

<https://osf.io/djkm6/> | [https://github.com/JZerna/OpenScience\\_Course](https://github.com/JZerna/OpenScience_Course)

# Survio Poll



[bit.ly/pre--reg](https://bit.ly/pre--reg)



# Outline

## What is a preregistration?

- Reasons for conducting preregs
- Essential elements

## How to practically conduct a prereg

- Templates and platforms

## Registered Reports

### Advocatus Diaboli

- But...

## Exercise

## Summary and further recommendations

### Registered Report (2<sup>nd</sup> phase)

Publish and/or  
conduct next experiment  
Publication bias

### Preregistration

Generate and  
specify hypothesis  
Failure to control for bias

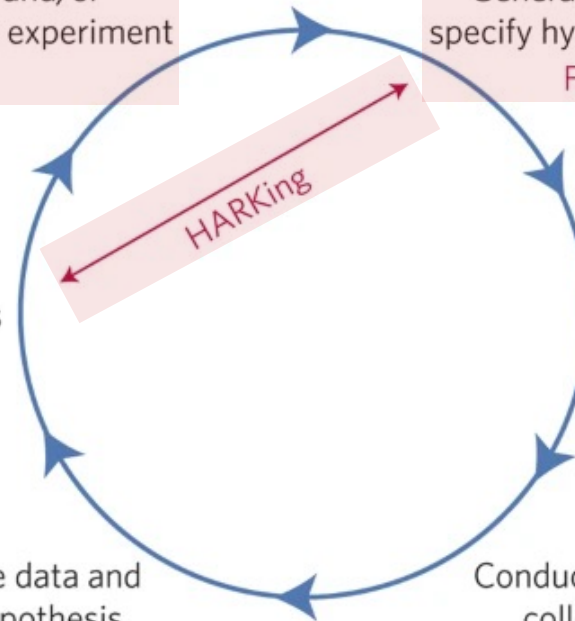
### Registered Report (1<sup>st</sup> phase)

