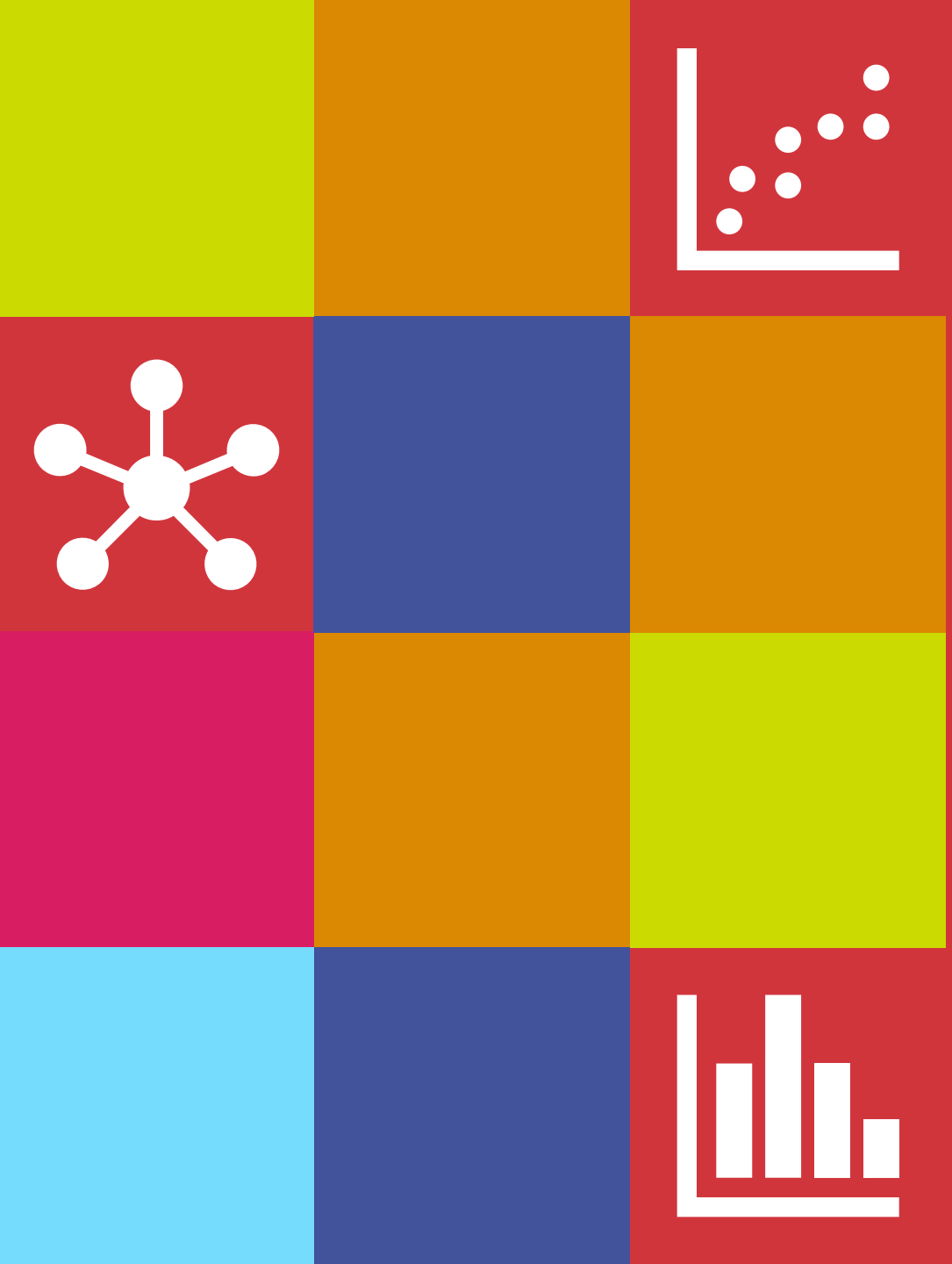


Reproducibility, Replicability, and Registration of Simulation Studies

Flake, Tibbe, Montoya, Alley & Shaw

MMM June 2024

Agenda

- Symposium overview
- Introductions
- Why do Reproducibility and Replicability of Simulation Studies Matter? (Flake)
- Replicating Simulation Research: A Case Study (Tibbe)
- Registered Reports for Simulation Studies (Montoya)
- How to Register Your Simulation Study: Our Lessons Learned (Alley & Shaw)

What is this symposium about?

