

# Open Science: An Introduction

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January 23, 2020

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  - What is Open Science?
  - Reproducibility and replicability
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# Who am I?

- Post-doctoral researcher at Ludwig-Maximilians-Universität, München
- 2011-2015: PhD at Macquarie University (Sydney, Australia)
- Cognitive Psychologist (Psycholinguistics)
- Research interests: Cognitive processing during reading, dyslexia
- Good (reproducible and replicable) research 😊
- Open Science activities:
  - Workshops and seminars
  - Member of the LMU Open Science Center & its steering committee
  - Ambassador of the Center for Open Science
  - Registered Reports: Encouraging more journals to start offering this publication format
  - Open Research Workflow in my own research

# What is Open Science?

- Broad concept
  - Open research workflow
    - Open Access
    - Registered Reports
    - Open Code
    - Open Peer Review
    - ...
  - Citizen Science
  - Open Education



# Why do we need Open Science?

- Good research:
  - Reproducible: The research workflow needs to be documented and comprehensible (same data, same analysis)
  - Replicable: When we repeat the research procedure, we should obtain a similar result (different data, same analysis)

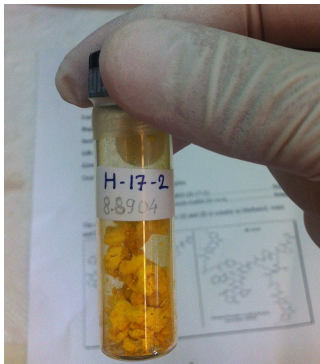


Image: <https://commons.wikimedia.org/wiki/File:>

# Replicability etc. in a nutshell

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable

https:

[//the-turing-way.netlify.com/reproducibility/03/definitions](https://the-turing-way.netlify.com/reproducibility/03/definitions)

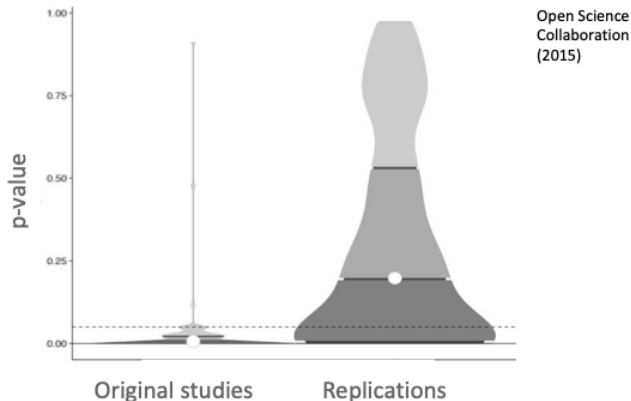
# Is research reproducible?

- Publication = Article (often behind a paywall)
- Materials: Often only described, not available for published articles
- Cherry-Picking: Selecting experiments and analyses that “worked”
- Analyses in point-and-click-software: often contain errors (s. Statcheck; Nujten et al., 2017)



# Is research replicable?

- Psychology: for ca. 2/3 of studies: different results when the experimental procedure is repeated





# WHY???

- Hypothesing After Results are Known (HARKING)
- Low statistical power
- $p$ -hacking: Creative exclusion of outliers, data transformations (s. <http://flexiblemeasures.com/>), ...
- Publication bias: by researchers or journals

→ All of this increases the probability that a significant effect in the literature does not reflect a true effect



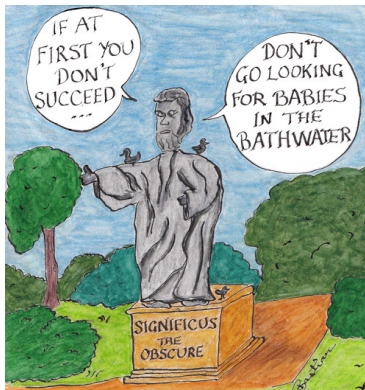
Image taken from Dorothy Bishop

“I’ll toss a coin 5 times and I’ll always predict the correct outcome!”

“I’ll toss a coin 5 times and I’ll always predict the correct outcome!”

