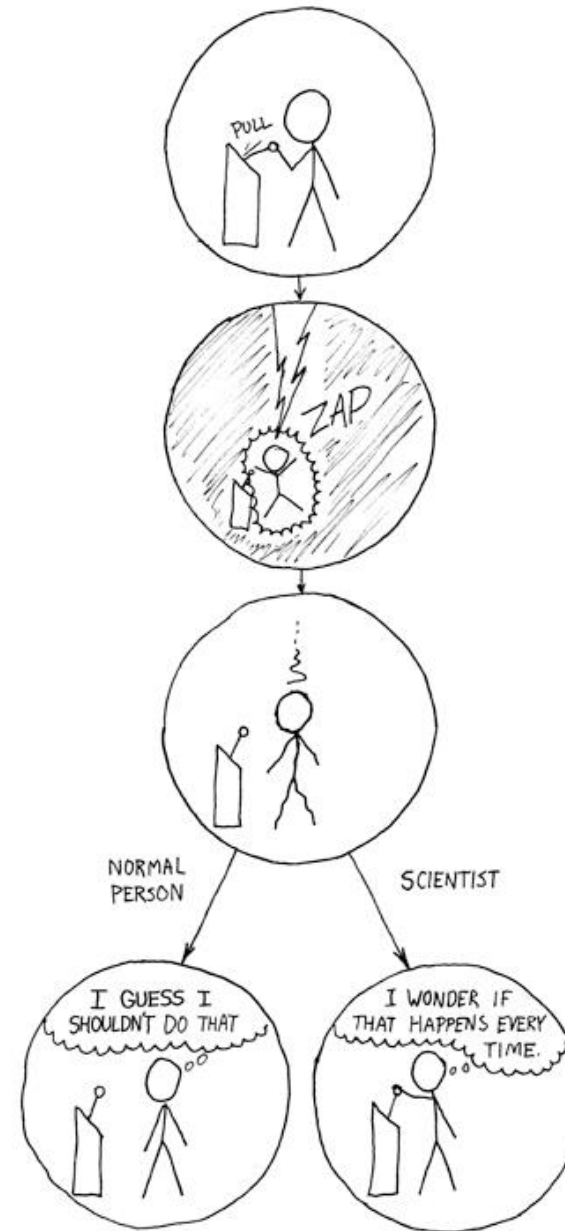


Methods Meeting

Open and Reproducible Science

Mana Ehlers
March 16, 2021



Why open science?

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity,

The garden of forking paths: Why multiple comparisons can be a problem, even when there is no “fishing expedition” or “p-hacking” and the research hypothesis was posited ahead of time*

Andrew Gelman[†] and Eric Loken[‡]

14 Nov 2013

False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant

Joseph P. Simmons¹, Leif D. Nelson², and Uri Simonsohn¹

¹The Wharton School, University of Pennsylvania, and ²Haas School of Business, University of California, Berkeley

Personality and Social Psychology Review
1998, Vol. 2, No. 3, 196–217

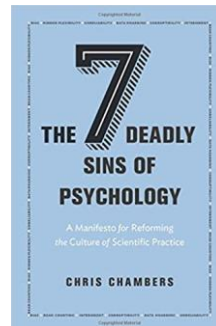
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Lawrence Erlbaum Associates, Inc.

HARKing: Hypothesizing After the Results are Known

Norbert L. Kerr
Department of Psychology
Michigan State University

This article considers a practice in scientific communication termed HARKing (Hypothesizing After the Results are Known). HARKing is defined as presenting

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DOI: 10.1177/0956797611417632
http://pss.sagepub.com
SAGE



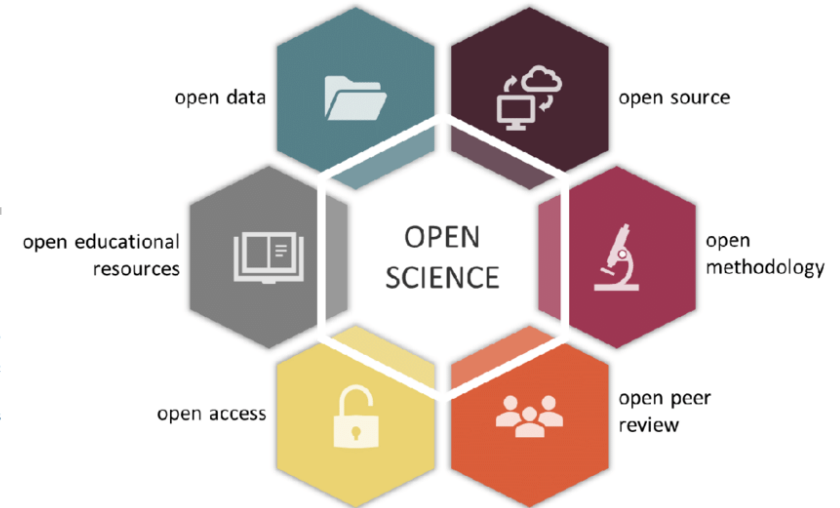
Editorial

Registered Reports

A Method to Increase the Credibility of Published Results

Brian A. Nosek¹ and Daniël Lakens²

¹University of Virginia and Center for Open Science, Charlottesville, VA, USA,
²Eindhoven University of Technology, The Netherlands



The preregistration revolution

Brian A. Nosek^{a,b,1}, Charles R. Ebersole^b, Alexander C. DeHaven^a, and David T. Mellor^a

^aCenter for Open Science, Charlottesville, VA 22903; and ^bDepartment of Psychology, University of Virginia, Charlottesville, VA 22904

Edited by Richard M. Shiffrin, Indiana University, Bloomington, IN, and approved August 28, 2017 (received for review June 15, 2017)

Increasing Transparency Through a Multiverse Analysis

Sara Steegen, Francis Tuerlinckx, Andrew Gelman, more...

