The Benefits and Limitations of Preregistration and Registered Reports

Dr. Markus Konkol, Open Science Officer at ITC

Slides based on: Reedy, M., Mellor, D. T., Montoya, A. K., & Rambo-Hernandez, K. E. (2021, February 5). Deep Dive into Open Scholarship: Preregistration and Registered Reports. Retrieved from osf.io/58xc9

Agenda

OS Kitchen
(Dis)advantages of pre-registration of (modelling) study
Reproduciblity --> executable paper discussing possible tools (perhaps leading to a workshop later on) . Inventory of current practices (Raul)
making your work reproducible is extra effort - how to make sure that you get something out of this effort (recognition, citations, learning, collaborations, ...)
Open Science when using individual (identifiable) person data > legal issues etc.

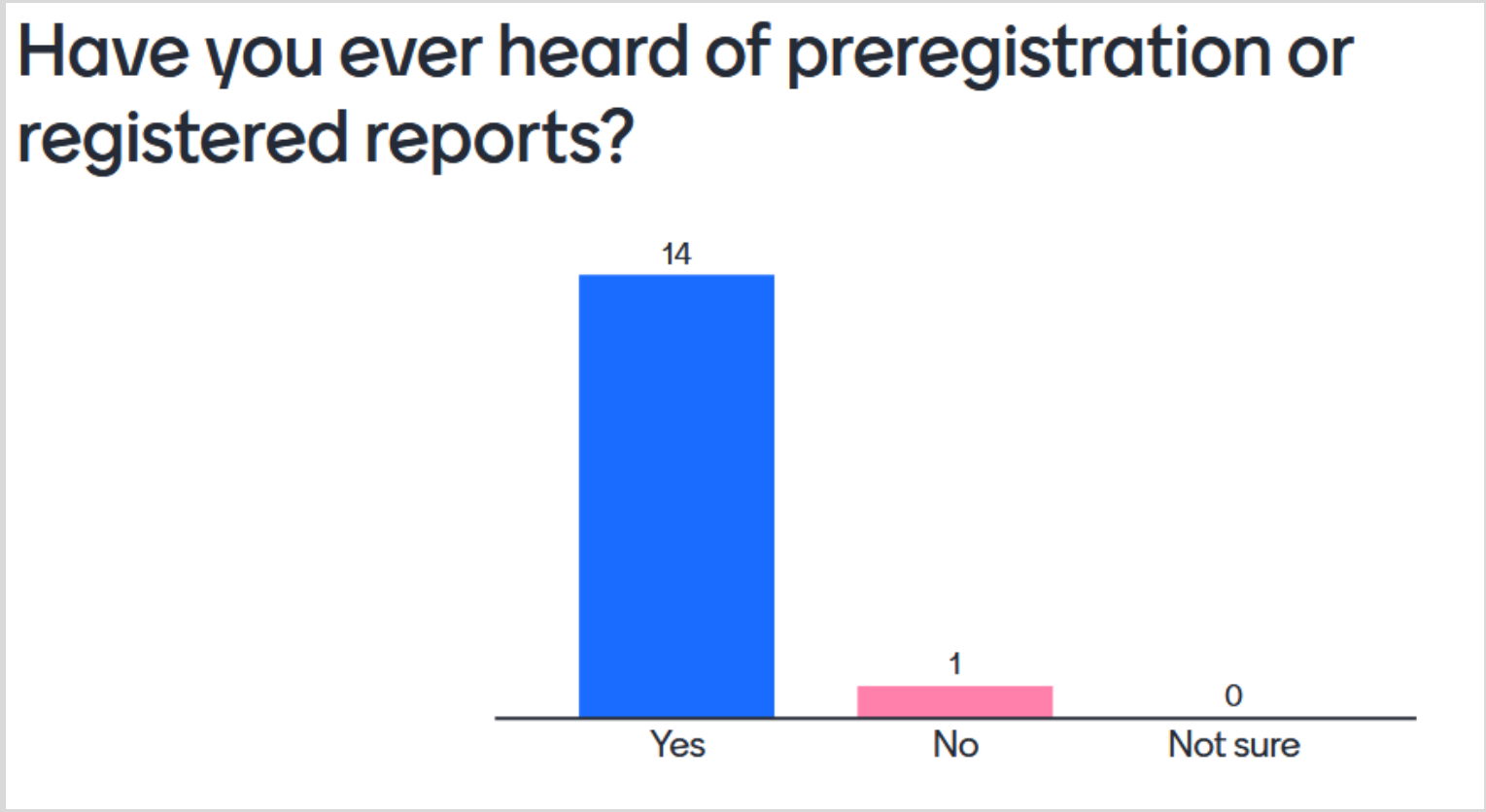
What's the problem?

What does Preregistration mean?

