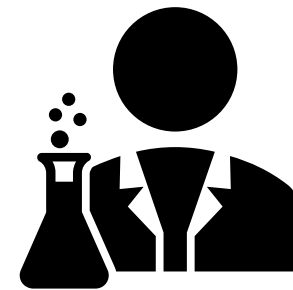
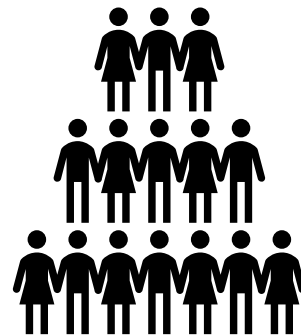




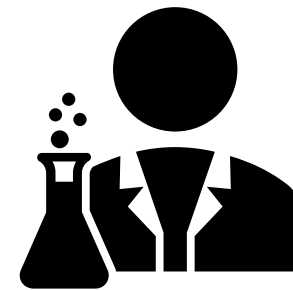
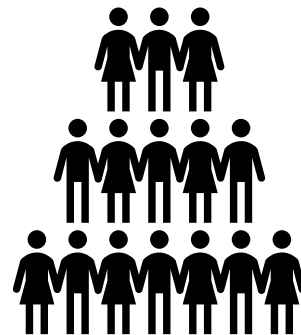
# Science & Society

- No time & resources to become an expert in every field → trust in science necessary (Hendriks et al., 2015)
- Science & Society have a social contract (Gibbons, 1999)
  - In return for the public's support, science is required to **transparently** produce **reliable** knowledge about how the world operates



# Science & Society

- Upsides of close collaboration with the public (Eagleman, 2013)
  - Inspire critical thinking and public debates
  - Correct misinformation
  - Improve law and policy



# Science & Society

## Pitfalls

- Large numbers of scientists working competitively in silos without combining their efforts (Ioannidis, 2005)
- Low Replicability (Reproducibility Project: Psychology, 2012).
- Inaccessible materials, data, and publications (Hofner et al., 2016)
- Lack of science communication (Lakomý et al., 2019)

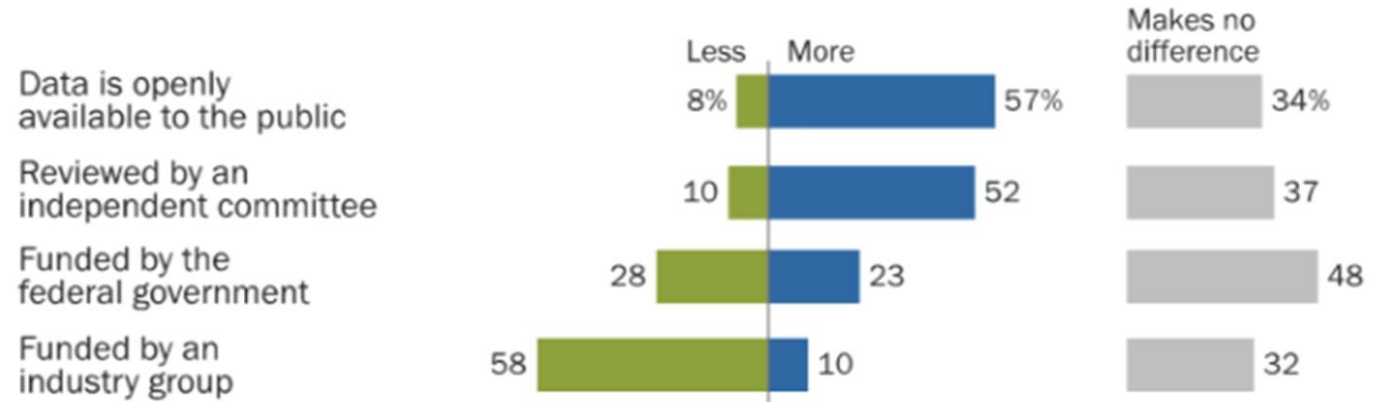


# Science & Society

## Pitfalls

### Majority of Americans say they are more apt to trust research when the data is openly available

*% of U.S. adults who say when they hear each of the following, they trust scientific research findings ...*