First Published September 29, 2016 | Research Article | Find in PubMed | Check for updates
https://doi.org/10.1177/1745691616658637

Article information

Show all authors

Altmetric 100

Abstract

Empirical research inevitably includes constructing a data set by processing raw data into a form ready for statistical analysis. Data processing often involves choices among several reasonable options for excluding, transforming, and coding data. We suggest that instead of performing only one analysis, researchers could perform a multiverse analysis, which involves performing all analyses across the whole set of alternatively processed data sets corresponding to a large set of reasonable scenarios. Using an example focusing on the effect of fertility on religiosity and political attitudes, we show that analyzing a single data set can be misleading and propose a multiverse analysis as an alternative practice. A multiverse analysis offers an idea of how much the conclusions change because of arbitrary choices in data construction and gives pointers as to which choices are most consequential in the fragility of the result.

Review | Nat Neurosci. 2017 Feb 23;20(3):299–303. doi: 10.1038/nn.4500.

Best practices in data analysis and sharing in neuroimaging using MRI

Thomas E Nichols¹, Samir Das^{2,3}, Simon B Eickhoff^{4,5}, Alan C Evans^{2,3}, Tristan Glatard^{2,6}, Michael Hanke^{7,8}, Nikolaus Kriegeskorte⁹, Michael P Milham^{10,11}, Russell A Poldrack¹², Jean-Baptiste Poline¹³, Erika Proal¹⁴, Bertrand Thirion¹⁵, David C Van Essen¹⁶, Tonya White¹⁷, B T Thomas Yeo¹⁸

> Psychol Sci. 2017 Nov;28(11):1547–1562. doi: 10.1177/0956797617723724. Epub 2017 Sep 13.

Sample-Size Planning for More Accurate Statistical Power: A Method Adjusting Sample Effect Sizes for Publication Bias and Uncertainty