Design study  
Low statistical power

Interpret results  
P-hacking

Analyse data and  
test hypothesis  
P-hacking

Conduct study and  
collect data  
Poor quality control

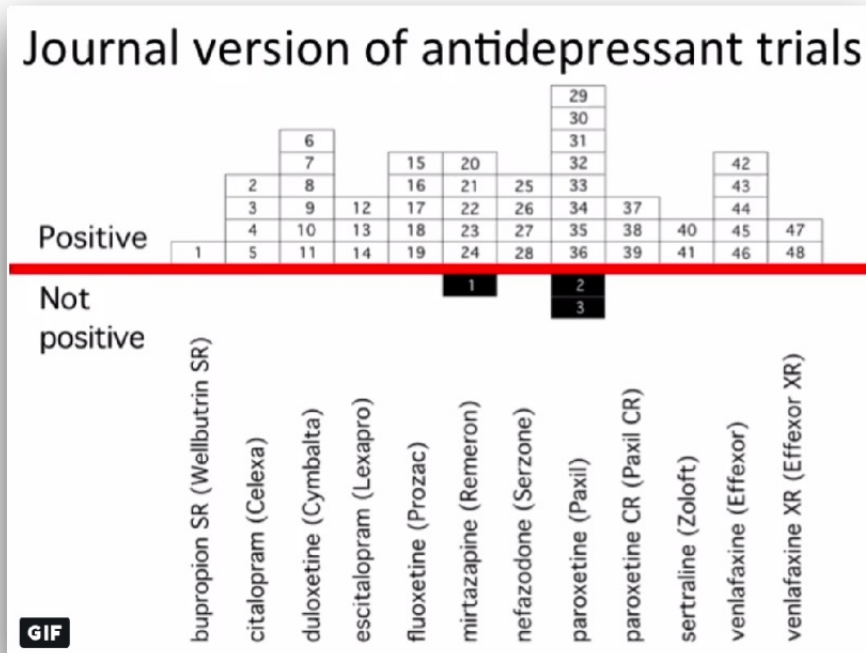


# Introduction

## Efficacy of anti-depressants (Turner et al., 2008)

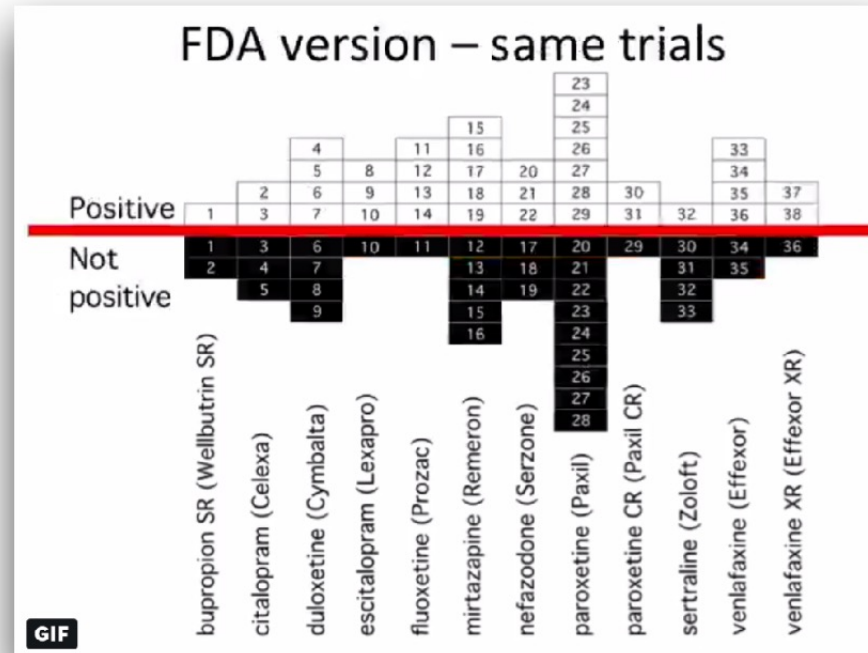
Trials published in journals

48 positive, 3 negative



Trials preregistered at FDA\*

38 positive, 36 negative



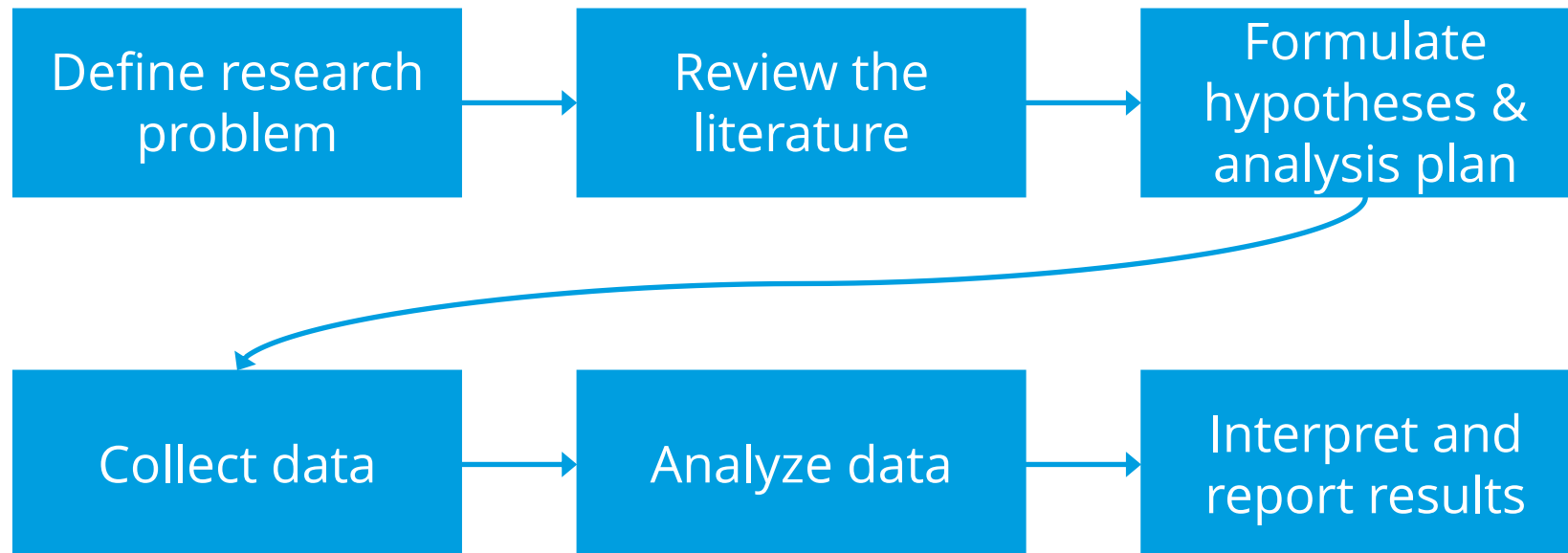
\* Food and Drug Administration

# What is a preregistration?

# What is a preregistration?

Reasons for conducting preregs

