The Impact of Open Science

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Open Science and Reproducible Research

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Open Science = "Open" in all shades + Reproducible Research

- "Open" as without a barrier i.e. freely accessible + reusable
- "open" as being completely open, honest, transparent
- "open" as being open for inputs from others

Making research openly accessible and reusable

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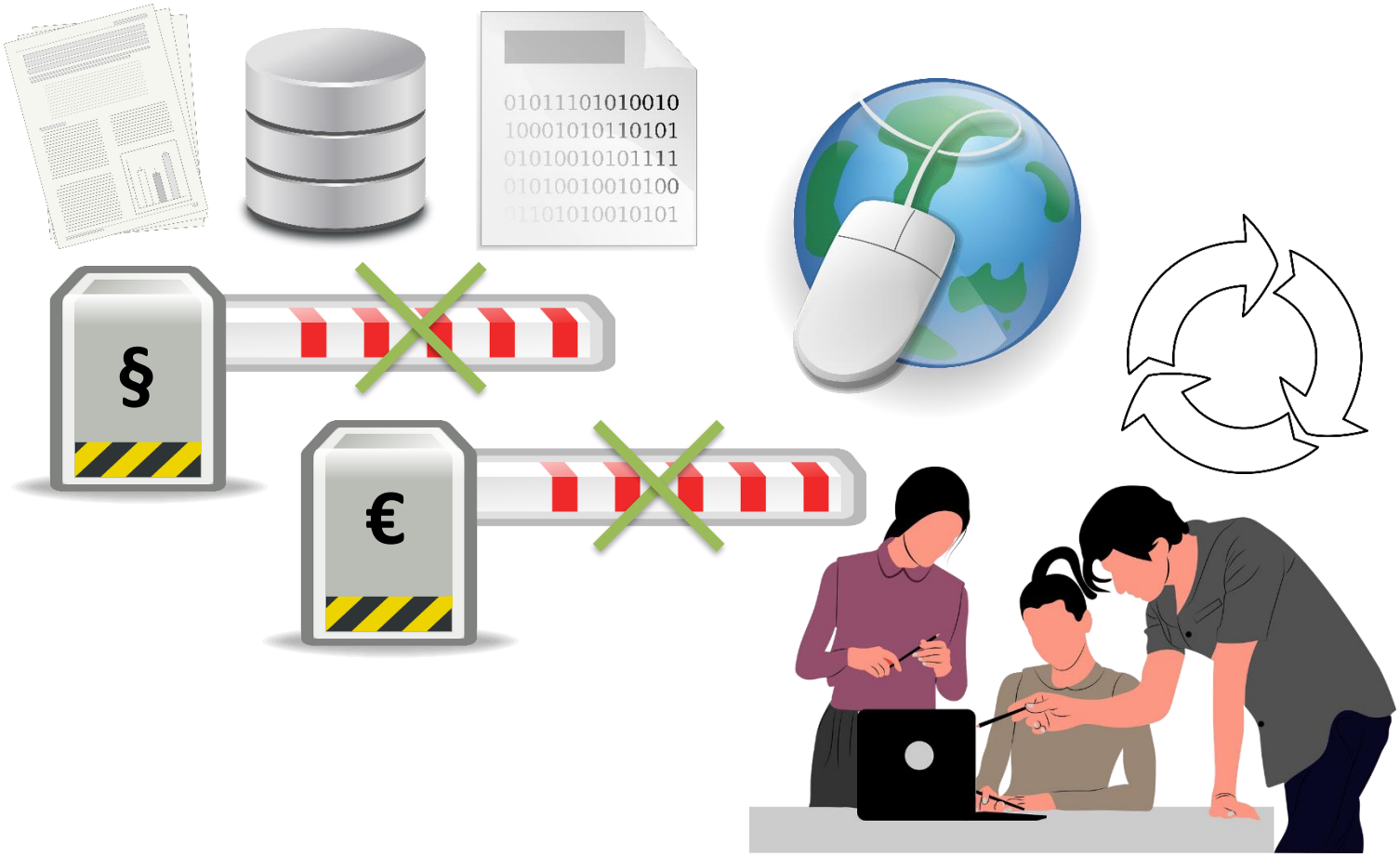