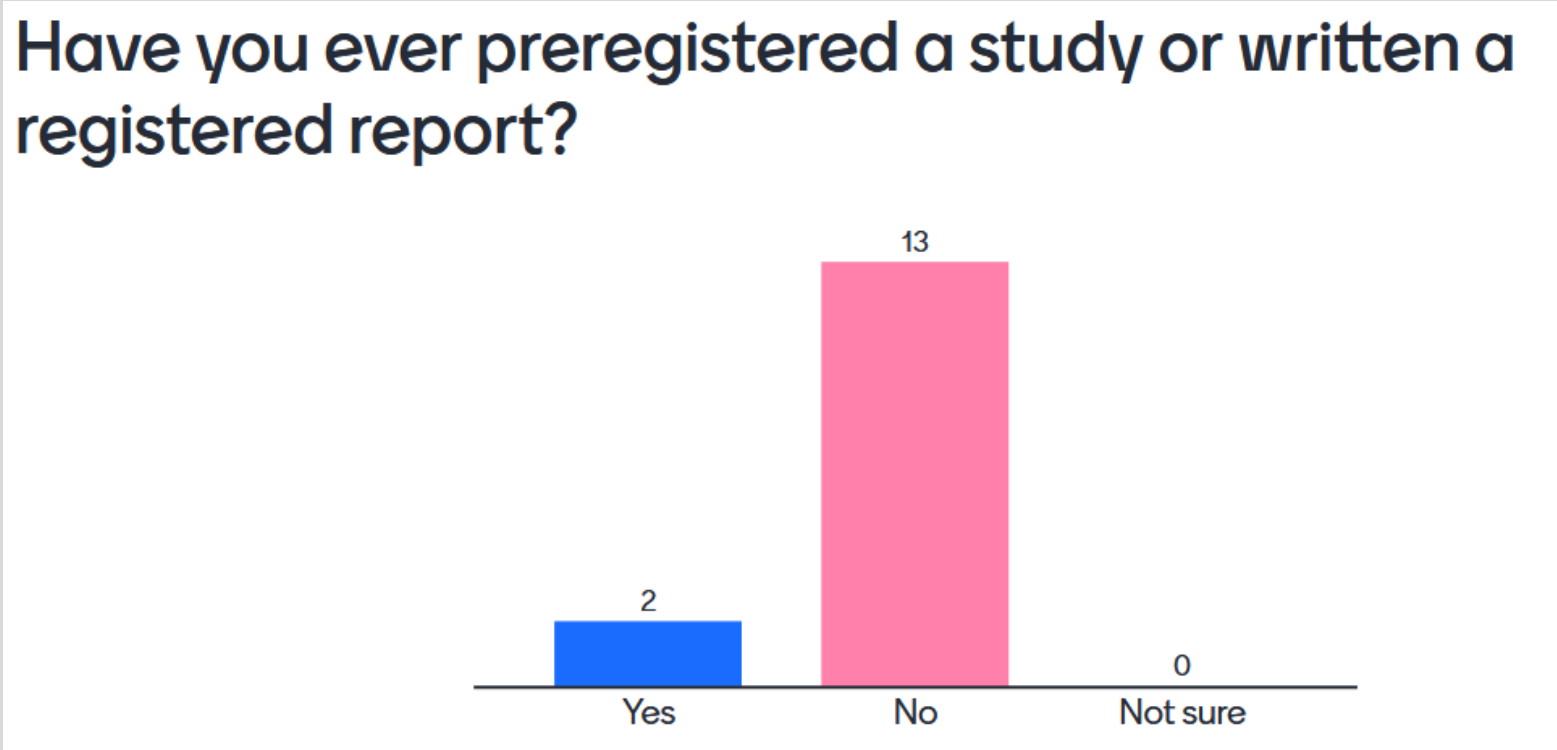
What are Registered Reports?

Discussion

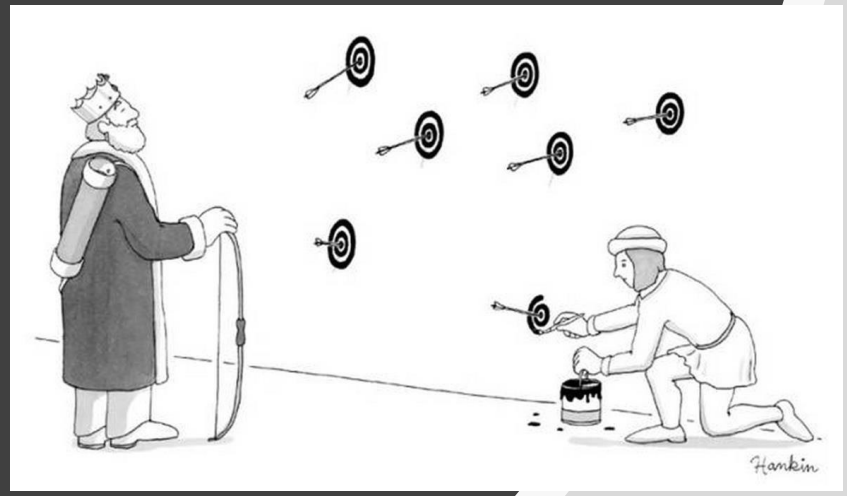
Quick survey



Quick survey



What's the problem?