## A prototypical research process

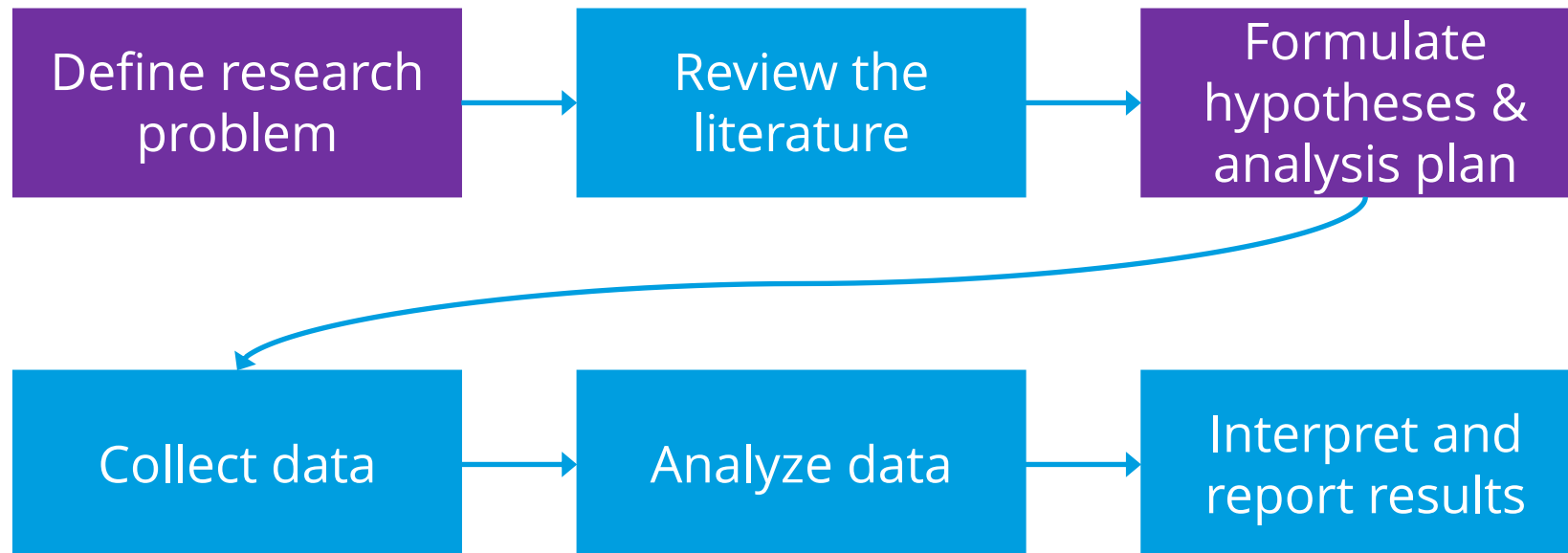


# What is a preregistration?

Reasons for conducting preregs

A prototypical research process

**A preregistration makes these steps explicit**





# What is a preregistration?

## Reasons for conducting preregs

### Definition

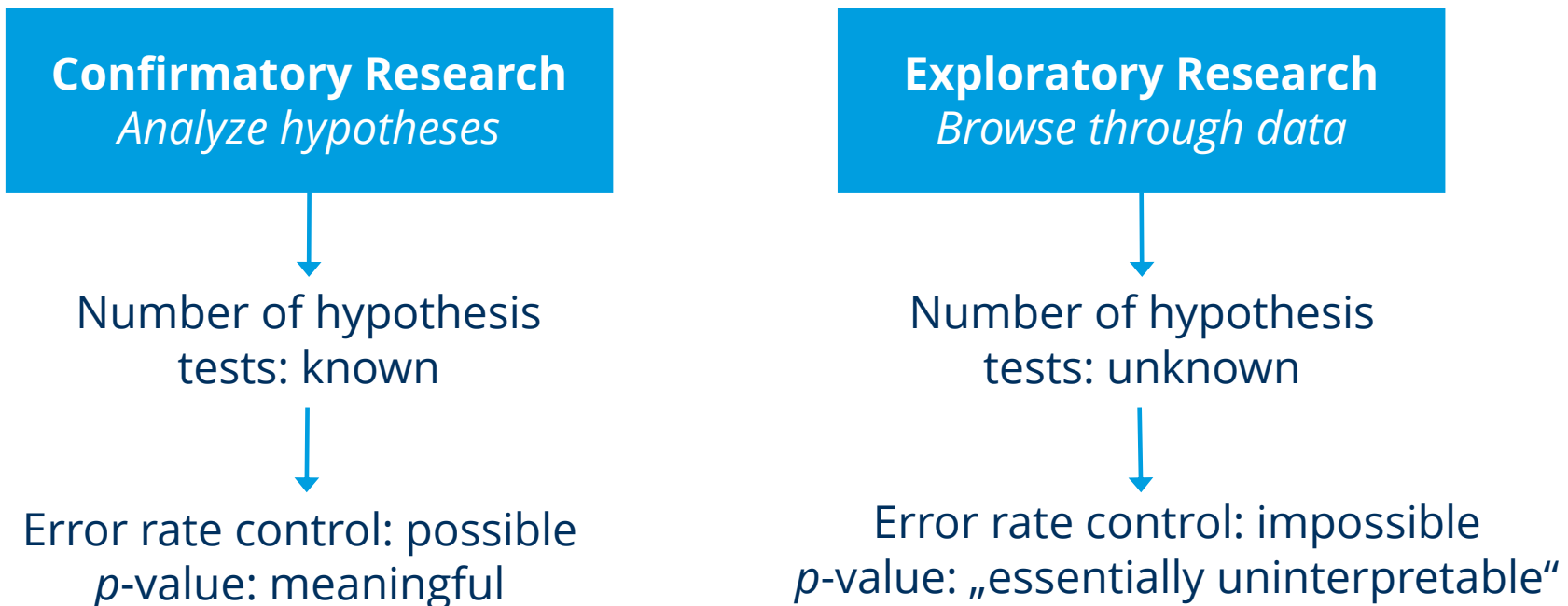
„The specification of a research design, hypotheses, and analysis plan prior to observing the outcomes of a study.“

Nosek & Lindsay (2018)

# What is a preregistration?

## Reasons for conducting preregs

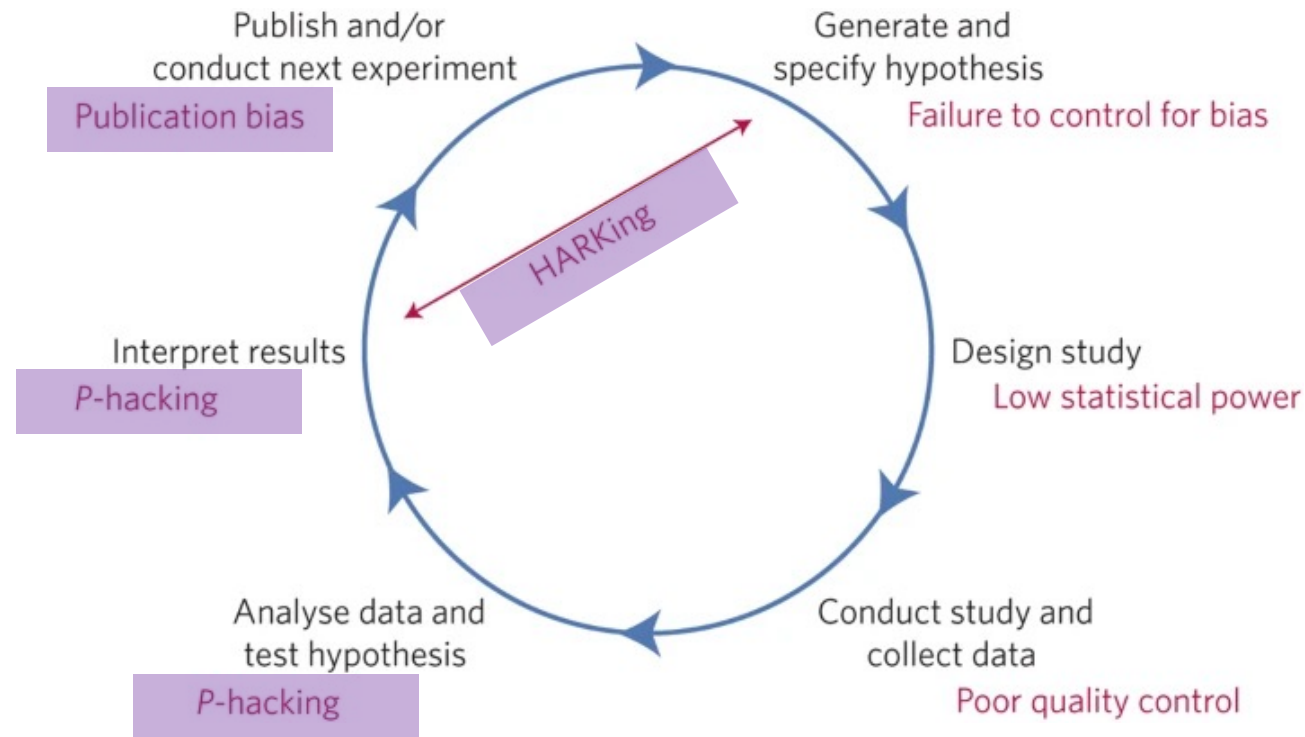
### 1. Clear distinction between confirmatory and exploratory research