Institutional repository, accessed world-wide

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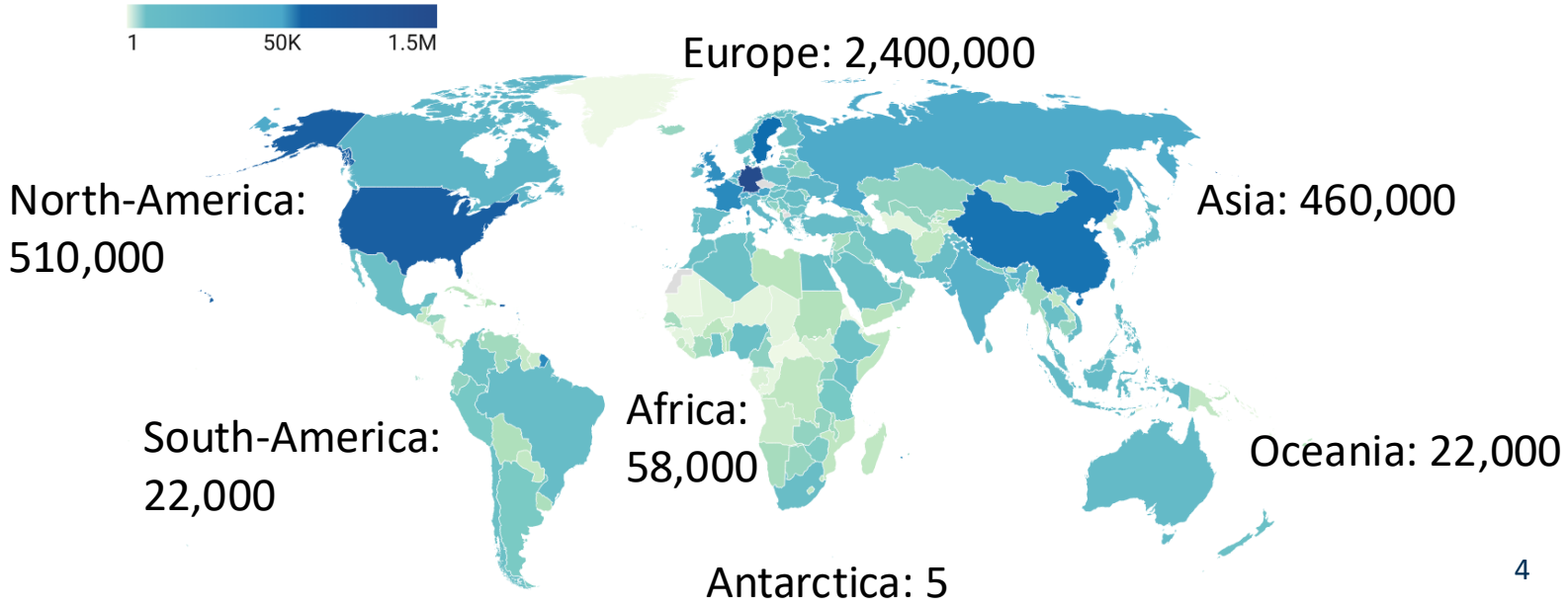
MADOC institutional repository of the University of Mannheim

8,400 entries (17%) with full-text (+630 from last year)

3.8 mio downloads (since 2011)