Pew Research Center, 2019



# Science & Society

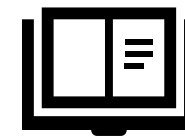
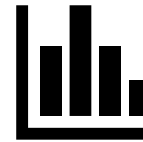
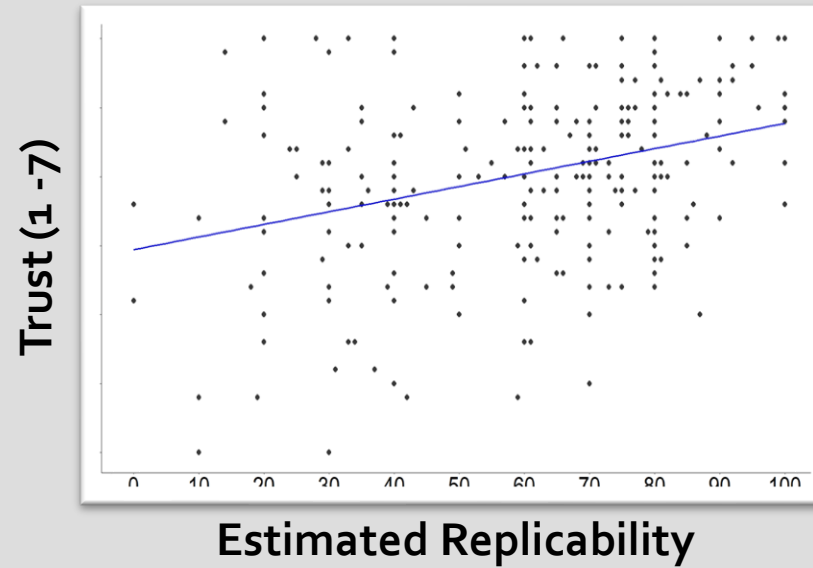
## Pitfalls

- Large numbers of scientists working competitively in silos without combining their efforts (Ioannidis, 2005)
- **Low Replicability** (Reproducibility Project: Psychology, 2012).
- Inaccessible materials, data, and publications (Hofner et al., 2016)
- Lack of science communication (Lakomý et al., 2019)



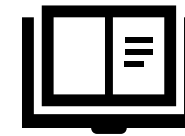
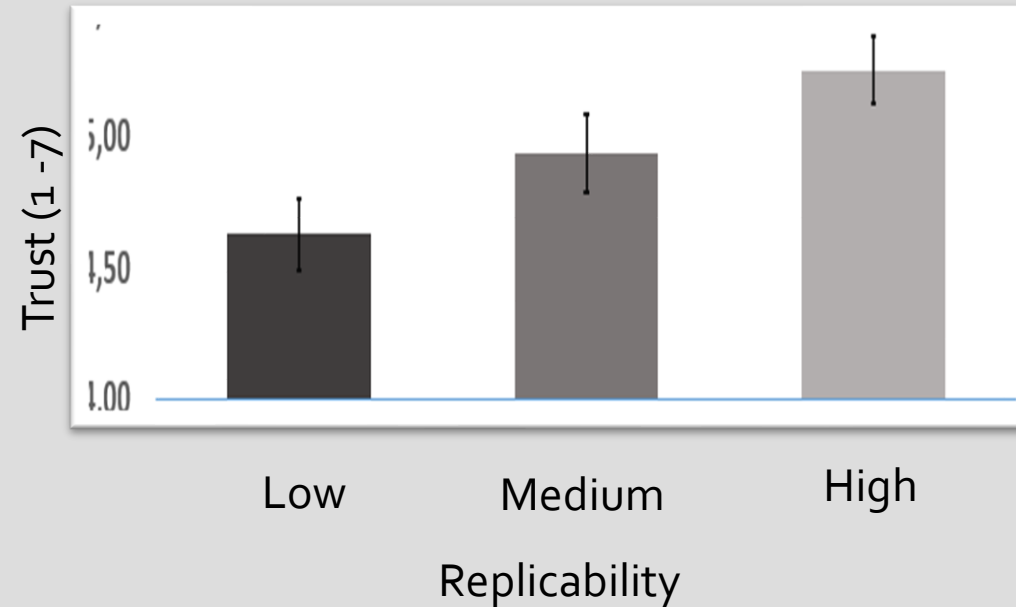
## Wingen, Berkessel, English (2020): Replicability & Trust in Psychological Science