- “I’ll toss the coin *until* I guess correctly 5 times in a row” → Optional stopping
- “This toss doesn’t count, I’m just warming up!” → Discarding participants or experiments
- “I’m not in shape today. My clairvoyant powers are only strong when the weather is nice!” → Sub-group analysis
- “OK, I only guessed 4/5 correctly. But that’s still better than chance!” → Outcome variable switching
- “A car just drove past! New hypothesis: Tossing a coin causes passing cars.” → HARKing

# p-Hacking and HARKing



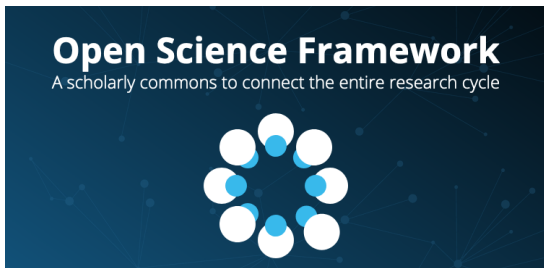
AN EARLY STATISTICAL PHILOSOPHER, SIGNIFICUS THE OBSCURE WAS KNOWN FOR MANGLED APHORISMS AND AN INTENSE HATRED OF POST HOC ANALYSES.

Image by Hilda Bastian

# What is the Open Science Framework?

`www.osf.io`

- Online platform
- Free of charge
- Open source 😊
- Collaboration
- Sharing of materials and outputs at all stages of the research process



Notice: The site will undergo maintenance between Jun 13, 2019 2:30 AM and Jun 13, 2019 4:30 AM (+0200 UTC). Thank you for your patience.

## What do Artificial Orthography Learning tasks actually measure?

[Make Private](#)[Public](#)[P 0](#)[--](#)

Contributors: [Xenia Schmalz](#)

Date created: 2019-01-23 04:45 PM | Last Updated: 2019-03-14 05:33 PM

[Create DOI](#)

Category: Project

Description: Add a brief description to your project

License: Add a license

Wiki



Add important information, links, or images here to describe your project.

Files



Click on a storage provider or drag and drop to upload

Filter



Name	Modified
What do Artificial Orthography Learning tasks ...	
OSF Storage (United States)	
ArtOrth_Cor_preprint.pdf	2019-03-14 05:33 PM
ArtOrth_Generalisation_Data.csv	2019-01-23 04:47 PM
ArtOrthCorr_data.csv	2019-01-23 04:47 PM
Materials.zin	2019-01-23 05:14 PM

Citation

Components

[Add Component](#)[Link Projects](#)

Add components to organize your project.

Tags

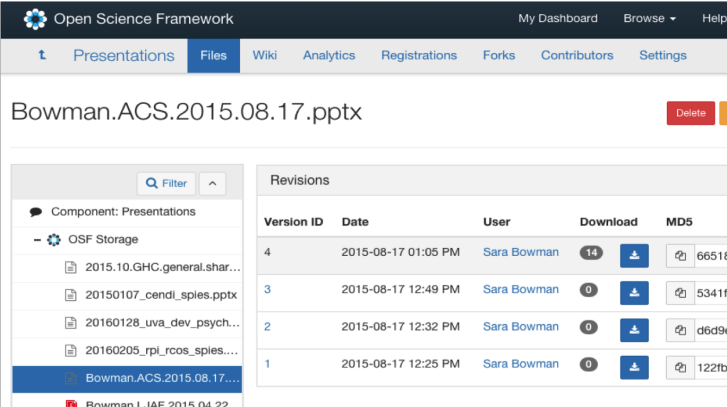
Add a tag to enhance discoverability

Recent Activity

Xenia Schmalz updated file ArtOrth\_Cor\_preprint.pdf in OSF Storage in What do

# Version control!

- Upload an updated version of a file with the same name → old version will be automatically replaced and archived!



The screenshot shows the Open Science Framework (OSF) interface. At the top, there is a navigation bar with the OSF logo, the text "Open Science Framework", and links for "My Dashboard", "Browse", and "Help". Below this is a secondary navigation bar with tabs for "Presentations", "Files", "Wiki", "Analytics", "Registrations", "Forks", "Contributors", and "Settings". The main content area displays the file name "Bowman.ACS.2015.08.17.pptx" and a "Delete" button. On the left, there is a sidebar with a search filter and a list of files under the "OSF Storage" component. The "Revisions" table on the right shows the following data:

Version ID	Date	User	Download	MD5
4	2015-08-17 01:05 PM	Sara Bowman	14	66518
3	2015-08-17 12:49 PM	Sara Bowman	0	5341f
2	2015-08-17 12:32 PM	Sara Bowman	0	d6d9e
1	2015-08-17 12:25 PM	Sara Bowman	0	122fb





# Who has never seen this before?



[Archives of Women's Mental Health](#)

October 2016, Volume 19, [Issue 5](#), pp 711–720 | [Cite as](#)

## A review of longitudinal studies on antenatal and postnatal depression

Authors [Authors and affiliations](#)

Lisa Underwood , Karen Waldie, Stephanie D'Souza, Elizabeth R Peterson, Susan Morton