Making research transparent

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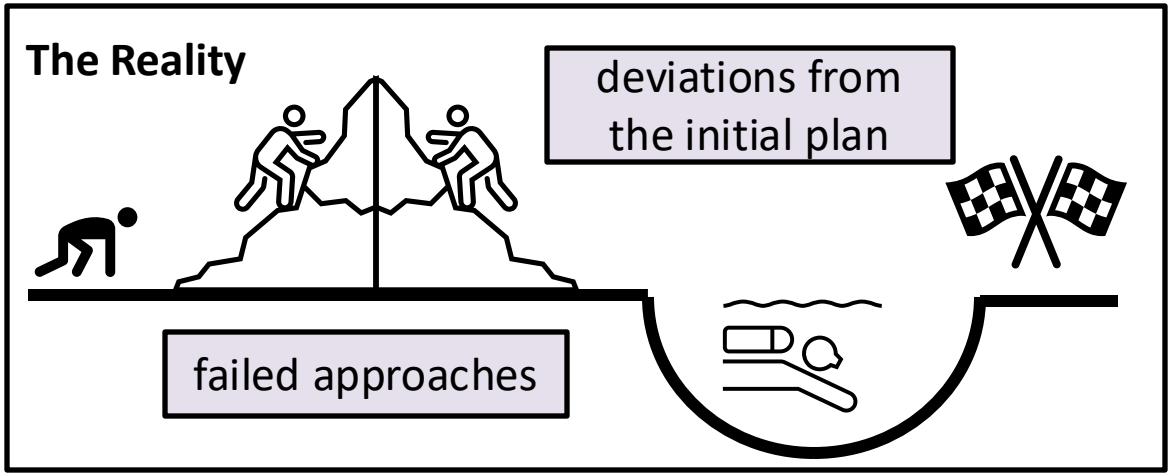
published literature

positive results



share plans + intermediate results

Preregistering initial research plans

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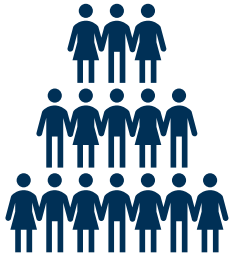
What is a pre-registration?

A preregistration is a document describing your initial research plans **before** conducting your research.



Data Collection

Deviations from initial plans are transparent, can be identified, + justified.

Making research transparent– with preregistration and registered reports

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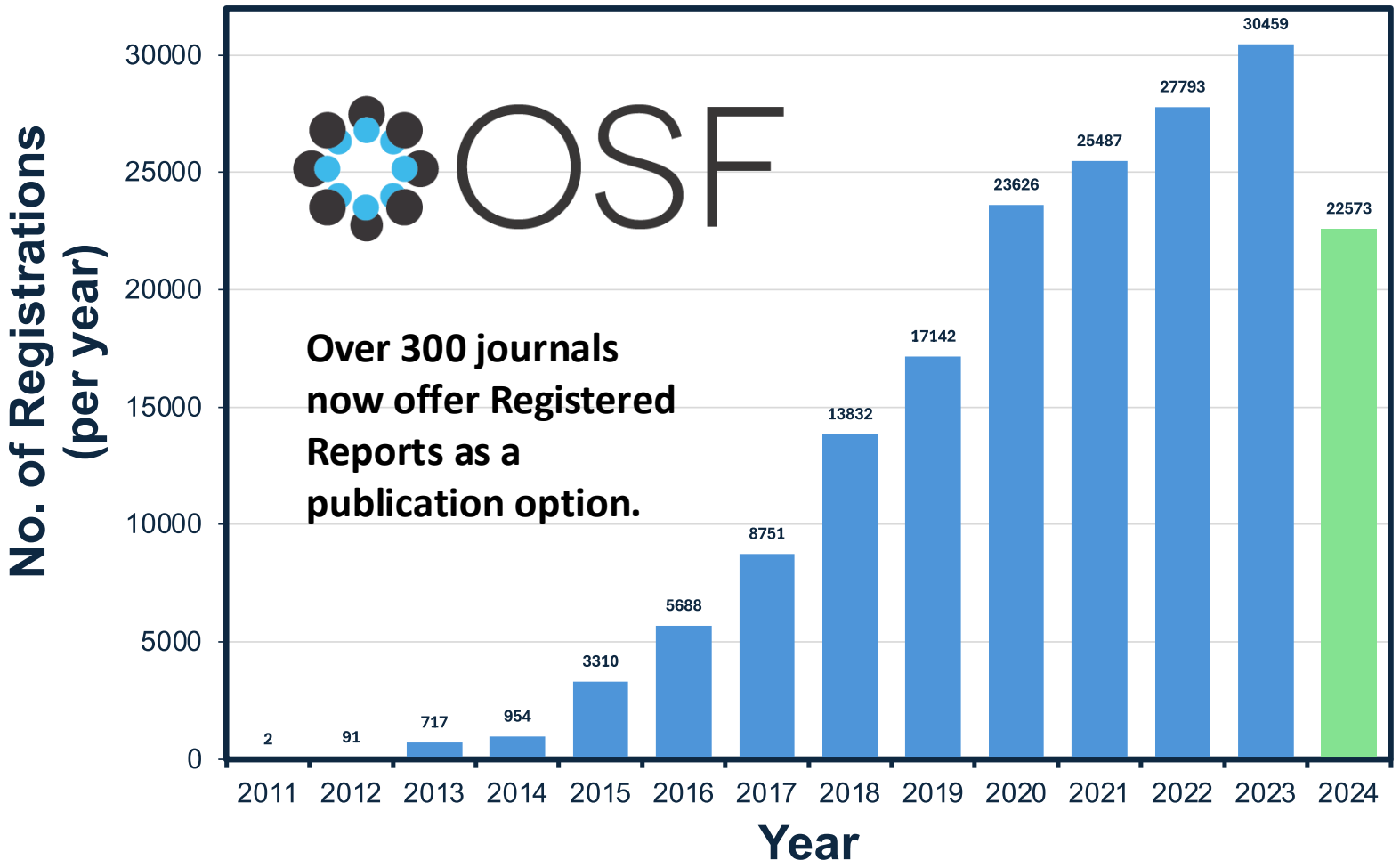