# What is a preregistration?

## Reasons for conducting preregs

### 2. Mitigate questionable research practices

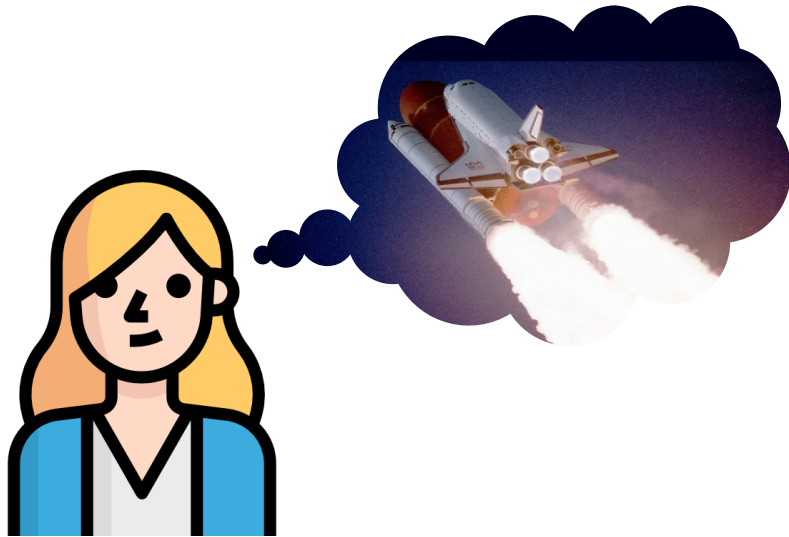


# What is a preregistration?

## Reasons for conducting preregs

### 3. Get your head around your research designs

Before you conduct the study...



„This is gonna be rocket science!“

When you look at your data...



„How should I ever analyze this mess?“

# What is a preregistration?

## Reasons for conducting preregs

### 4. Build your reputation

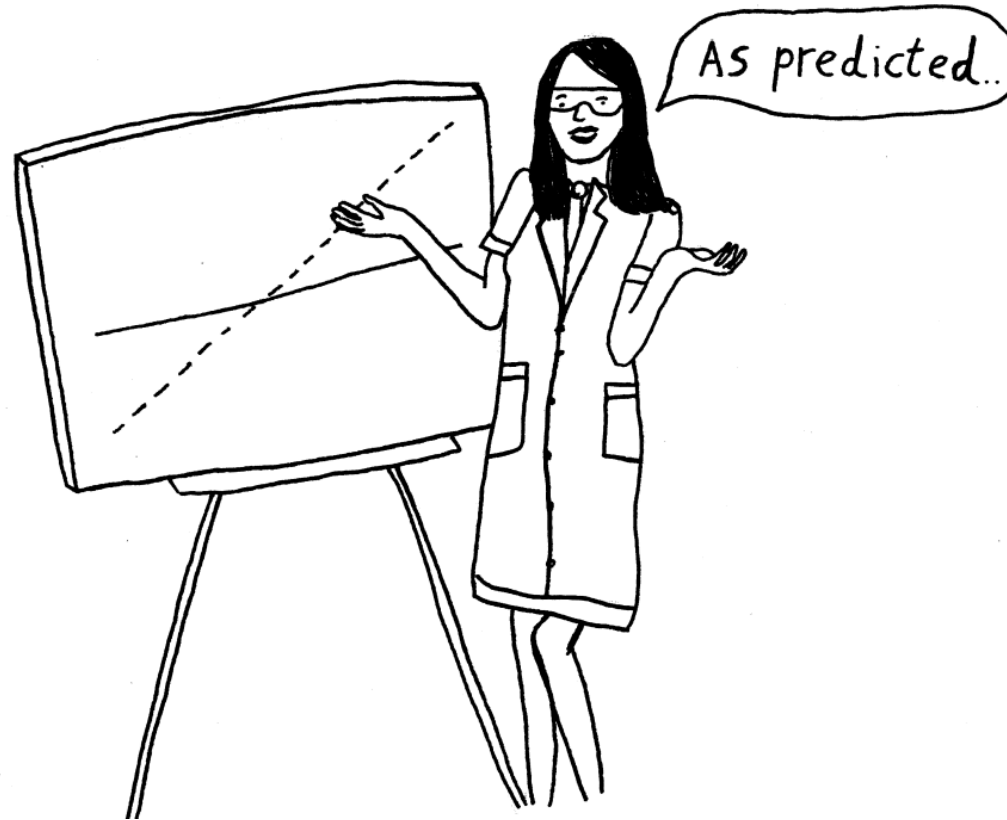


- Not afraid of falsification
- Transparent scientist
- Shields him/herself from bias

# What is a preregistration?

## Reasons for conducting preregs

### 5. Take credit for your ideas



# What is a preregistration?

## Essential elements

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff



### Essential

- Describe hypotheses as relationship between variables
- Describe shape of interaction effects
- Describe manipulation checks (or why they are not included)



### Recommended

- Figures / tables to describe interaction effects
- Rationales / theoretical frameworks to justify the hypotheses

# What is a preregistration?

## Essential elements



### Essential

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff

- Independent variables (describe variable, all levels, between- or within-person?)
- Dependent variables
- Third variables (covariates, moderators, control variables etc.)