Samantha F Anderson¹, Ken Kelley¹, Scott E Maxwell¹

Open Access | Published: 10 January 2017

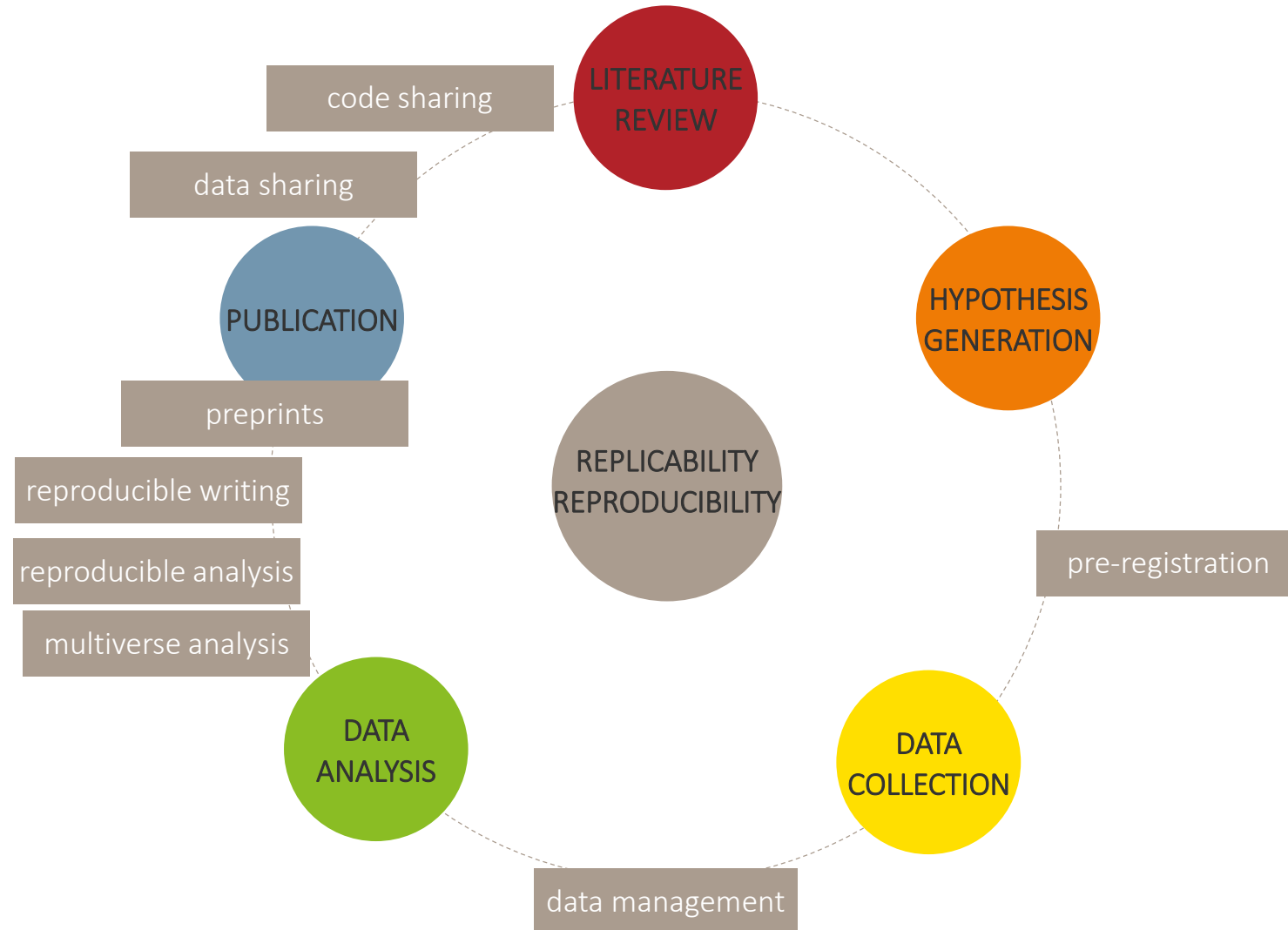
A manifesto for reproducible science

Marcus R. Munafò[✉], Brian A. Nosek, Dorothy V. M. Bishop, Katherine S. Button, Christopher D. Chambers, Nathalie Percie du Sert, Uri Simonsohn, Eric-Jan Wagenmakers, Jennifer J. Ware & John P. A. Ioannidis

Nature Human Behaviour 1, Article number: 0021 (2017) | Cite this article

65k Accesses | 887 Citations | 2598 Altmetric | Metrics

The research process



Pre-registration: Why and What?



Why?

- Counteracts (publication) bias, low power, p-hacking/researchers degrees of freedom, HARKing
- Distinction between exploratory and confirmatory hypotheses
- Promotes transparent research
- Encourages more thorough planning

What?

- time-stamped research plan
- submitted (before data collection) to public registry

Content (minimum)

- Research question and hypotheses
- Dependent and independent variables
- Sample size (justification)
- Statistical model specification



The four horsemen of reproducibility – Dorothy Bishop

Pre-registration: How and Where?

- 1) Open-ended registration: You make the rules! Provide summary of project.
- 2) Aspredicted.org: 8 questions about project (state of data collection, hypothesis, variables, sample size, analyses, others)



- 3) OSF pre-registration template: covers 25 subject areas (basics plus room for introduction, design plan, sampling plan, data collection details, exclusions etc.)



- 4) Registered report



The process – Hands on

Study Information

1. Title (required)
 - 1.1. Provide the working title of your study. It may be the same title that you submit for publication of your final manuscript, but it is not a requirement.
 - 1.2. **Example:** Effect of sugar on brownie tastiness.
 - 1.3. **More info:** The title should be a specific and informative description of a project. Vague titles such as 'Fruit fly preregistration plan' are not appropriate.
2. Authors (required)
3. Description (optional)
 - 3.1. Please give a brief description of your study, including some background, the purpose of the study, or broad research questions.
 - 3.2. **Example:** Though there is strong evidence to suggest that sugar affects taste preferences, the effect has never been demonstrated in brownies. Therefore, we will measure taste preference for four different levels of sugar concentration in a standard brownie recipe to determine if the effect exists in this pastry.
 - 3.3. **More info:** The description should be no longer than the length of an abstract. It can give some context for the proposed study, but great detail is not needed here for your preregistration.
4. Hypotheses (required)
 - 4.1. List specific, concise, 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. If a specific interaction or moderation is important to your research, you can list that as a separate hypothesis.
 - 4.2. **Example:** If taste affects preference, then mean preference indices will be higher with higher concentrations of sugar.

New registration

Metadata

- Study Information
- Design Plan
- Sampling Plan
- Variables
- Analysis Plan
- Other
- Review

Registration Metadata

This metadata applies only to the registration you are creating for this project.

Title *



The neurostructural underpinnings of human fear learning and fear extinction

Description *

Understanding conditioned fear constitutes a vital part in understanding the development of anxiety and anxiety-related disorders (Lissek et al., 2005). Generally, the fear conditioning process comprises different experimental phases (Lonsdorf & Merz, 2017). Throughout the acquisition of conditioned fear (fear learning during fear acquisition training) an innately aversive stimulus, the unconditioned stimulus (US), is paired with an initially neutral stimulus, the conditioned stimulus (CS+), producing a conditioned response (CR) to the CS+ while a second control stimulus (CS-) is never paired with the US. Hence, the CS+ gains predictive power of the appearance of a US. Within the extinction phase (extinction learning during extinction training) the CS is no longer coupled with a US and an inhibitory extinction memory is formed. When later presented with a CS (retention test) one can either observe a retention of the extinction memory indicating dominance of the extinction memory or the return of fear responding (ROF) indicating dominance of the fear over the extinction memory (Myers & Davis, 2007).