Reproducible research

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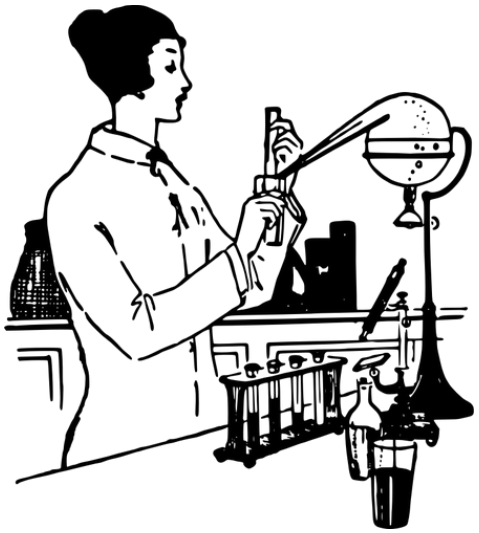
writes up their research

reads the paper + materials



separated by space + time

Making research reproducible/replicable

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jupyter Guide_Notebook (unsaved changes)

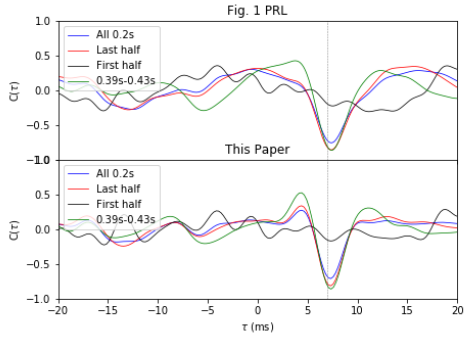
File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 3 (ipykernel)

Run Markdown Download GitHub Binder Memory: 136.2 MB / 4 GB

In [26]:
```
corr_vals = [fig_observed_correlation_vals, original_correlation_vals,
             fig_resid_correlation_vals, resid_correlation_vals]
titles = ['Fig. 1 PRL', 'This Paper']

def plot_subplot(corr_vals, titles):
    """Plots correlation values and titles on the same subplot."""
    fig, axes = plt.subplots(2, 1, sharex=True, figsize=(7, 5))
    fig.subplots_adjust(hspace=0)
    for i, ax in enumerate(axes):
        plot_correlation_vals_axis(corr_vals[i], ax)
        ax.set_title(titles[i])

plot_subplot(corr_vals[:2], titles)
```



Above, calculating cross correlations between the Hanford and Livingston data shows evidence of the signal at a shift of around 7 ms.