# What is a preregistration?

## Essential elements



### Essential

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff

- Pre-selection rules (e.g., age limits)
- Where, from whom, and how will the data be collected?
- Justify planned sample size (power analysis or Bayesian design analysis)
- Describe data collection termination rule

# What is a preregistration?

## Essential elements

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff



### Essential

Describe all anticipated exclusion criteria, e.g.

- Missing, erroneous, overly consistent responses
- Failing check-tests or suspicion probes
- Demographic exclusions
- Data-based outlier criteria
- Method-based outlier criteria (e.g., too long response times)



### Recommended

- Set fail-save levels of exclusion at which whole study needs to be stopped, altered, and restarted

# What is a preregistration?

## Essential elements

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff



### Essential

Describe statistical analyses that test hypotheses. Include:

- Relevant variables and how they are calculated
- Statistical technique
- Each variable's role in the technique (e.g., IV, DV, covariate)
- If covariates are used: Rationale for using them
- For techniques other than NHST: criteria + inputs toward making conclusions about your hypotheses



### Recommended

- Multiple testing correction, missing data handling
- Anticipated data transformations
- Assumptions and assumption checks

# What is a preregistration?

## Essential elements



### Recommended

1. Hypotheses
2. Design
3. Planned sample
4. Exclusion criteria
5. Analysis plan
6. Additional stuff

- For exploratory analyses: „We don’t have any hypotheses“
- Transparency statement: How will research output be shared?
- Conditional safeguards: What will happen if...?

# How to practically conduct a preregistration

# Registered Report

## Preregistration & Publication

### Preregistration templates:

- [AsPredicted.org](https://aspredicted.org)
- [OSF Preregistration](https://osf.io/preregistration/)
- [International Open Science: A Preregistration Template for Quantitative Research in Psychology](https://www.open-science.com/open-science-preregistration-template-for-quantitative-research-in-psychology/)
- [Replication Recipe \(Brandt et al., 2013\): Pre-Registration](https://www.replication-recipe.com/pre-registration/)
- [Replication Recipe \(Brandt et al., 2013\): Post-Completion](https://www.replication-recipe.com/post-completion/)
- [Open-Ended Registration](https://open-ended-registration.com/)
- [Secondary Data Preregistration](https://secondary-data-preregistration.com/)
- [Pre-Registration in Social Psychology \(van t'Veer & Giner-Sorolla, 2016\)](https://pre-registration-social-psychology.com/)
- [BAM!!!Lab Study preregistration](https://bamlab.com/preregistration/)
- [Happy Lab Preregistration \(quite short\)](https://happy-lab.com/preregistration/)
- [...](#)

# Registered Report Preregistration & Publication



<http://aspredicted.org/>

## Pro:

- Easy „fill-the-blanks“ concept
- timestamped

## Con:

- Multiple private preregistrations possible, can remain private forever
- Not easy to find without the link

## AsPredicted Questions

(version 2.00)

This **blog post** on how to answer pre-registration questions may be a useful resource.

### 1) Data collection. Have any data been collected for this study already?

- o Yes, we already collected the data.
- o No, no data have been collected for this study yet.
- o It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.  
(Note: "Yes" is not an accepted answer.)

### 2) Hypothesis. What's the main question being asked or hypothesis being tested in this study?

**Example:** A month-long academic summer program for disadvantaged kids will reduce the drop in academic performance that occurs during the summer.

We **recommend** using up to about 3200 characters.

### 3) Dependent variable. Describe the key dependent variable(s) specifying how they will be measured.

**Example:** Simple average GPA across all courses during the first semester after the intervention.

### 4) Conditions. How many and which conditions will participants be assigned to?

**Example 1:** Two conditions: Offering summer program: yes vs. no. **Example 2:** 12 conditions in a mixed design lab study. Participants will be assigned to one of four conditions: math training, verbal training, memory task, or control (4 between-subject conditions). Each participant will complete a math test, a verbal test, and a memory test (3 within-subject conditions).

### 5) Analyses. Specify exactly which analyses you will conduct to examine the main question/hypothesis.

**Example:** Linear regression predicting the simple average GPA in the semester after the intervention with a dummy variable indicating whether the participant was offered the summer program or not (intention-to-treat-analysis). We will also conduct the same regression controlling for simple average GPA during the semester before the intervention, gender, & household income (an 8-point scale ranging from 1 = below \$20,000 and 8 = above \$150,000).