By Charlie Hankin

Questionable research practices

- HARKing (**H**ypothesizing **A**fter **R**esults are **K**nown)
  - Switching from *explorative research* to *hypothesis testing*
  - Generating hypotheses vs. testing hypotheses
- P-hacking
  - Tune data analysis to achieve significant p-value
- Selective Reporting
  - Report only on positive results ("cherry picking")

Drawbacks related to the scientific system

- Publication bias ("file drawer problem")
- Late feedback from reviewers

Bouter, L. What Research Institutions Can Do to Foster Research Integrity. Sci Eng Ethics 26, 2363–2369 (2020). https://doi.org/10.1007/s11948-020-00178-5

Tamarinde L. Haven & Dr. Leonie Van Grootel (2019) Preregistering qualitative research, Accountability in Research, 26:3, 229-244, DOI: 10.1080/08989621.2019.1580147

What is preregistration?

"Preregistration of an analysis plan is committing to analytic steps without advance knowledge of the research outcomes. That commitment is usually accomplished by posting the analysis plan to an independent registry […]" (Nosek et al. 2018)

- Usually done **after** you finished designing the study **and before** you started data collection
- Typically, **independent** of a journal
- Requires **approval** from all authors before submission
- Timestamped
- DOI (cannot be deleted or edited)
- Public or embargoed

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., Mellor, D. T. (2018): The Preregistration revolution. Proceedings of the National Academy of Sciences, 115 (11) 2600-2606; DOI: 10.1073/pnas.1708274114

What is preregistration?

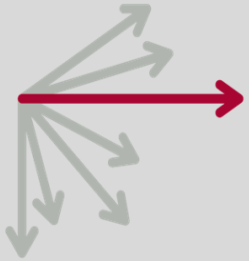
Preregistration of a study typically includes:

- Hypotheses or research questions
- Sample Size Plan
- Key variables and how they are measured
- Experimental conditions
- Exclusion/Inclusion criteria
- Analysis plan

Wicherts, J. M., Veldkamp, C. L., Augusteijn, H. E., Bakker, M., Van Aert, R., & Van Assen, M. A. (2016). Degrees of freedom in planning, running, analyzing, and reporting psychological studies: A checklist to avoid p-hacking. *Frontiers in psychology*, *7*, 1832. https://doi.org/10.3389/fpsyg.2016.01832

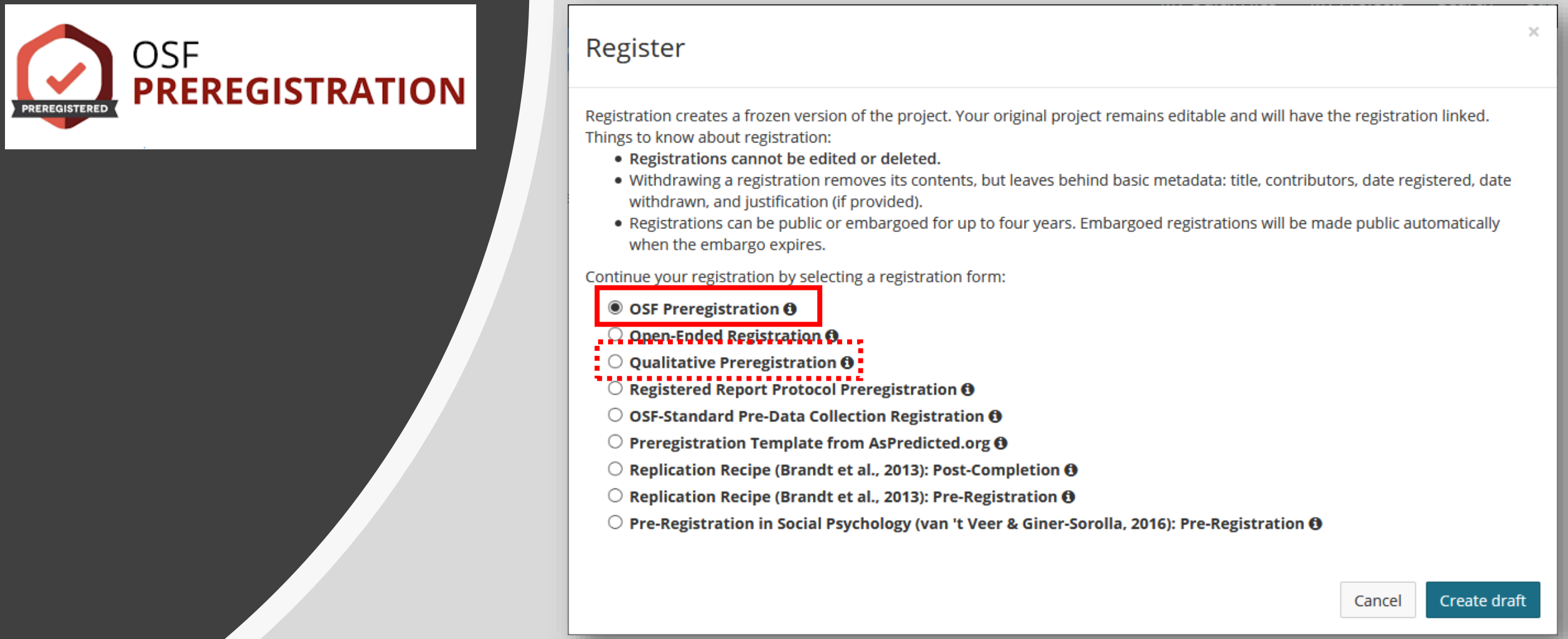
Where to preregister?