Contributors

Edit contributors on your project

Name	Permission
 Mana Ehlers	Administrator
 Tina Lonsdorf	Administrator

Category

Project

Affiliated institutions

You have no institutional affiliations

License *

A license tells others how they can use your work in the future and files submitted with the registration. For more information

[License FAQ](#)

Subjects *

The neurostructural underpinnings of human fear learning and fear extinction – investigating the dorsal Anterior Cingulate Cortex, Amygdala and ventromedial Prefrontal Cortex

Public registration

Overview

Files

Wiki

Components 0

Links 0

Analytics

Comments 0

Study Information

Hypotheses

Description:

Understanding conditioned fear constitutes a vital part in understanding the development of anxiety and anxiety-related disorders (Lissek et al., 2005). Generally, the fear conditioning process comprises different experimental phases (Lonsdorf & Merz, 2017). Throughout the acquisition of conditioned fear (fear learning during fear acquisition training) an innately aversive stimulus, the unconditioned stimulus (US), is paired with an initially neutral stimulus, the conditioned stimulus (CS+), producing a conditioned response (CR) to the CS+ while a second control stimulus (CS-) is never paired with the US. Hence, the CS+ gains predictive power of the appearance of a US. Within the extinction phase (extinction learning during extinction training) the CS is no longer coupled with a US and an inhibitory extinction memory is formed. When later presented with a CS (retention test) one can either observe a retention of the extinction memory indicating dominance of the extinction memory or the return of fear responding (ROF) indicating dominance of the fear over the extinction memory (Myers & Davis, 2007).

Throughout the past decades research mainly focused on the functional connections and alterations in cortical and subcortical structures in fear acquisition, extinction, reinstatement and return of fear (Hartley et al., 2011; LaBar et al., 1998; Lonsdorf et al., 2017; Lonsdorf & Merz, 2017; Phelps et al., 2004). Thus, the functional activation of a neural fear circuit including structures such as the amygdala for fear learning (Cacciaglia et al., 2015; LaBar et al., 1998; Pohlack et al., 2012), the hippocampus for contextual conditioning and fear memory (Bast et al., 2001; Phillips & LeDoux, 1992; Sanders et al., 2003), or the ventromedial prefrontal cortex (vmPFC) in fear inhibition (Delgado et al., 2008; Hartley et al., 2011; Phelps et al., 2004) was at the core of fear research. However, studies regarding the structural basis of fear acquisition and extinction are still scarce and present inconsistent or even contradictory results. In the following, current evidence pertaining to the association between the structural nature of the dorsal Anterior Cingulate Cortex (dACC), the amygdala and the medial Orbitofrontal Cortex (mOFC) - as part of the vmPFC- and fear conditioning and extinction is briefly summarized.

Especially the structural association of the dACC with conditioned fear has been

Contributors

Janne Nold, Mana Ehlers, and Tina Lonsdorf

Description

No description

Registration type

OSF Preregistration

Date registered

March 25, 2020

Date created

March 25, 2020

Registered from

osf.io/y73qw

Category

Project

Registration DOI

[10.17605/OSF.IO/XQCR6](https://doi.org/10.17605/OSF.IO/XQCR6)

Publication DOI

No publication DOI

Subjects

No subjects

Affiliated institutions

This registration has no affiliated institutions

License

No license

Discussion: Pre-registration for fMRI

Problems:

- Too many decisions to make
- Analysis pipeline changes over time
- Power analysis

Some solutions and things to keep in mind:

- Template with overview of the many decisions to make: <https://osf.io/dvb2e/>
- Analysis plans can change: make amendments to pre-registration or describe differences in paper
- Power analysis for fMRI: <http://neuropowertools.org>; <http://fmripower.org/>

Resources: https://docs.google.com/document/d/1YrBc_bFlnWJVSjLjqQ_rRKtRMh9TTLLUcYMCsORg7Y0/edit

Data Management – A standard for data organization



<https://en.wikibooks.org/wiki/SPM/BIDS>

Why is it important?

- Makes your own life easier (e.g. reproducing results, adapting scripts)
- Enhances understandability of data structure and reproducibility of results within own lab
- Facilitates sharing data and using publicly shared data

BIDS (as an example)