# Registered Report

## Preregistration & Publication



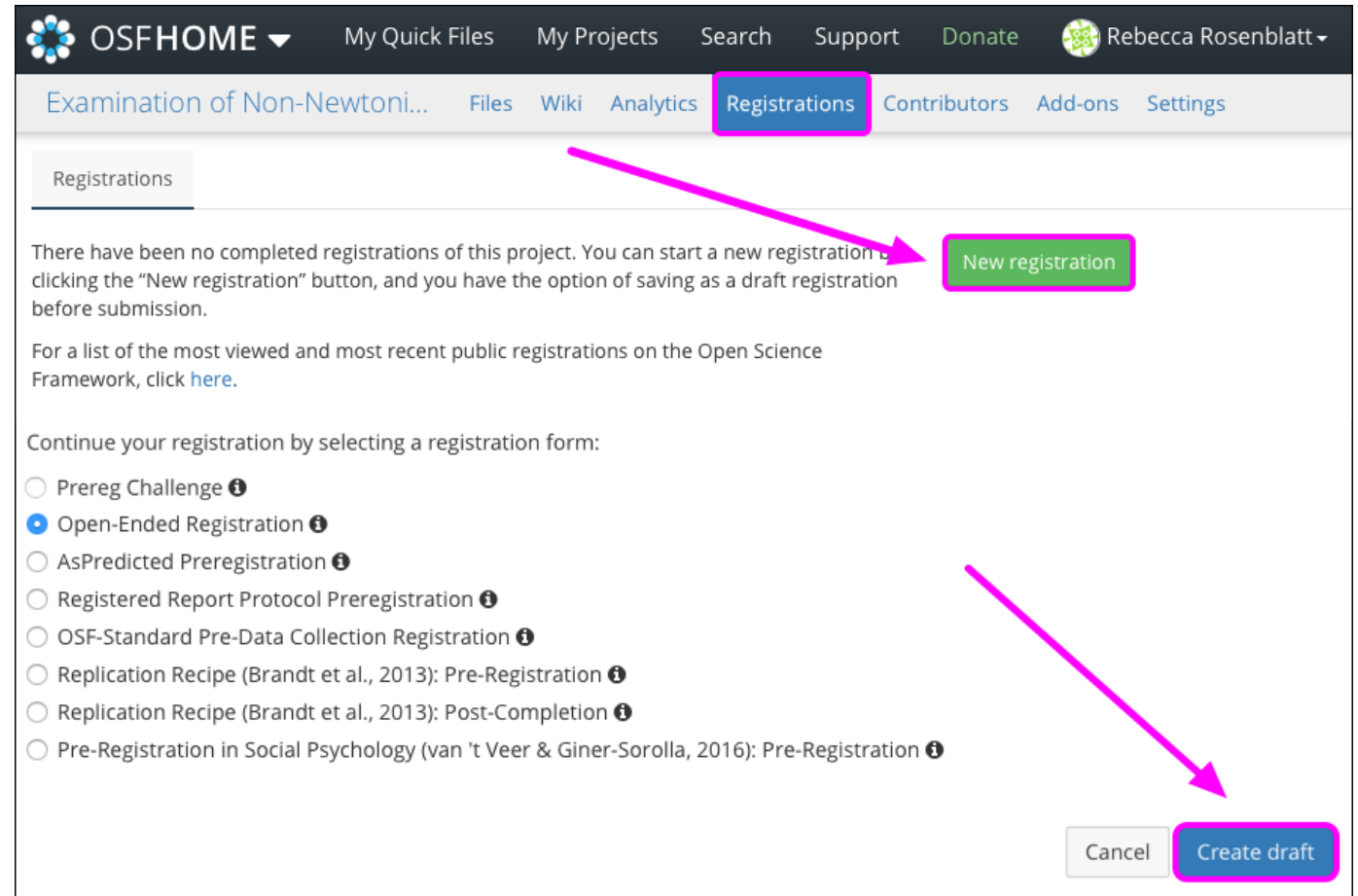
### Pro:

- coupled to OSF project
- timestamped
- flexible templates
- no max. file size

### Con:

- not 100% intuitive

Most easiest way: Write your preregistration as a PDF, upload to project, and choose „Open-ended Registration“

A screenshot of the OSFHOME website's "Registrations" page. The page has a dark blue header with the OSFHOME logo and navigation links: "My Quick Files", "My Projects", "Search", "Support", "Donate", and a user profile for "Rebecca Rosenblatt". Below the header is a light blue navigation bar with tabs: "Examination of Non-Newtoni...", "Files", "Wiki", "Analytics", "Registrations" (highlighted with a pink box), "Contributors", "Add-ons", and "Settings". The main content area has a "Registrations" sub-header. Below it, a text block states: "There have been no completed registrations of this project. You can start a new registration by clicking the 'New registration' button, and you have the option of saving as a draft registration before submission." A pink arrow points from the "Registrations" tab to a green "New registration" button. Below this, another text block says: "For a list of the most viewed and most recent public registrations on the Open Science Framework, click [here](#)." This is followed by a section titled "Continue your registration by selecting a registration form:" with a list of radio button options: "Prereg Challenge", "Open-Ended Registration" (selected with a blue dot), "AsPredicted Preregistration", "Registered Report Protocol Preregistration", "OSF-Standard Pre-Data Collection Registration", "Replication Recipe (Brandt et al., 2013): Pre-Registration", "Replication Recipe (Brandt et al., 2013): Post-Completion", and "Pre-Registration in Social Psychology (van 't Veer & Giner-Sorolla, 2016): Pre-Registration". A pink arrow points from the "Open-Ended Registration" option to a blue "Create draft" button at the bottom right, which is next to a grey "Cancel" button.

<http://help.osf.io/m/registrations/l/524205-register-your-project#!prettyPhoto>



# Registered Report

## Preregistration & Publication



### Other platforms and institutional repositories

- [GitHub.com](https://github.com)
- [Figshare.com](https://figshare.com)
- Clinical Trials: [clinicaltrials.gov](https://clinicaltrials.gov)
- American Economic Association's Registry: [socialscienceregistry.org](https://socialscienceregistry.org)
- Evidence in Governance and Politics: [egap.org/content/registration](https://egap.org/content/registration)

#### Pro:

- coupled to GitHub account
- timestamped
- flexible templates

#### Con:

- Not the first place to look for preregs
- No template provided
- GitHub now is owned by Microsoft (commercial interests)

# Registered Report

## Preregistration & Publication



### Other platforms and institutional repositories

- [GitHub.com](https://github.com)
- [Figshare.com](https://figshare.com)
- Clinical Trials: [clinicaltrials.gov](https://clinicaltrials.gov)
- American Economic Association's Registry: [socialscienceregistry.org](https://socialscienceregistry.org)
- Evidence in Governance and Politics: [egap.org/content/registration](https://egap.org/content/registration)

#### Pro:

- timestamped
- flexible templates
- altmetrics provided

#### Con:

- Not the first place to look for preregs
- No template provided
- Commercial platform