In [27]:
```
plot_subplot(corr_vals[2:], titles)
```

https://gwosc.org + https://gwosc.org/tutorials/

Making research inclusive

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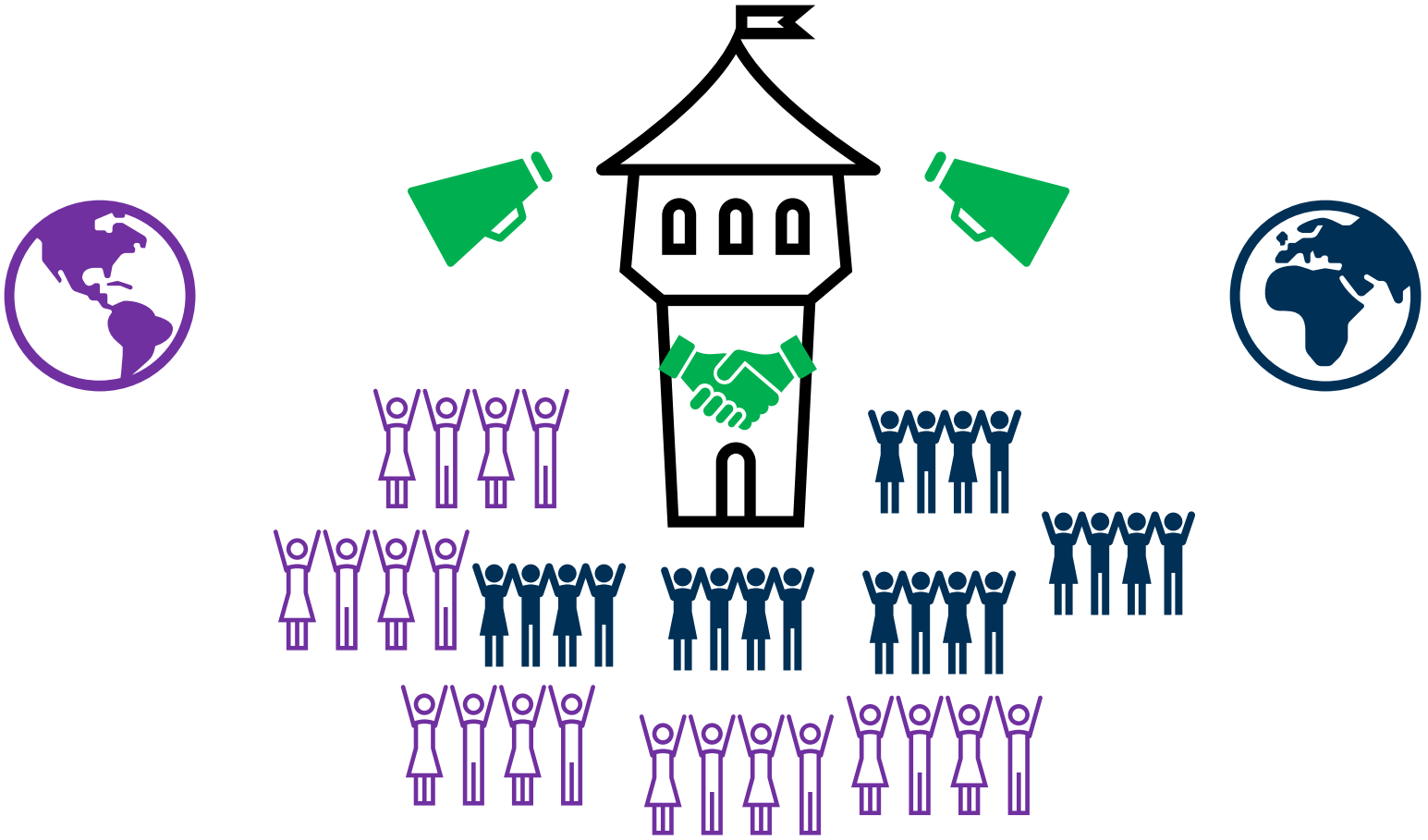