- 1) Json files: metadata and side-car file
- 2) TSV files: participant informations, events onsets etc
- 3) Nii-gz files. Zipped nifti files MRI data

```

sub-01  subject
├── anat  datatype
│   └── sub-01_run-01_T1w.nii.gz
sub-01
├── func
│   └── sub-01_task-nback_bold.nii.gz

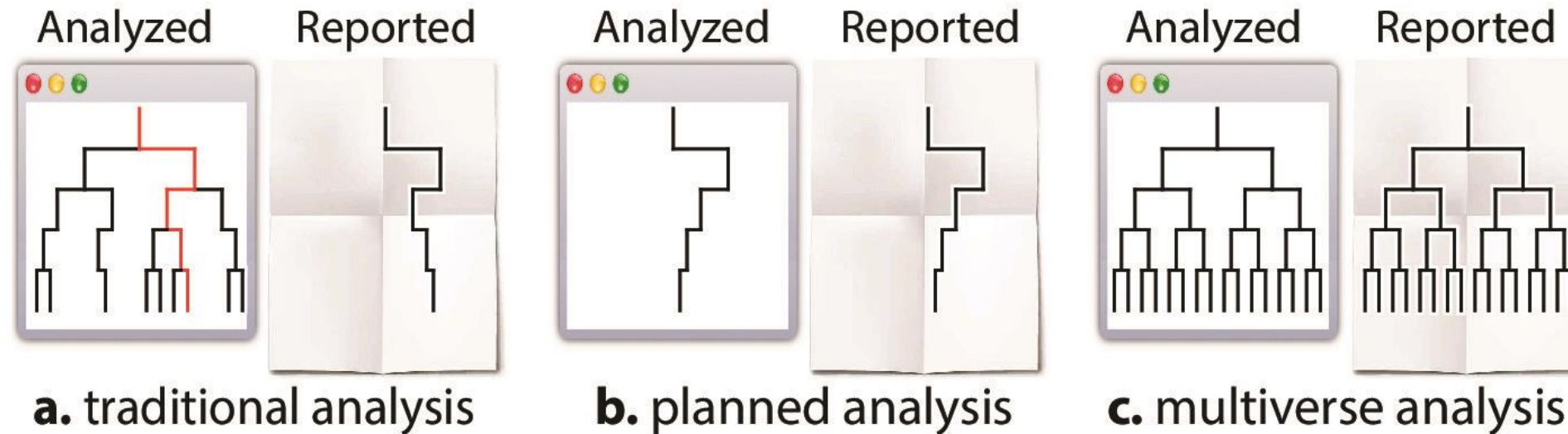
```

```

dset/
├── dataset_description.json
├── participants.tsv
└── sub-01
    ├── anat
    │   ├── sub-01_T1w.json
    │   └── sub-01_T1w.nii.gz
    ├── dwi
    │   ├── sub-01_dwi.bval
    │   ├── sub-01_dwi.bvec
    │   ├── sub-01_dwi.json
    │   └── sub-01_dwi.nii.gz
    ├── fmap
    │   ├── sub-01_acq-dwi_dir-AP_epi.json
    │   ├── sub-01_acq-dwi_dir-AP_epi.nii.gz
    │   ├── sub-01_acq-dwi_dir-PA_epi.json
    │   ├── sub-01_acq-dwi_dir-PA_epi.nii.gz
    │   ├── sub-01_acq-func_dir-AP_epi.json
    │   ├── sub-01_acq-func_dir-AP_epi.nii.gz
    │   ├── sub-01_acq-func_dir-PA_epi.json
    │   └── sub-01_acq-func_dir-PA_epi.nii.gz
    └── func
        ├── sub-01_task-nback_run-01_bold.json
        ├── sub-01_task-nback_run-01_bold.nii.gz
        ├── sub-01_task-nback_run-01_events.tsv
        ├── sub-01_task-nback_run-01_sbref.json
        └── sub-01_task-nback_run-01_sbref.nii.gz

```


Data analysis: Multi verse



Increasing Transparency Through a Multiverse Analysis

Sara Steegen, Francis Tuerlinckx, Andrew Gelman, more...

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First Published September 29, 2016 | Research Article | [Find in PubMed](#)



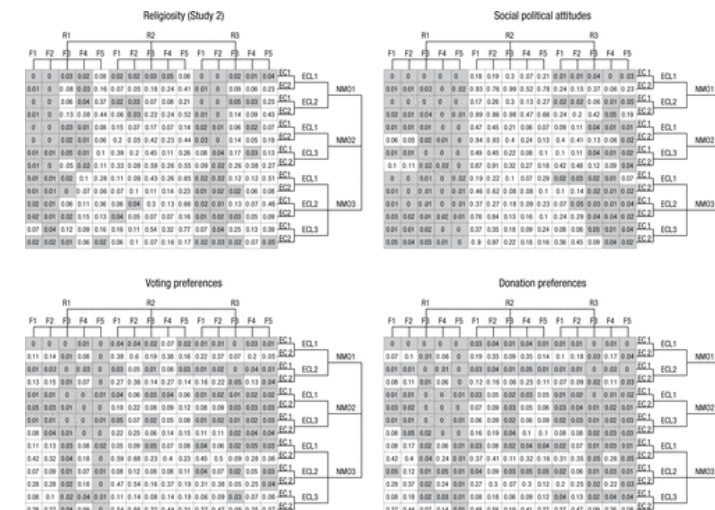
<https://doi.org/10.1177/1745691616658637>

[Article information](#)



Abstract

Empirical research inevitably includes constructing a data set by processing raw data into a form ready for statistical analysis. Data processing often involves choices among several reasonable options for excluding, transforming, and coding data. We suggest that instead of performing only one analysis, researchers could



Reproducible data analysis and results preparation

Why is it important?

- Enhances trust in our results
- Enhances efficiency (adjustments in the process, adaptation for new projects)
- Enables collaboration