# Registered Report

# Registered Report

## Preregistration & Publication

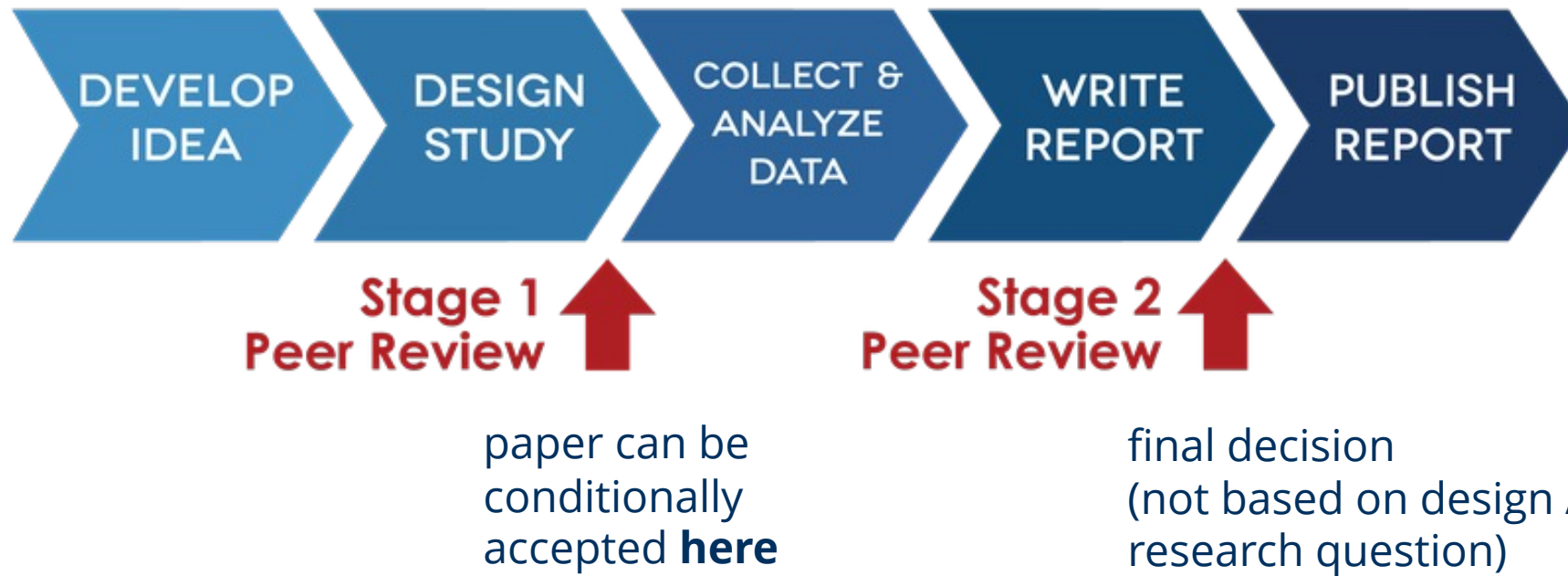
### Definition

“Registered Reports are a format of empirical article where a study proposal is reviewed before the research is undertaken. Pre-registered proposals that meet high scientific standards are then provisionally accepted before the outcomes are known, independently of their results.”

Chris Chambers (2016)

# Registered Report

## How does it work?



# Registered Report

## Availability of Registered Reports

Currently, over 300 journals use the Registered Reports publishing format

Applied Cognitive Psychology  
Behavioral Neuroscience  
Brain and Cognition  
Brain and Neuroscience Advances  
Cognition and Emotion  
Collabra  
Cortex  
Developmental Cognitive Neuroscience  
Developmental Science  
eNeuro  
European Journal of Neuroscience  
European Journal of Personality  
Experimental Psychology

Frontiers  
Journal of Cognition  
Journal of Experimental Psychology: LMC  
Journal of Personality  
Journal of Personality and Social Psychology  
Nature Communications  
Nature Human Behaviour  
NeuroImage Reports  
Open Psychology  
Personality Science  
PLOS ONE  
Psychological Science  
Scientific Reports  
Social Psychological Bulletin

# Advocatus Diaboli

# Advocatus Diaboli



**But...**

... preregistration keeps me from conducting exploratory research!



- Improving your confirmatory research does not mean that you have to refrain from doing exploratory research
- You can also preregister your exploratory research (e.g., planned analysis methods)



# Advocatus Diaboli



**But...**

... preregistration takes so much time!



- Actually it might even save you time during data analysis / interpretation
- Preregistration mostly changes the order of the research process (e.g., think about how to analyze your data *before* / *after* you collect them)

# Advocatus Diaboli



**But...**

... someone will steal my ideas!



- On the contrary: By preregistering your ideas you mark them as yours! If anyone still dares to steal them, it will be very easy to point this out as scientific misconduct.

# Advocatus Diaboli



**But...**

... what if I (or my students) make mistakes in the preregistration?



- Everyone makes mistakes, no need to be embarrassed!
- You can always deviate from your preregistered analysis if you give a good justification.
- If you make your preregistration open and someone finds a mistake, consider yourself lucky because this spares you finding it out when it is too late.

# Advocatus Diaboli



**But...**

... people preregister stuff and then deviate significantly from the preregistration. What is it good for then?



- As a reviewer, it should make you vigilant about the quality of the paper → require justifications for deviations from the preregistration
- As a reader, you will be able to judge the quality of results (do they come from confirmatory or exploratory research?)
- It helps you to spot QRPs.

# Exercise

# Exercise

## Preregistration



### Sample 5 - SUMMER PROGRAMS - GPA performance, Chicago, July 2016 (#578)

**Author(s)**

Larry TheRobot (AsPredicted College) - larry@aspredicted.org

**Created:** 04/07/2016

**Made public:** 04/07/2016

**1) What's the main question being asked or hypothesis being tested in this study?**

A month-long academic summer program for disadvantaged kids will reduce the drop in academic performance that occurs during the summer.