OSF
PREREGISTRATION



AS PREDICTED

OSF
PREREGISTRATION



https://help.osf.io/hc/en-us/articles/360019738834-Create-a-Preregistration

OSF
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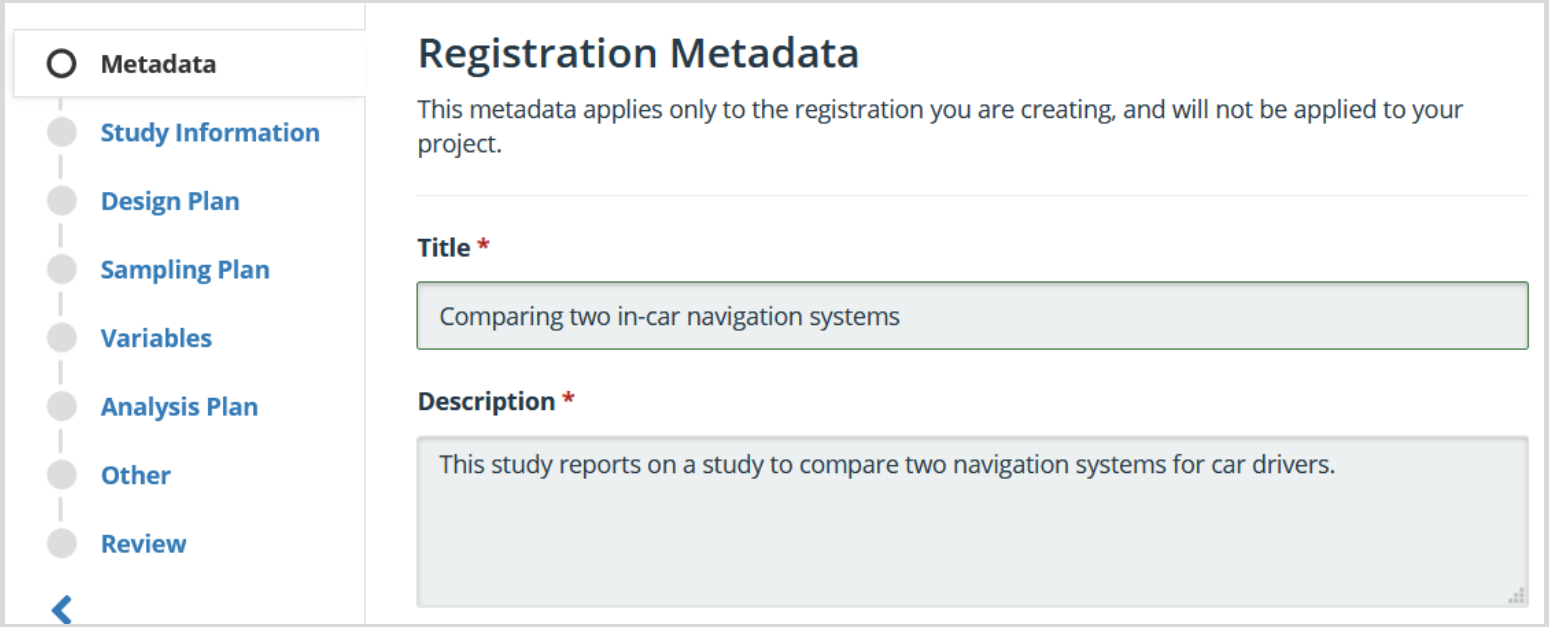