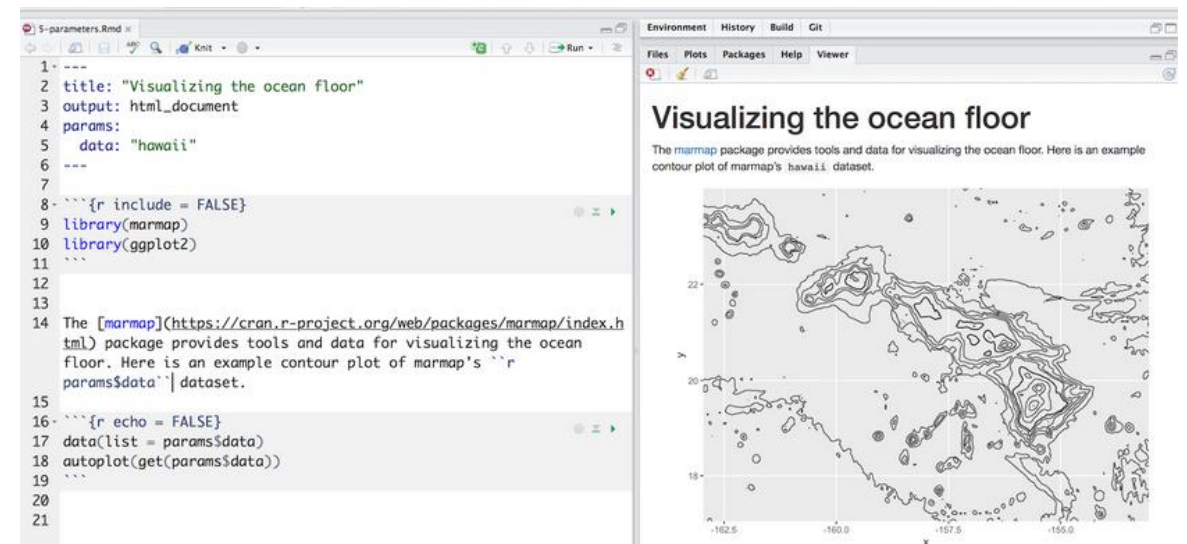
Aspiration: run single command to regenerate all results and figures from raw data

Recommendations for reproducible workflow:

- Consistent file structure and nomenclature
- Machine-readable file types
- Recording and controlling tools, libraries, versions etc.
- Automate as much as possible
- Version control

Reproducible data analysis: Tools

Data organization: custom script or converters



Reproducible manuscript writing

Why?

- Better control over results; reproducibility ensured
- Changes in analyses and results are implemented automatically
- Facilitates collaborative working on manuscript (analyses, figures, writing)

Papaja package using R Markdown:

<https://github.com/crsh/papaja>

Workshop: March, 29 and 30

```
56 # Material and methods
57
58 ## Participants
59
60 ```{r echo=FALSE, message=F, warning=F, results=F}
61
62 ### Sample characteristics of T0:
63 # Compute n
64 n_T0 <- length(dataCovAll$id)
65
66 # Table gender, select females only
67 genderTable_T0 <- table(dataCovAll$gender)
68 females_T0 <- genderTable_T0[grepl("female", names(genderTable_T0))]
69
70 # Age: Mean and SD, keep trailing zeros
71 age_mean_T0 <- format(round(mean(dataCovAll$age_T0, na.rm = T), 2), nsmall = 2)
72 age_sd_T0 <- format(round(sd(dataCovAll$age_T0, na.rm = T), 2), nsmall = 2)
73 age_range_T0 <- paste(range(dataCovAll$age_T0), collapse = " - ")
74
75 ### Sample characteristics of T1:
76 # Compute n
77 n_T1 <- length(dataCovAll$id[which(dataCovAll$dropout == 0)])
78
79 # Table gender, select females only
80 genderTable_T1 <- table(dataCovAll$gender[which(dataCovAll$dropout == 0)])
81 females_T1 <- genderTable_T1[grepl("female", names(genderTable_T1))]
82
83 # Age: Mean and SD
84 age_mean_T1 <- format(round(mean(dataCovAll$age_T1[which(dataCovAll$dropout == 0)],
85                               na.rm = T), 2), nsmall = 2)
86 age_sd_T1 <- format(round(sd(dataCovAll$age_T1[which(dataCovAll$dropout == 0)],
87                               na.rm = T), 2), nsmall = 2)
88 age_range_T1 <- paste(range(dataCovAll$age_T1[which(dataCovAll$dropout == 0)],
89                               na.rm = T), collapse = " - ")
90
91 ### Compute n of complete cases
92 n_complete <- length(dataCovComplete$id)
93
94 ```
95
96 In total, 120 participants (female-M,T0 = `r females_T0`, age-M,T0 = `r age_mean_T0`, age-SD,T0 = `r age_sd_T0`, age-range,T0 = `r age_range_T0`) were a priori selected from a study within the framework of the collaborative Research Center SFB TRR 58 which examines functional genomics and gene-by-environment interactions. The selection was based on the absence of traumatic experiences during childhood as assessed by the Childhood Trauma Questionnaire [Bernstein2003; Klinitzke2012]: only participants with emotional abuse < 13, physical abuse < 10, sexual abuse < 8, emotional neglect < 15, and physical neglect < 10 were included [Bernstein2003; Glaesmer2016]. Exclusion criteria were age under 18 or over 50, regular medical (except oral contraceptives) or illegal substance intake, chronic diseases, and neurological/psychiatric disorders. Participants were right handed and had normal or corrected to normal vision. For further sample characteristics of the final sample, see Table 1. They all gave written informed consent to the protocol which was approved by the local ethics committee (PV 5157, Ethics Committee of the General Medical Council Hamburg). The study was conducted in accordance with the Declaration of Helsinki. All participants were naïve to the experimental setup. The financial compensation was 170 € in case of complete participation.
```