### 1. Information about the Reproducibility Project: Psychology



## Wingen, Berkessel, English (2020): Replicability & Trust in Psychological Science

### 2. Experimental manipulation of replicability





# Science & Society

## Pitfalls

### Wingen, Berkessel, English (2020): Replicability & Trust in Psychological Science

#### Effects of trust repair strategies

#### Cohen's d [95% CI]

Transparency  
(Study 3, N = 304)

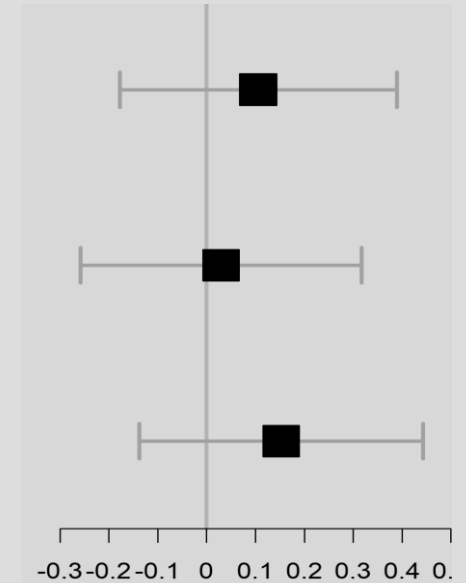
0.11 [-0.18, 0.39]

Context Sensitivity  
(Study 4, N = 303)

0.03 [-0.26, 0.32]

Increased Replicability  
(Study 5, N = 304)

0.15 [-0.14, 0.44]



→ **Trust is easy to lose and hard to repair**

(see also Anvari & Lakens, 2019 and Hendriks et al., 2020)



# Science & Society

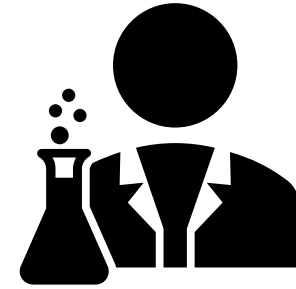
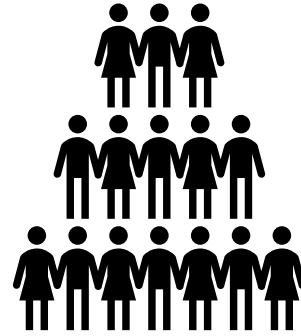
## Pitfalls

- Large numbers of scientists working competitively in silos without combining their efforts (Ioannidis, 2005)
- Low Replicability (Reproducibility Project: Psychology, 2012).
- Inaccessible materials, data, and publications (Hofner et al., 2016)
- Lack of science communication (Lakomý et al., 2019)
  
- → **Room for improvement in fulfilling the social contract** (Munafò et al., 2017)
- → **Improvement necessary to not lose trust** (Wingen et al., 2020)



# Open Science & Society

## Opportunities



### What now?

“Open Science is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods.”

- Foster Open Science

# Open Science & Society

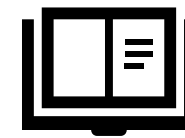
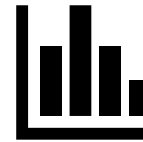
## Opportunities

Pre-Registration &  
Registered Reports can prevent  
cognitive biases  
(Munafó et al., 2017)



MZES-GEIS Pre-Registration Challenge

Submit a hypothesis-driven research design and pre-registered analysis plan,  
the best paper is awarded data collection free of charge.



# Open Science & Society

## Opportunities

Team Science Efforts can  
prevent low power & non-  
cooperative research  
(Klein et al., 2014)



The Many Lab

## ManyBabies

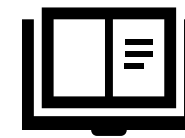
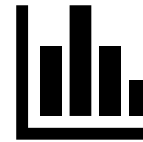
Multi-lab replications of influential experiments in



## OSSC19 Crowdsourced Replication Initiative

Become one among many authors:

Replicate and enhance a cross-national quantitative study



# Open Science & Society

## Opportunities

Open Materials & Data make  
research accessible &  
facilitate collaboration  
(Hofner et al, 2016)