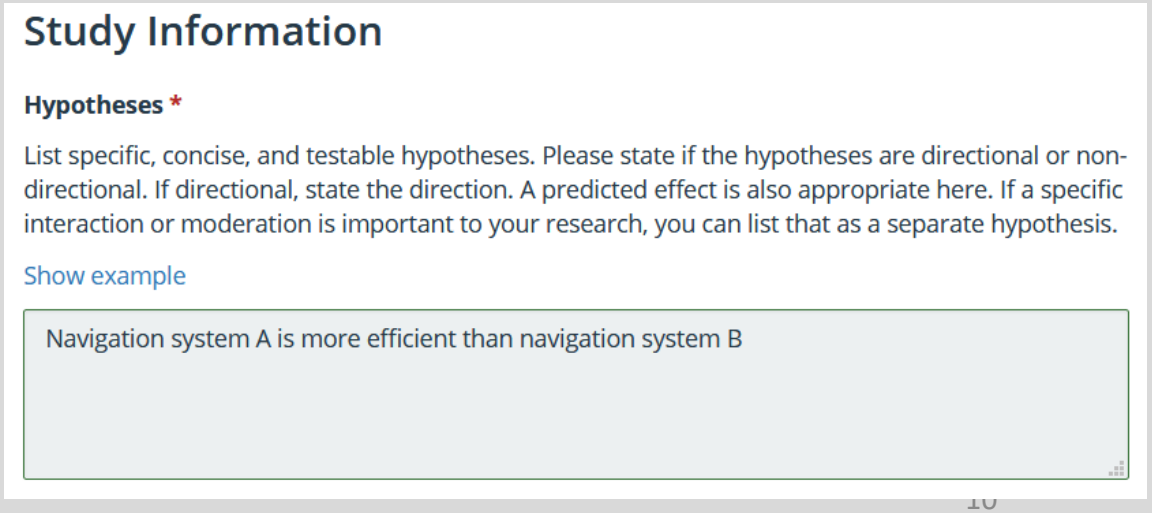

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OSF PREREGISTRATION

Study design *

Describe your study design. The key is to be as detailed as is necessary given the specific parameters of the design. There may be some overlap between this question and the following questions. That is OK, as long as sufficient detail is given in one of the areas to provide all of the requested information. Examples include two-group, factorial, randomized block, and repeated measures. Is it a between (unpaired), within-subject (paired), or mixed design? Describe any counterbalancing required.

Show example

Participants will first use navigation system A to reach target 1 and then navigation system B to reach target 2....

Sampling Plan

Existing Data *

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. See https://cos.io/prereg for more information.

- (●) 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

https://help.osf.io/hc/en-us/articles/360019738834-Create-a-Preregistration

OSF
PREREGISTRATION

Analysis Plan

Statistical models *

What statistical model will you use to test each hypothesis? Please include the type of model (e.g. ANOVA, RMANOVA, MANOVA, multiple regression, SEM, etc) and the specification of the model. This includes each variable that will be included, all interactions, subgroup analyses, pairwise or complex contrasts, and any follow-up tests from omnibus tests. If you plan on using any positive controls, negative controls, or manipulation checks you may mention that here. Provide enough detail so that another person could run the same analysis with the information provided. Remember that in your final article any test not included here must be noted as exploratory and that you must report the results of all tests.

Show example

We will use ANOVA to compare the navigation times.