**2) Describe the key dependent variable(s) specifying how they will be measured.**

Simple average GPA across all courses during the first semester after the intervention.

**3) How many and which conditions will participants be assigned to?**

Two conditions: Offering summer program: yes vs no.

**4) Specify exactly which analyses you will conduct to examine the main question/hypothesis.**

Linear regression predicting the dependent variable with a dummy indicator for having been offered the summer program vs not (intention-to-treat analysis). We will also report results when controlling for baseline levels of the dependent variable (simple GPA average semester before training), gender & household income.

**5) Any secondary analyses?**

The effect may be larger for boys rather than girls, and for children living with one rather than two parents/guardians.

**6) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.**

We will offer the program until 500 people have agreed to participate in it or until June 30, 2016 (whichever comes first).

**7) Anything else you would like to pre-register? (e.g., data exclusions, variables collected for exploratory purposes, unusual analyses planned?)**

We include a battery of questions for exploratory purposes including happiness, videogame playing and family activity. We will also collect data on a survey with 24 questions and will report the results of those data in a separate project.

**8) Have any data been collected for this study already?**

No, no data have been collected for this study yet

## Discussion:

Do you think this is a good or bad preregistration?

What would you change?

# Summary

# Summary

## Preregistration

### How can you improve your OS record (almost) without effort?

1. **As a reviewer:** ask the authors which analyses are confirmatory and which exploratory
2. **As a researcher:** write down your hypotheses/expectations before you start your studies
3. **Always:** Interfere when someone wants to exploit researcher degrees of freedom to “prove” an effect





# Further recommendations

# Further Recommendations

## Preregistration

### Who to ask?

- Center for Open Science Preregistration Coaching Network: <https://cos.io/blog/preregistration-coaching-network/>
- Registered Reports FAQ (by Chris Chambers): <https://cos.io/rr/> (see „FAQ“ tab)
- Registered Reports: Editor of your RR journal
- Ask Open Science Initiative (e.g., OSIP @TUD): <https://tu-dresden.de/mn/psychologie/die-fakultaet/open-science>

OPEN SCIENCE INITIATIVE

**OSIP** Open Science Initiative  
der Fakultät Psychologie der TUD

# Further Ressources

## Important Links

- COS (2018). *Registered Reports: Peer review before results are known to align scientific values and practices*. Available on [cos.io/rr/](https://cos.io/rr/)
- Lin, W. & Green, D.P. (2016). Standard operating procedures: A safety net for pre-analysis plans. *PS: Political Science & Politics*, 49(03), 495-500. [stat.berkeley.edu/~winston/sop-safety-net.pdf](https://stat.berkeley.edu/~winston/sop-safety-net.pdf)
- Nosek, B.A. & Lindsay, S. (2018). Preregistration becoming the norm in psychological science. *APS Observer*, 31(3). Available on [psychologicalscience.org/observer/preregistration-becoming-the-norm-in-psychological-science](https://psychologicalscience.org/observer/preregistration-becoming-the-norm-in-psychological-science).
- Schönbrodt, F. S., Scheel, A., & Stachl, C. (2017). *LMU workshop „pre-registration“*. Slides available on [osf.io/yd487/](https://osf.io/yd487/)
- van t’Veer, A.E. & Giner-Sorolla, R. (2016). Pre-registration in social psychology: A discussion and suggested template. *Journal of Experimental Social Psychology*, 67, 2-12. [osf.io/56g8e/](https://osf.io/56g8e/)

# Further Ressources

## References

- Chambers, C. (2016). Interview by Alice Power on the Royal Society Publishing blog. *Registered reports: What are they and why are they important?* Available on [blogs.royalsociety.org/publishing/registered-reports-what-are-they-and-why-are-they-important/](https://blogs.royalsociety.org/publishing/registered-reports-what-are-they-and-why-are-they-important/)
- Kothari, C.R. (2004). *Research methodology: Methods and techniques*. (2nd ed.) New Delhi: New Age International. Available on <https://goo.gl/16aqXQ>.
- Lin, W. & Green, D.P. (2016). Standard operating procedures: A safety net for pre-analysis plans. *PS: Political Science & Politics*, 49(03), 495-500. [stat.berkeley.edu/~winston/sop-safety-net.pdf](https://stat.berkeley.edu/~winston/sop-safety-net.pdf)
- Munafò, M. R., Nosek, B. A., Bishop, D. V. M., Button, K. S., Chambers, C. D., Percie du Sert, N., . . . Ioannidis, J. P. A. (2017). A manifesto for reproducible science. *Nature Human Behaviour*, 1(21) doi: [10.1038/s41562-016-0021](https://doi.org/10.1038/s41562-016-0021)
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- Schönbrodt, F. D. & Wagenmakers, E.-J. (2017). Bayes factor design analysis: Planning for compelling evidence. *Psychonomic Bulletin & Review*. 1-15. doi: [10.3758/s13423-017-1230-y](https://doi.org/10.3758/s13423-017-1230-y)
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- Wagenmakers, E.-J. & Dutilh, G. (2016). Seven selfish reasons for preregistration. *APS Observer*, 29(9). Available on [psychologicalscience.org/issue/nov-16](https://psychologicalscience.org/issue/nov-16)
- Wagenmakers, E.-J., Wetzels, R., Borsboom, D., Maas, H. L. J. v. d., & Kievit, R. A. (2012). An agenda for purely confirmatory research. *Perspectives on Psychological Science*, 7(6), 632–638. doi: [10.1177/1745691612463078](https://doi.org/10.1177/1745691612463078)
- van t’Veer, A.E. & Giner-Sorolla, R. (2016). Pre-registration in social psychology: A discussion and suggested template. *Journal of Experimental Social Psychology*, 67, 2-12. [osf.io/56g8e/](https://osf.io/56g8e/)

# Science isn't broken

It's just a hell of a lot harder than we give it credit for.



# Thank you!