1 Material and methods

1.1 Participants

In total, 120 participants (female-M,T0 = 79, age-M,T0 = 24.68, age-SD,T0 = 3.70, age-range,T0 = 18 - 34) were a priori selected from a study within the framework of the Collaborative Research Center SFB TRR 58 which examines functional genomics and gene-by-environment interactions. The selection was based on the absence of traumatic experiences during childhood as assessed by the Childhood Trauma Questionnaire (Bernstein et al. 2003; Klinitzke et al. 2012): Only participants with emotional abuse < 13, physical abuse < 10, sexual abuse < 8, emotional neglect < 15, and physical neglect < 10 were included (Bernstein et al. 2003; Glaesmer 2016). Exclusion criteria were age under 18 or over 50, regular medical (except oral contraceptives) or illegal substance intake, chronic diseases, and neurological/psychiatric disorders. Participants were right handed and had normal or corrected to normal vision. For further sample characteristics of the final sample, see Table 1. They all gave written informed consent to the protocol which was approved by the local ethics committee (PV 5157, Ethics Committee of the General Medical Council Hamburg). The study was conducted in accordance with the Declaration of Helsinki. All participants were naïve to the experimental setup. The financial compensation was 170 € in case of complete participation.

Preprints I

What?

- Non-peer reviewed unpublished version of paper made available to the public (usually on preprint server)

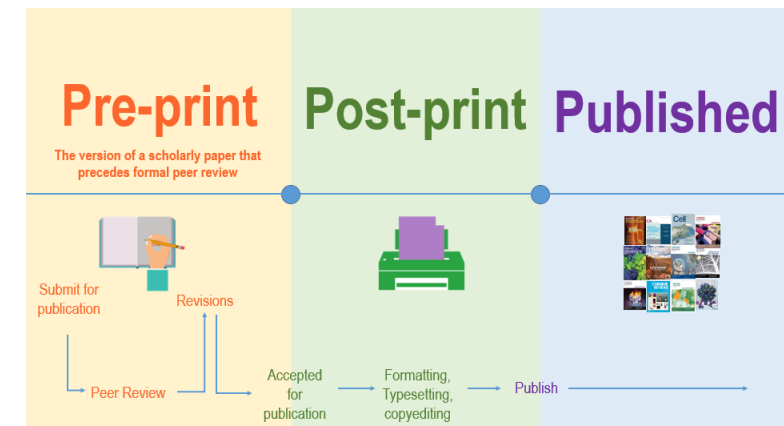
Why?

- Making new results available faster (avoid being scooped)
- Receive feedback outside of peer-review



How?

- Check guidelines of journal you are intending to submit to
- Choose preprint server and upload document
- Update postprint with link/reference to peer-reviewed version later



Preprints II



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Search Advanced Search

bioRxiv is receiving many new papers on coronavirus SARS-CoV-2. A reminder: these are preliminary reports that have not been peer-reviewed. They should not be regarded as conclusive, guide clinical practice/health-related behavior, or be reported in news media as established information.

New Results

[Comment on this paper](#)

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Increasing stimulus similarity drives nonmonotonic representational change in hippocampus

Jeffrey D Wammes, Kenneth A Norman, Nicholas B Turk-Browne
doi: <https://doi.org/10.1101/2021.03.13.435275>

This article is a preprint and has not been certified by peer review [what does this mean?].

[Abstract](#) [Info/History](#) [Metrics](#) [Preview PDF](#)

Abstract

Studies of hippocampal learning have obtained seemingly contradictory results, with manipulations that increase coactivation of memories sometimes leading to differentiation of these memories, but sometimes not. These results could potentially be reconciled using the nonmonotonic plasticity hypothesis, which posits that representational change (memories moving apart or together) is a U-shaped function of the coactivation of these memories during learning. Testing this hypothesis requires manipulating coactivation over a wide enough range to reveal the full U-shape. To accomplish this, we used a novel neural network image synthesis procedure to create pairs of stimuli that varied parametrically in their similarity in high-level visual regions that provide input to the hippocampus. Sequences of these pairs were shown to human participants during high-resolution fMRI. As predicted, learning changed the representations of paired images in the dentate gyrus as a U-shaped function of image similarity, with neural differentiation occurring only for moderately similar images.

Competing Interest Statement

The authors have declared no competing interest.

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Dissociable pathways for moving and static face perception begin in early visual cortex: evidence from an acquired prosopagnosic

AUTHORS
Magdalena W Siwinska, Caitlin Bearpark, Julia Corkhill, Aimee McPhillips, David Pitcher

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Abstract

To investigate the functional connections between the core components of the face processing network we tested Herschel, an acquired prosopagnosic patient with a right ventral occipitotemporal lesion. In Experiment 1 Herschel, and control participants, were scanned with functional magnetic resonance imaging (fMRI) while viewing videos of moving ...

[See more](#)

Preprint DOI

[10.31234/osf.io/sdtrv](https://doi.org/10.31234/osf.io/sdtrv)

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Disciplines

Life Sciences Neuroscience Cognitive Neuroscience

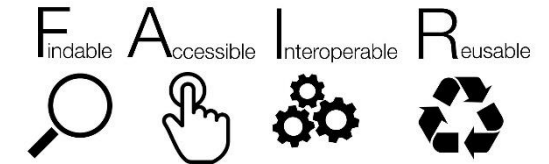
Tags

Keywords
Face processing, occipital face area (OFA), fusiform face area (FFA), posterior superior temporal sulcus (pSTS)

Highlights
• An acquired prosopagnosic with a right occipitotemporal lesion completed three fMRI

Questions and concerns about preprints?
Do you submit them?
Do you cite them?