Starting an era of replication (and reproduction) for methodological researchers

SCIENCE

The “marshmallow test” said patience was a key to success. A new replication tells us s’more.

The famous psychology test gets roasted in the new era of replication.

by **Brian Resnick**
Jun 6, 2018, 1:10 PM EDT

Go ahead. Eat the damn marshmallow. Getty Images

The Speakers

- Jessica Flake: Associate Prof, into measurement and open science
- Tristan Tibbe: PhD student, missing data and mediation analysis
- Amanda Montoya: Associate prof, into mediation and registered reports
- Lindsay Alley: PhD student, into measurement invariance and how to make decisions in SEM
- Mairead Shaw: PhD candidate, into developing tools for multilevel models

Why Do Reproducibility and Replicability of Simulation Studies Matter?

Background

1

What is reproducibility and replication?

2

What crisis?

3

What reforms are other disciplines undertaking?

What are reproducibility and replication?

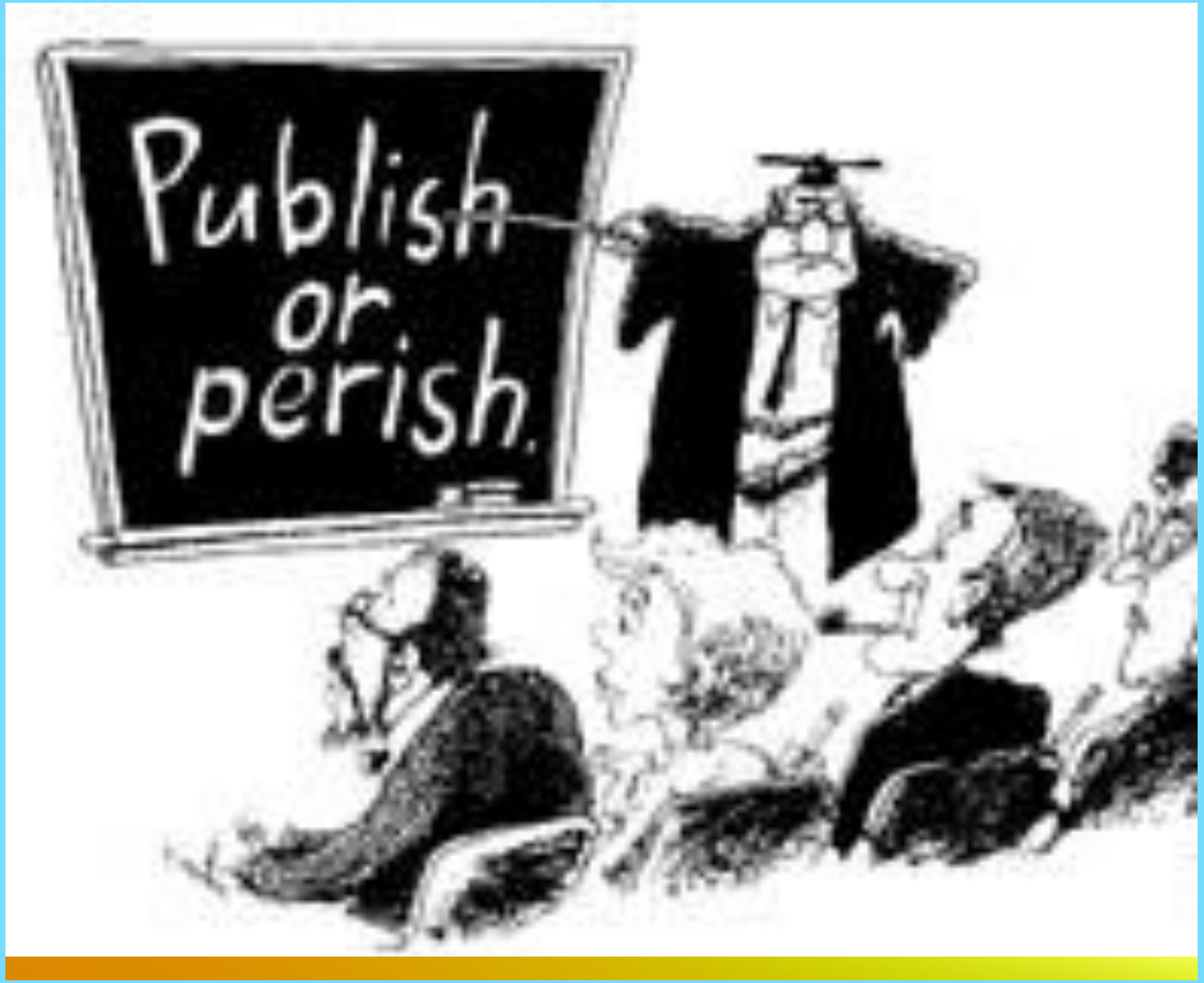
Original study: An empirical, quantitative study that makes a novel claim