### Initial Name Set

Nett, Dorrough, Glöckner & 1 more

Source of the initial name set to be entered in the validation

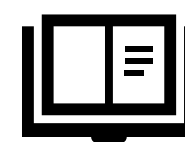
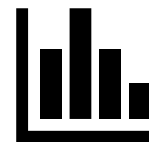
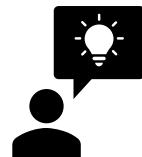
### Collected Measurements

Nett, Dorrough, Glöckner & 1 more



Project Implicit®

Collect Implicit




Open Science  
& Society

Opportunities

Reproducible & improved  
analyses can increase  
reproducibility and statistical  
inferences  
(Nosek et al., 2015)

**Make Your Code Reproducible**

Juli Tkotz [↗](#)




 **stackoverflow** [About](#) [Products](#) [For Tear](#)

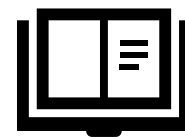
Home **Doing T.test in R**

```
a <- dist(st)
c <- hclust(d)
plot(c)
```

0:14 / 2:10:38 • Welcome

R Programming Tutorial - Learn the Basics of Statistical Computir

1.080.115 Aufrufe • 06.06.2019  18.029  663  TEILEN



# Open Science & Society

## Opportunities

Preprints, Open Review,  
Open Access open up peer-  
review and access to final  
publications

### Preprints and Open Access in Mathematics

Prof. Dr. Simone Göttlich [↗](#)

University of Mannheim – Chair of Scientific Computing

## Open Peer Review

This course will introduce you to Open Peer Reviewing and let you know how you can get started

[UB Mannheim](#)

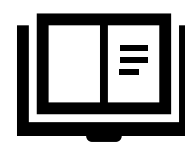
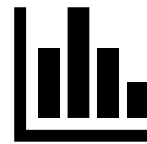
Catalog search

Website search

Search Primo catalog ...

[Home](#) / [Teaching & research](#) / [Publishing and open access](#)

### Publishing and Open Access



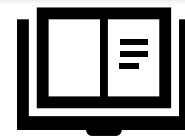


# Open Science & Society

## Opportunities

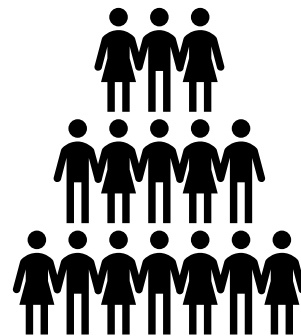
Science Communication can  
increase trust in and support  
of science  
(Lakomý et al., 2019)

The screenshot shows the LinkedIn profile for 'The Inquisitive Mind'. The profile picture is a circular image of a man with glasses and a blue shirt, with the text 'Wir sind' overlaid. The header includes the LinkedIn logo and the name 'The Inquisitive Mind'. Below the header is a navigation bar with links for 'the magazine', 'blog', 'book reviews', 'videos', 'the foundation', and 'donate'. The main content area features a large 'SCIENTISTS' title, a 'Folge ich' button, and a video player. The video is titled 'YOGASCIENCE' and 'INFLUENZA' and is from the channel 'mailab'. The video description asks 'Wie sinnvoll ist eine Grippeimpfung?' and mentions 423,429 views from 11 months ago.

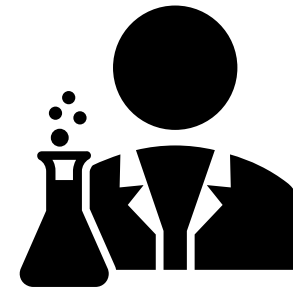
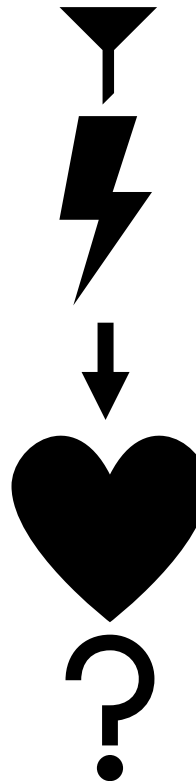


# Open Science & Society

## Pitfalls



Open Science



# Open Science & Society

## Pitfalls

„Unfiltered“ information without necessary context?