https://help.osf.io/hc/en-us/articles/360019738834-Create-a-Preregistration

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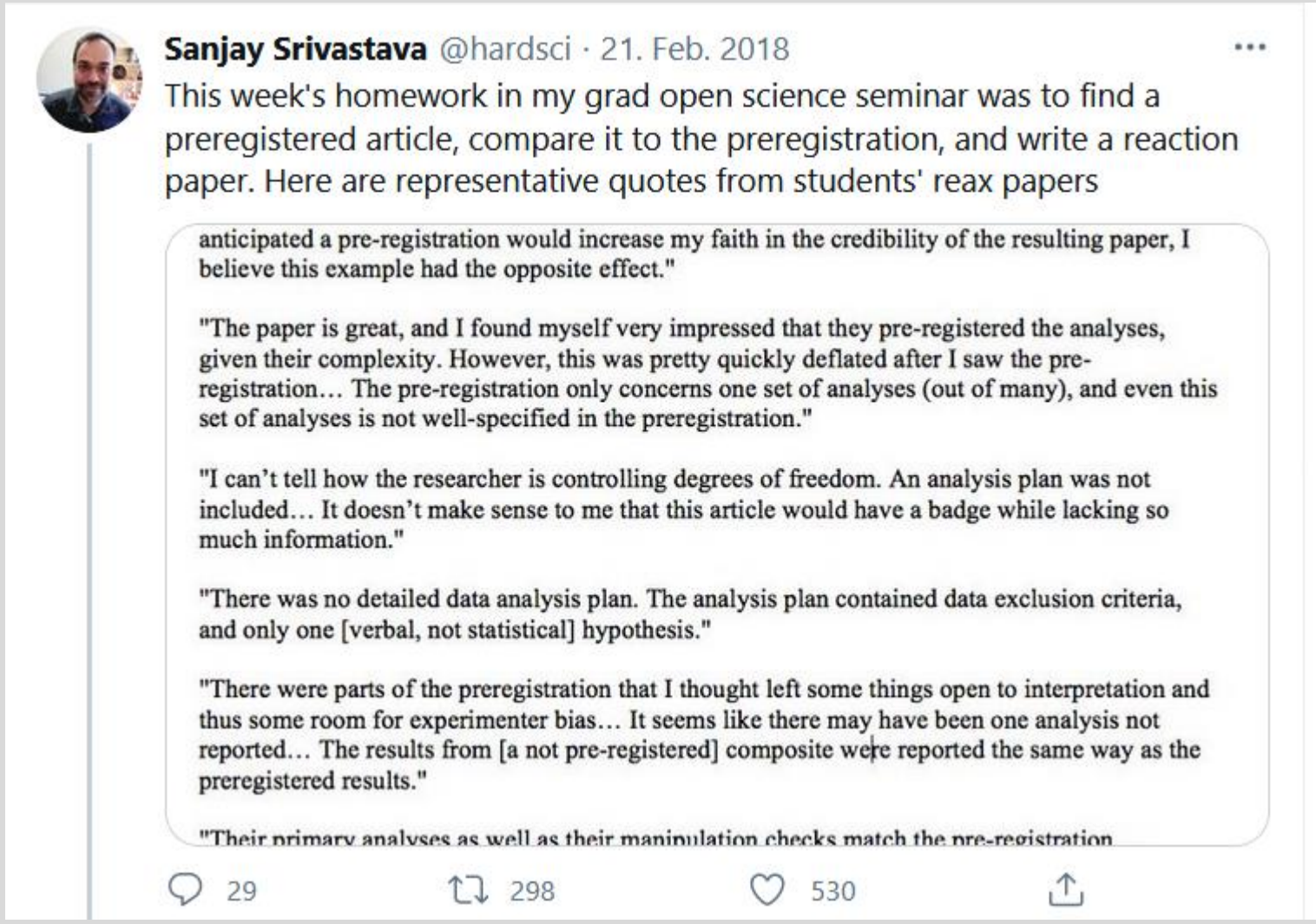
Limitations of preregistration



Sanjay Srivastava @hardsci · 21. Feb. 2018

This week's homework in my grad open science seminar was to find a preregistered article, compare it to the preregistration, and write a reaction paper. Here are representative quotes from students' reax papers

anticipated a pre-registration would increase my faith in the credibility of the resulting paper, I believe this example had the opposite effect."

"The paper is great, and I found myself very impressed that they pre-registered the analyses, given their complexity. However, this was pretty quickly deflated after I saw the pre-registration… The pre-registration only concerns one set of analyses (out of many), and even this set of analyses is not well-specified in the preregistration."

"I can't tell how the researcher is controlling degrees of freedom. An analysis plan was not included… It doesn't make sense to me that this article would have a badge while lacking so much information."

"There was no detailed data analysis plan. The analysis plan contained data exclusion criteria, and only one [verbal, not statistical] hypothesis."