Reproducibility and Reproduction: With the data from the original study, you can analyze it and get the same results as reported by the study authors, i.e., you can reproduce the results with the same data using the information provided

Replicability and Replication: With the information provided, you conduct a new study, aimed to make the same claim as the original study. You collect new data and evaluate the new results as in line with the original or not, i.e., you can replicate the results on a different dataset

Short history

- Basically, we found out that reproducing and replicating research is very difficult
- Fraud, failed replications, p-hacking awareness (2012ish)
- Incentives issues
  - Need to publish
  - Need statically significant results to publish



Reforms Took Off

Center for Open Science

- Created a place to share research materials and preprints
- Developed the Transparent and Open Practices guidelines
- Rolled out badges

COS isn't the only player, there are a host of platforms and resources, funding opportunities, and journal initiatives

A new publication format, the registered report, entered the scene

How does reproducibility and replicability relate to simulations?

Reproduction: With the information provided, you can simulate the same data and get the same results

Replication: With the information provided, you can simulate different data and get the same results

Field Standards

We have a "trust us" approach to science

Siepe et al., ➔

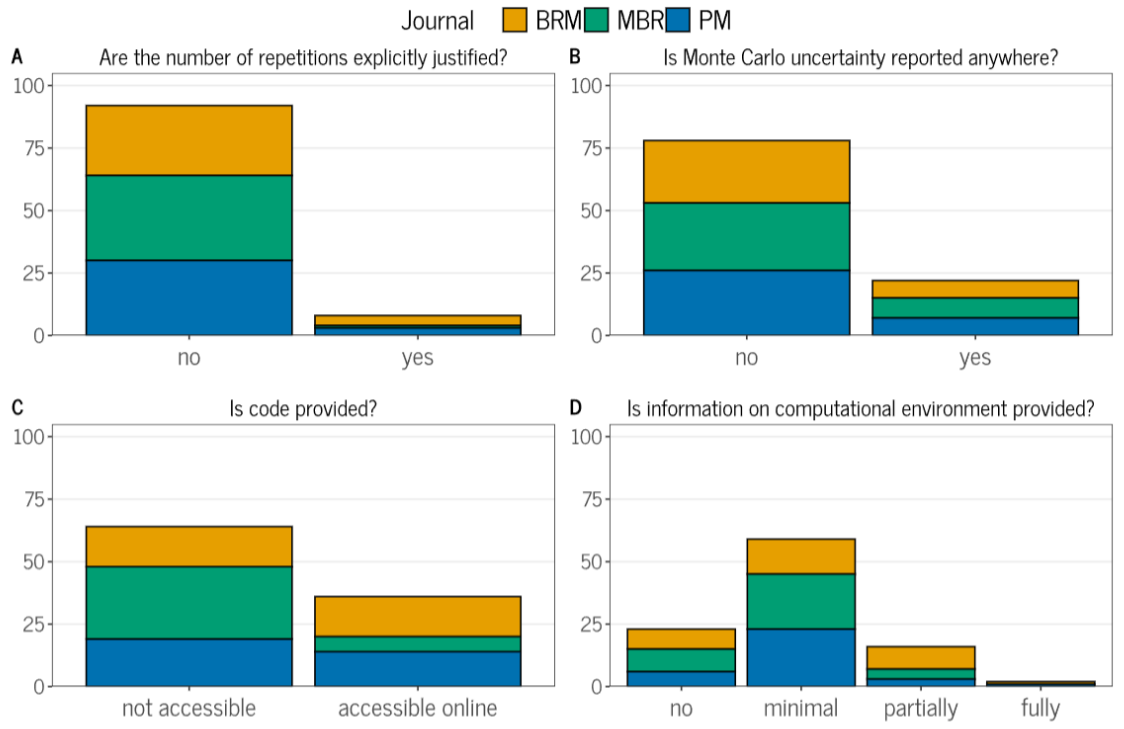
What are methodologists' incentives?