- More public criticism (blogs, twitter, facebook)
  - → without training legitimate disagreement might be mistaken for “trouble” (Pittinsky, 2015)
- Scientific uncertainty reduces perceived value of scientific fields (Broomell & Kane, 2017; Howe et al., 2019)
- Preprints vs. Peer-reviewed papers (Wingen et al., in prep)
- Science Communication is not strictly controlled

# Open Science & Society

## Pitfalls

„Unfiltered“ information without necessary context?

- More public criticism (blogs, twitter, facebook)
  - → without training legitimate disagreement might be mistaken for “trouble” (Pittinsky, 2015)
- **Scientific uncertainty reduces perceived value of scientific fields** (Broomell & Kane, 2017; Howe et al., 2019)
- Preprints vs. Peer-reviewed papers (Wingen et al., in prep)
- Science Communication is not strictly controlled

# Open Science & Society

## Pitfalls

Editorial | Published: 29 October 2019

## Scientific uncertainty

*Nature Climate Change*

4098 Accesses | 26

### The effects of communicating uncertainty on public trust in facts and numbers

Anne Marthe van der Bles<sup>a,b,c,1</sup>, Sander van der Linden<sup>a,b,d,1</sup>, Alexandra L. J. Freeman<sup>a,b</sup>, and David J. Spiegelhalter<sup>a,b</sup>

<sup>a</sup>Winton Centre for Risk and Evidence Communication, University of Cambridge, Cambridge CB3 0WA, United Kingdom; <sup>b</sup>Department of Pure Mathematics and Mathematical Statistics, University of Cambridge, Cambridge CB3 0WA, United Kingdom; <sup>c</sup>Department of Social Psychology, University of Groningen, 9812 TS Groningen, The Netherlands; and <sup>d</sup>Cambridge Social Decision-Making Lab, Department of Psychology, University of Cambridge

- **How** scientists express uncertainty matters (Howe et al., 2019)
  - Concrete range of possibilities → increased trust
  - Unpredictable impacts → reduced trust
- Only small decrease in trust in numbers trustworthiness of source (Van der Bles et al., 2020)

→ **Uncertainty not necessarily bad!**

# Society & Open Science

„Unfiltered“ information without necessary context?

- More public criticism (blogs, twitter, facebook)
  - → without training legitimate disagreement might be mistaken for “trouble” (Pittinsky, 2015)
- Scientific uncertainty reduces perceived value of scientific fields (Broomell & Kane, 2017; Howe et al., 2019)
- Preprints vs. Peer-reviewed papers (Wingen et al., in prep)
- **Science Communication is not strictly controlled**

## Peer-Review in Science Communication



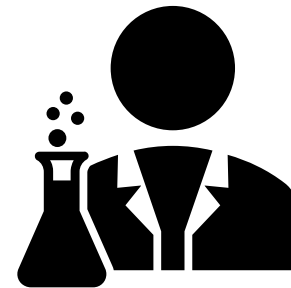
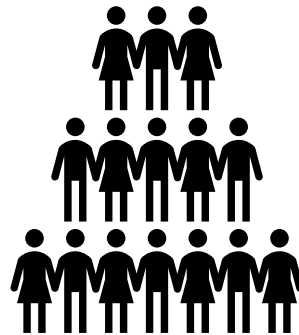
### The Inquisitive Mind

#### What is Peer-Review?

In-Mind Magazine is a peer-reviewed magazine presenting research to a broad audience. What does peer-review entail? Peer-review means that articles are reviewed by experts in the field, who remain anonymous to the authors.

# Conclusion

- Science & Society have a social contract
- Science's compliance with this contract could be improved
- Open Science offers methods to do so
- These contain pitfalls that need to be kept in mind
- Solutions are already researched & implemented







# Summary

- Science & Society have a social contract
  - Science should **transparently** produce **reliable** knowledge about how the world operates
  - Many pitfalls along the way (e.g., closed methods, data, & access)
- Science's compliance with this contract could be improved
- Open Science offers methods to do so (e.g., collaborative efforts, reproducible methods, open access publications)
- These contain pitfalls that need to be kept in mind (e.g., uncertainty reduces trust, preprint vs. peer-review)
- Solutions are already researched and implemented (e.g., framing of uncertainty, primer on peer-review, peer-review in science communication)