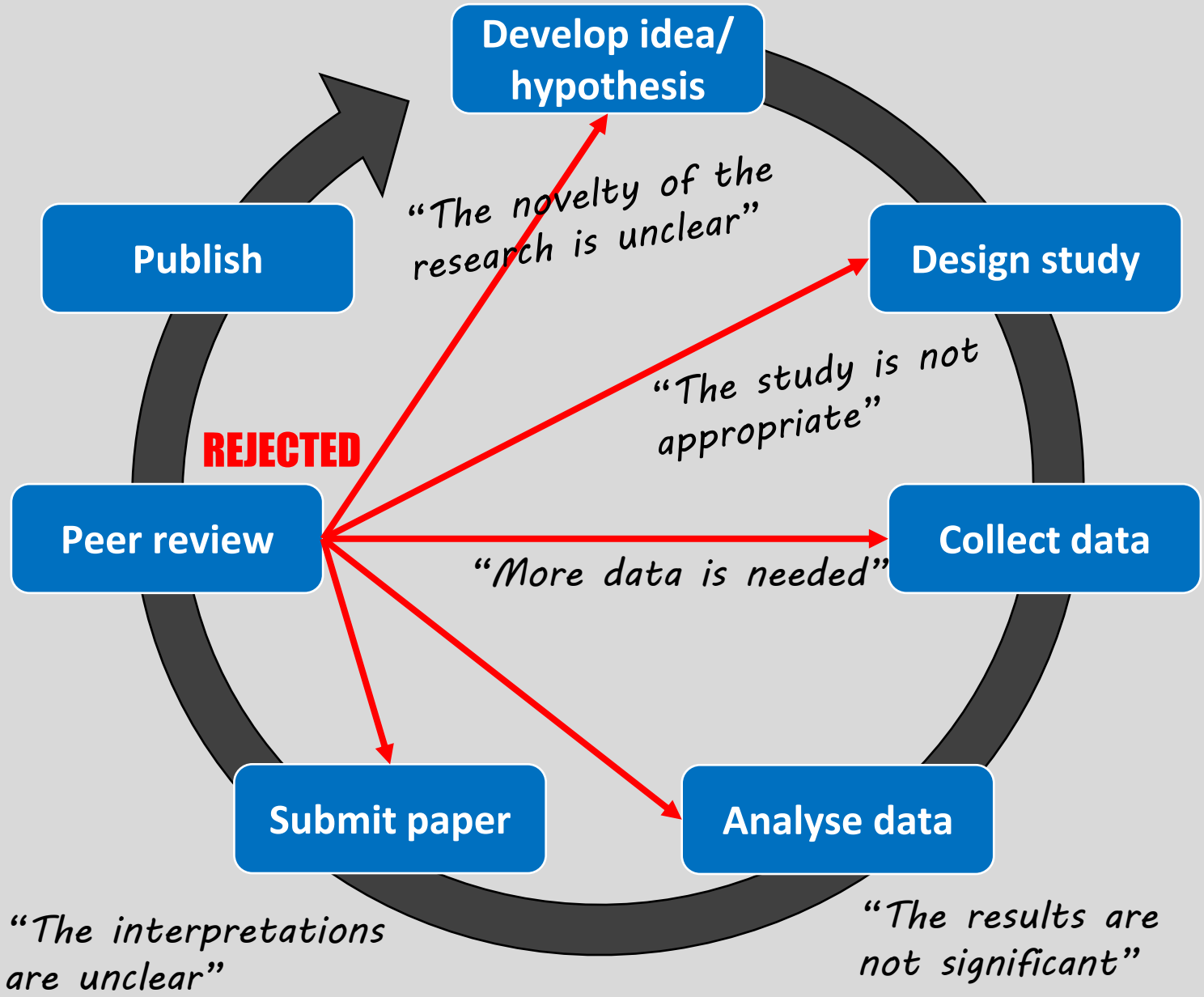
"There were parts of the preregistration that I thought left some things open to interpretation and thus some room for experimenter bias… It seems like there may have been one analysis not reported… The results from [a not pre-registered] composite were reported the same way as the preregistered results."

"Their primary analyses as well as their manipulation checks match the pre-registration

29 298 530

https://twitter.com/hardsci/status/966096799151747072?lang=de

Limitations of preregistration



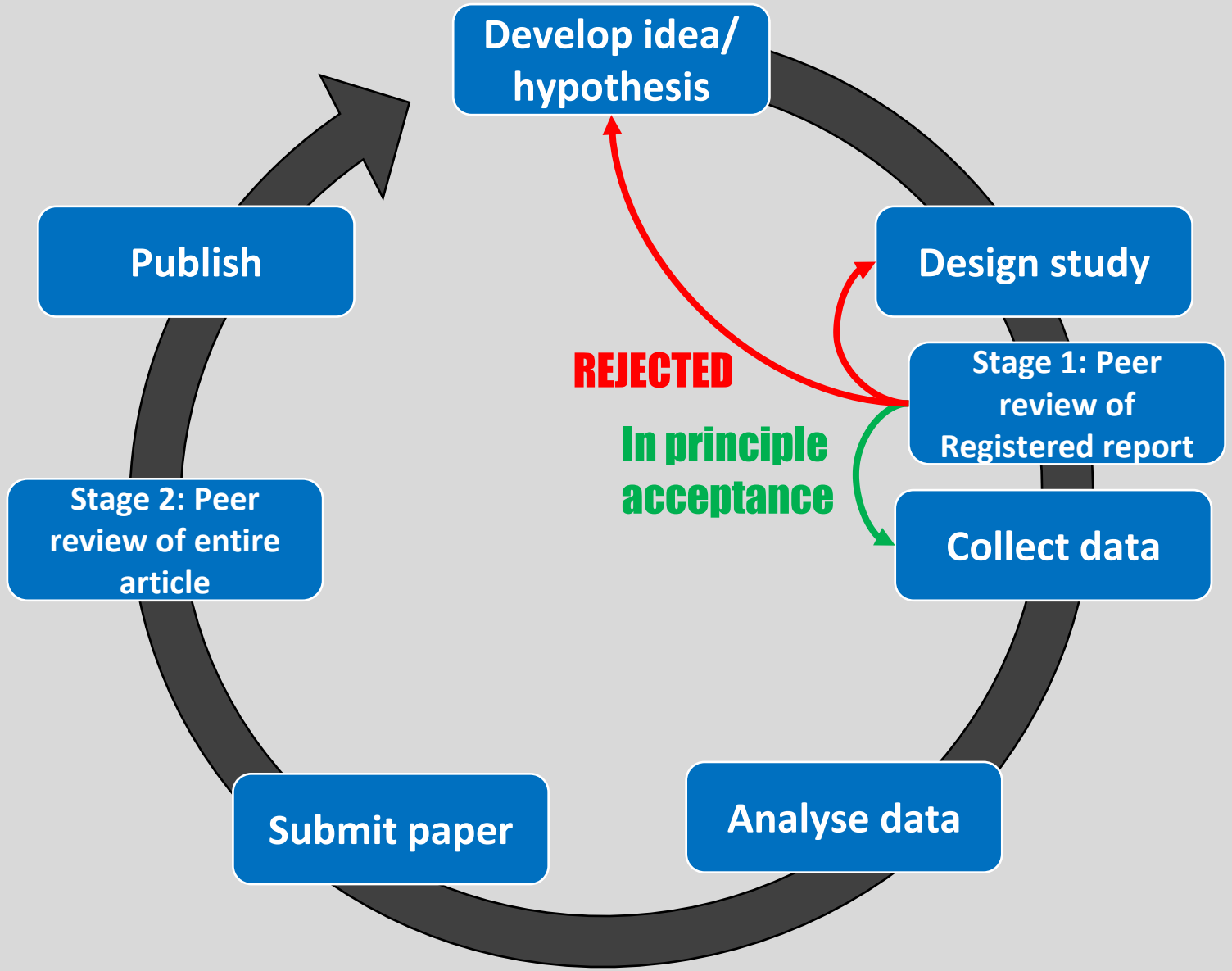
Based on https://www.fosteropenscience.eu/content/what-open-science-introduction