Making research inclusive

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https://mueckenatlas.com/

Core principles lead to Open Science practices

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Core principle	Leading goal	Examples
openly accessible + reusable	To make research openly accessible and reusable	Open Access, Open Data, Open Code
transparent	To make research transparent	Pre-registration, Open Material, Open Lab Notebooks
reproducible/replicable	To make research reproducible/replicable	Reproducible code/manuscripts
inclusive	To make research inclusive	Science Communication, Citizen Science

The Positive Impact of Open Science on Academia*

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Trust

Improving trust by researchers in others research

Open Science Badges have a positive impact on researchers trust in other researchers work

Reproducibility

Improving our ability to reproduce/replicate published research results

Preregistrations reduce deviation from initial plans and registered reports are positivley related to sound statistical practice.

Citations

Increasing the accessibility of research results

Advantage for citations of publications which are available as preprints as well as green and Hybrid Open Access

Adapted from Klebel, T., Traag, V., Grypari, I., Stoy, L., & Ross-Hellauer, T. (2024, July 21). The academic impact of Open Science: a scoping review. https://doi.org/10.31235/osf.io/ptjub

*Other inconclusive and negative effects of Open Science have also been identified

The Positive Impact of Open Science on Academia*

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Efficiency

Saving time and financial resources

Preprints speed up the Dissemination of research. Open Science contributed to rapid production of research during the COVID 19 pandemic

Novelty

Developing New Ideas

There is a positive effect of open science practices on the rate of *true discoveries*

Reuse

Maximising reuse of research objects (e.g., data, code, methods)

Open and FAIR Data has been shown to increase reuse of research objects

Adapted from Klebel, T., Traag, V., Grypari, I., Stoy, L., & Ross-Hellauer, T. (2024, July 21). The academic impact of Open Science: a scoping review. https://doi.org/10.31235/osf.io/ptjub

*Other inconclusive and negative effects of Open Science have also been identified

The Negative Impacts of Open Science on Academia

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Equity, Diversity and Inclusion:

- *Open Access publications have more diverse collaboration and are cited by broader audiences,* **BUT**
- Open Access APC model marginalises groups or countries which do not have the same resources
- Reuse of data more challenging for those with fewer resources.
- Projects involving Citizen Science are more prevalent in the global north

Adapted from Klebel, T., Traag, V., Grypari, I., Stoy, L., & Ross-Hellauer, T. (2024, July 21). The academic impact of Open Science: a scoping review. https://doi.org/10.31235/osf.io/ptjub

How can you get started with Open Science?

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1. Open Science can cost resources (both financial and time), if you can't do them right now, revisit them when you have the resources to do so.

2. It is okay and completely normal not to do every Open Science practice in every research project, start small.

3. Get inspired, familiarize yourself with Open Science practices, seek advice, discuss with your fellow researchers and be patient with them.

Open Science Day 2024

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How Open Science can make the difference in your career!
- Dr. Alex Spike Gibbs

Making software engineering more replicable!
- Dr. Marcus Kessel

Communicating outside of the research bubble!
- Prof. Dr. Frank Kalter

RN DE German Reproducibility Network

Open Science Grant 2024 Awardees

funded by Open Science Office

Open Science Day 2024

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BERD @NFDI

German Internet Panel

FDZ FORSCHUNGSDATENZENTRUM UB MANNHEIM

RN DE German Reproducibility Network

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Thanks for listening and enjoy!

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Sources

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https://pixabay.com/illustrations/key-hole-spider-surreal-caught-5993034/
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