FAIR principle



Findable:

- Use of unique and persistent identified (doi)
- Machine-readable metadata
- Use of searchable repository

Accessible:

- Open and freely available data
- Can be retrieved by identifier

Interoperable

- Use of accessible and broadly applicable language for representation (i.e. avoid proprietary data formats)
- Use vocabulary following the FAIR principle

Reusable

- Data are described in detail
- Provide data usage license (e.g. CC-By Attribution 4.0 International)

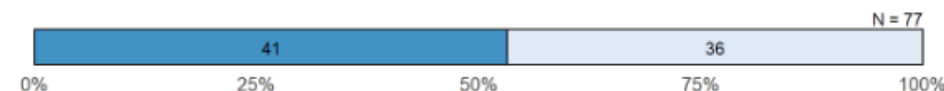
Data and Code Sharing: FAIR principle applied

- Create machine-readable metadata (xml, html, csv, json)
- Label your **variables** and provide a **codebook** (incl. description of variable names, data transformations, measurement units, measurement scales, questionnaire versions etc.)
- Save data files in non-proprietary formats (csv, tsv)
- Share primary data: first instance of digital data in standardized formats (e.g. EDF, NIFTI) (Recommendations by DGP, 2020)
- Scripts: comment a lot, make them easy to use for others
- Find the right **repository**
- Provide a **license**

A Proprietary data formats

Proprietary:

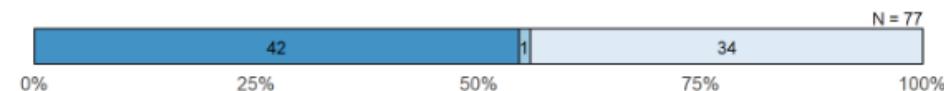
☒ no ☐ yes



B Codebook availability

Available:

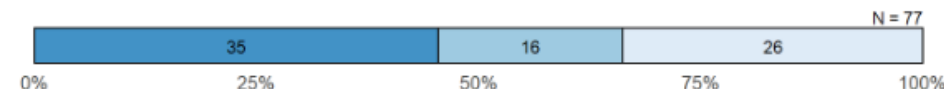
☒ no ☐ partly ☐ yes



C Understandability of Dataset

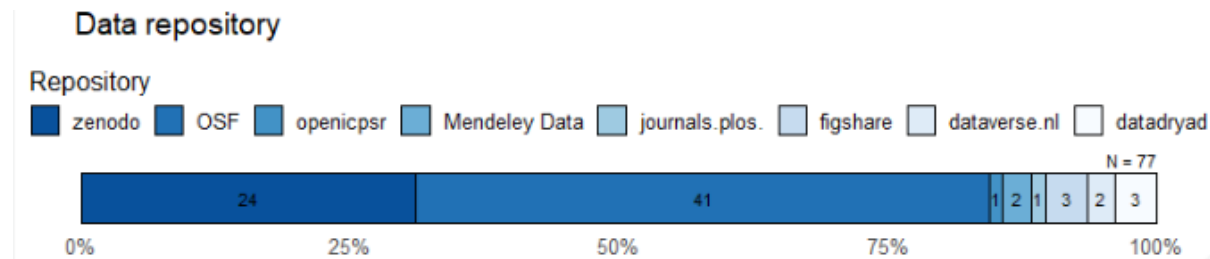
Understandable:

☒ no ☐ partly ☐ yes



Repositories

- Avoid personal or lab websites
- Avoid university or journal websites
- Chose repository that adheres to EU regulations, ensures persistent data access and link to identifier



Repository	Country / Jurisdiction	Costs	Identifier (Y/N)	Machine Searchable (Y/N)	Usage statistics (Y/N)
Zenodo	EU	free	Y	Y	Y
OSF	USA	free	Y	N	Y
Mendeley	Netherlands	free	Y	N	Y
Figshare	UK	Free up to 100GB	Y	N	Y
Dryad	USA	\$120/package	Y	N	Y
Dataverse	USA	free	Y	N	Y
ICPSR	USA	Free up to 2GB	Y	N	Y
GESIS	Germany	free	Y	N	Unclear

Licensing

Important to know:

- Important: primary data are not generally protected by copyright!
- Primary data is factual information and not a personal intellectual creation or expression of yourself
- But data that you collated, manipulated , transformed, etc. falls under the laws of copyright

Why?

- Informs people what they are allowed to do with your data.

Which license to choose?

- Easiest to use standard license
- CC (creative commons) license: places data in the public domain
- Most commonly used: CC by 4.0 International

This license lets others distribute, remix, adapt, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials.

Beyond FAIR: Ethical considerations

- General Data Protection Regulation (GDPR) passed in 2016
- Active consent for data usage
- Separate consent for usage of data within project and data for unknown purpose (if shared with others)
- Explicit consent for data sharing in and beyond repositories that adhere to GDPR standards (i.e. US based servers)
- (Pseudo)anonymization: identification of data subjects no longer possible (i.e. anonymization key should be destroyed when project is completed)
- Defacing of MRI data

What is important for
Data Protection
in science in the future?

General and specific changes in data protection
for scientific use resulting from the EU General
Data Protection Regulation

Katrin Schaar

July 2016

For practical tips: Meyer et al., 2017

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