Registered Reports

- Usually done **after** you finished designing the study **and before** you started data collection
- Submitted to a journal and peer-reviewed

  → Typically, **not independent** of a journal
- Guaranteed publication after acceptance independent of positive or negative results
- Contains:
  - Introduction
  - Literature Review
  - Methods
  - Analysis Plan (potentially with results based on dummy data)

Registered Reports



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Benefits of Registered Reports

“Registered Reports eliminates the bias against negative results in publishing because the results are not known at the time of review."

Daniel Simons, Professor at University of Illinois

"Because the study is accepted in advance, the incentives for authors change from producing the most beautiful story to the most accurate one."

Chris Chambers, Professor at Cardiff University

https://www.cos.io/initiatives/registered-reports

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Limitations of Registered Reports

- Careful time management and planning required
- Not possible if data collection is about to start
- Not recommended if you are under time pressure
- Hardly feasible if grant deadlines are close
- Difficult to combine with student projects
- Still not provided by many journals/conferences
- A well thought-out analysis plan is not easy

Preregistration vs. Registered Reports

	Preregistration	Registered Reports
Length	Flexible	Intro, Related Work, Methods, (Results)
When peer reviewed	After research is done and report is written	Before data collection
Changes possible	Yes (with good reasons)	Yes (with good reasons)
Increases transparency	Yes	Yes
Prevents HARKing	Yes	Yes
Prevents p-hacking	Yes	Yes
Prevents selective reporting	Yes	Yes
Prevents publication bias	No	Yes
Early feedback from reviewers	No	Yes
Number of reviews	1 (if at all)	2
Independent of a journal	Yes	No
Pick journal early	No	Yes
Guaranteed publication	No	Yes
Approval from all authors requ.	Yes	Yes
Timestamped, DOI	Yes	Yes
Needs careful time management	No	Yes
Possible under time pressure	Yes	No
Public or embargoed	Yes	Yes

Open Questions

Why are preregistrations and registered reports still uncommon in some disciplines (e.g. geoscience, social science) and how can we promote them a bit more?

Open Questions

Where do you see benefits and limitations in the context of pre-registration/registered reports?

Open Questions

- Where do you see benefits and limitations in the context of pre-registration/registered reports?
- What is needed for successful preregistration/registered reports?
- What are your experiences with preregistration/registered reports?
- Why haven’t you done that, yet? Do you have any concerns?
- Why are preregistrations and registered reports still uncommon in some disciplines (e.g. geoscience, social science) and how can we promote them a bit more?

What else?

- **Before you leave, a little evaluation:** https://openscience.utwente.nl/index.php/799588?lang=en
- Database of journals providing registered reports: https://www.cos.io/initiatives/registered-reports
- Many examples: https://www.zotero.org/groups/479248/osf/collections/KEJP68G9
- Preregistration of qualitative studies https://www.youtube.com/watch?v=BNf9totTA_4&t=569s
- **Spread the word**

- Next OS Kitchen: 25th March at 14:00

Twitter: @OSCTwente