Review Article

First Online: 16 April 2016



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# Under the hood of the paywall

## Publication

### Traditional journal (closed access)

- Journals paid by library subscription fees
- When authors publish, they give up the copyright to their article
- Institutional log-in required to access the article

### Hybrid Open Access

- Traditional journals
- Authors pay a fee for Open Access publication (typically >1,000€)
- Authors retain copyright
- Anyone can access the paper
- Libraries still pay

### Gold Open Access

- Journals with business model where authors pay for publication (>700€)
- Any paper is available OA from the beginning
- Authors retain copyright

### Green Open Access

- Authors make the article available on personal website
- Legal if the journal allows it!
- Check journal on Sharepa/Romeo
- Preprints, e.g., on OSF, PsyArXiv.com, researchgate (if you must)

# What to do when you get paywalled?

- Try Unpaywall (install button) to find legal Open Access version of paper: <http://unpaywall.org/welcome>
- Install and use the Open Access Button: <https://openaccessbutton.org/>
- Write to the authors, template: <https://osf.io/4nd3w/>
- Don't use sci-hub: [sci-hub.tw](http://sci-hub.tw) 😊 😊 😊 😊 😊

For more info (and interview with Sci-hub founder Alexandra Elbakyan), see movie “Paywall: The business of scholarship”  
[https://www.youtube.com/watch?v=HM\\_nWsdbNvQ](https://www.youtube.com/watch?v=HM_nWsdbNvQ)

- Version of the paper *before* peer-review (as opposed to post-print)
- PsyArXiv.com, osf.io, researchgate (meh)
- Appear on Google Scholar
- If paper already published: check <http://sherpa.ac.uk/romeo/index.php> for Copyright policies of the journal (often: non-formatted 'Author's version' OK)



# Advantages of pre-prints

- Counts as Green Open Access
- Publication of “unpublishable” work (reduces publication bias; learning about things that don’t work)
- Show your productivity on your CV, even if your publication record is not the best (looks better than “manuscript in preparation”)





Xenia Schmalz 

 FOLLOWING

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Verified email at [med.uni-muenchen.de](mailto:med.uni-muenchen.de) - [Homepage](#)

[Psycholinguistics](#) [cognitive psychology](#) [research methods](#) [reading](#) [open science](#)

<input type="checkbox"/>	TITLE			CITED BY	YEAR
<input type="checkbox"/>	<a href="#">We still need more trust in science: the need for broader adoption of Registered Reports</a>				2019
	TB Roettger, X Schmalz, C Chambers, H Fraser, D Mellor, L Ostojic, ... MetaArXiv				
<input type="checkbox"/>	<a href="#">Effectiveness of spelling treatment approaches for learners with dyslexia—A meta-analysis and systematic review</a>				2019
	K Galuschka, R Görgen, J Kalmar, S Haberstroh, X Schmalz, ... OSF Preprints				
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	C Fischer, N Eisentraut, G Fischer, B Fecher, S Friesike, M Goller, ... OSF Preprints				
<input type="checkbox"/>	<a href="#">Getting a precise RT estimate for single items in a reading aloud task</a>				2019
	X Schmalz OSF Preprints				
<input type="checkbox"/>	<a href="#">Preregistration: Where do I start?</a>				2019
	X Schmalz Open Science Day-empowering open, transparent, and reproducible research at ...				

## The Hardest Science

### Everything is fucked: The syllabus

PUBLISHED ON [August 11, 2016](#)

**PSY 607: Everything is Fucked**

Prof. Sanjay Srivastava

Class meetings: Mondays 9:00 – 10:50 in 257 Straub

Office hours: Held on Twitter at your convenience ([@hardsci](#))

In a much-discussed article at Slate, social psychologist Michael Inzlicht told a reporter, “Meta-analyses are fucked” ([Engber, 2016](#)). What does it mean, in science, for something to be fucked? Fucked needs to mean more than that something is complicated or must be undertaken with thought and

Sanjay Srivastava



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<https://thehardestscience.com/2016/08/11/everything-is-fucked-the-syllabus/>

[https://twitter.com/xenia\\_sch/status/1214564710281965569](https://twitter.com/xenia_sch/status/1214564710281965569)

# Example 1: Open collaborative writing

- Writing a manuscript or book with git or google documents, etc.
- Inviting others to contribute, add ideas, correct errors

Interpretable machine learning

**Interpretable Machine Learning**

*A Guide for Making Black Box Models Explainable.*

Christoph Molnar  
2019-12-17

Preface

**Interpretable  
Machine Learning**

Table of Contents:

- Preface
- 1 Introduction
  - 1.1 Story Time
  - 1.2 What is Machine Learning?
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  - 2.2 Taxonomy of Interpretability Met...
  - 2.3 Scope of Interpretability
  - 2.4 Evaluation of Interpretability
  - 2.5 Properties of Explanations
  - 2.6 Human-friendly Explanations
- 3 Datasets
  - 3.1 Bike Rentals (Regression)

<https://christophm.github.io/interpretable-ml-book/>,  
Christoph Molnar



# Example 2: Crowdsourcing research questions

- Public call for general public to submit questions about health
- Resulted in “Village” project



The screenshot shows the website for the Village Project. At the top left is the Village logo, which consists of three stylized human figures in a circle. To its right is the tagline: "How to raise the village to raise the child". A navigation menu includes links for "About us", "News & Events", "Resources & Material", "Media & Press", "Get involved", "Contact", and "DE | EN". Below the navigation is a video player with a play button and the text "Research group Village - Introduction to the ...". To the right of the video player is a text block titled "The Village Project - supporting children of parents with mental illness in Austria". The text describes the project's goals and methods, mentioning the Ludwig Boltzmann Gesellschaft and the Medical University Innsbruck. Logos of partner institutions like TU Wien, FH St. Pölten, and Maastricht University are visible at the bottom of the video player area.

“How to raise the village to raise the child”

**The Village Project - supporting children of parents with mental illness in Austria**

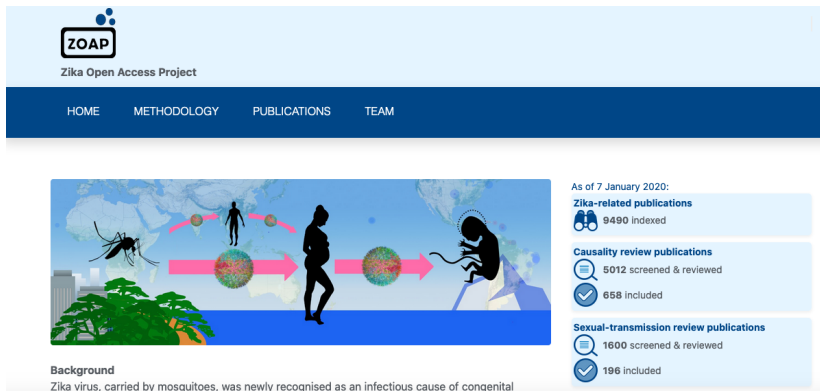
Research Group Village of the Ludwig Boltzmann Gesellschaft in cooperation with the Medical University Innsbruck

Children of parents with a mental illness (COPMI) often need additional supports to lead the happy and healthy lives they desire. In some cases though, those supports are either not available or not found by families, resulting in negative long-term outcomes for these children. This four-year research project aims to increase identification and strengthen formal and informal supports around children when their parents have a mental illness. This project will be co-developed with stakeholders and will implement and evaluate two practice approaches, focused on the child and on principles of collaborative care. The project utilizes a realist framework (as well as implementation science principles, and the theory of symbolic interactionism) and mixed-methodologies, and involves numerous data collection methods including: literature reviews, questionnaires, focus groups, interviews, and observations to determine the impact and benefits of providing increased supports for COPMI in Austria.

<https://tell-us.online/>,  
<https://village.lbg.ac.at/about?lng=en>, Ludwig Boltzmann  
Institute, Austria

# Example 3: Living systematic review

- Automatising steps which are required for a systematic review (e.g., finding literature, removing duplicates)
- Publishing results in Open Access journals



**ZOAP**  
Zika Open Access Project

HOME METHODOLOGY PUBLICATIONS TEAM

As of 7 January 2020:

- Zika-related publications**  
9490 Indexed
- Causality review publications**  
5012 screened & reviewed  
658 included
- Sexual-transmission review publications**  
1600 screened & reviewed  
196 included

**Background**  
Zika virus, carried by mosquitoes, was newly recognised as an infectious cause of congenital

<https://zika.ispm.unibe.ch/home>

# Want to learn more?

- Munich ROCS (Researchers for Open and Credible Science):  
<https://lists.lrz.de/mailman/listinfo/munichrocs>
- Open Science Beers Munich: Doodle poll for meeting in February currently open: Scan QR code and sign up to Munich ROCS mailing list or Facebook page
- ReproducibiliTea Journal Club
- Sign up to LMU Open Science Center News  
<https://lists.lrz.de/mailman/listinfo/lmu-osc>
- Have a look at the LMU Open Science Center website