Publish or perish (same as everyone else)

Publish what?

New (superior) methods

Common Issues of Simulation Studies in Psychology as Identified in the Literature Review.



Note. 100 articles were reviewed that included simulation studies and were published in *Psychological Methods*, *Behavioral Research Methods*, and *Multivariate Behavioral Research* in 2021 and 2022.

We have publication bias and QRPs too

"over-optimistic bias" – new methods are better than existing ones (Boulesteix)

Seven sins of methodological research ➔

- Selective reporting
- Publication bias
- Lack of neutral comparison studies
- Lack of replication studies
- Poorly designed comparison studies
- Lack of meta-analyses/reviews of methods
- Lack of reporting

Research articles

The multiplicity of analysis strategies jeopardizes replicability: lessons learned across disciplines

Sabine Hoffmann ✉, Felix Schönbrodt, Ralf Elsas, Rory Wilson, Ulrich Strasser and Anne-Laure Boulesteix

Published: 21 April 2021 | https://doi.org/10.1098/rsos.201925

What is the problem with publication bias towards new methods?

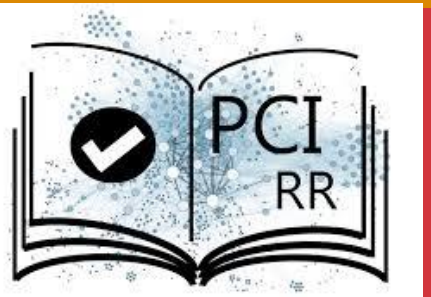
Ever expanding garden of forking paths

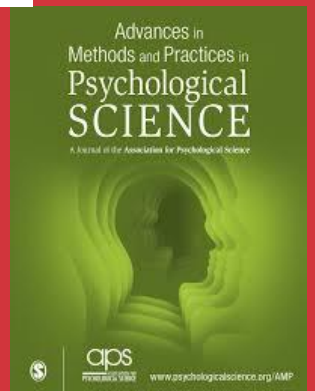
facilitates exploiting analytical flexibility to find significance

…or just totally getting lost with little hope of finding the truth

The more methods we create, the harder it is going to be to replicate

We should develop new methods, but we need better reporting standards and more development for rigorous use





We can adopt and develop reforms!

We can enhance reporting to reproduction standards

We can conduct replication and design neutral comparison studies that are reviewed ahead of time

We can curtail publication bias and selective reporting with registered reports

We can do what we do best, develop the methods and practices needed for methods research!

PERSPECTIVE article

Front. Epidemiol., 14 September 2022
Sec. Research Methods and Advances in Epidemiology
Volume 2 - 2022 | https://doi.org/10.3389/fepid.2022.973470

This article is part of the Research Topic
Insights In Research Methods and Advances in Epidemiology: 2022
View all 6 Articles

It's time! Ten reasons to start replicating simulation studies

Anna Lohmann[1] Oscar L. O. Astivia[2] Tim P. Morris[3] Rolf H. H. Groenwold[1,4*]

Up Next

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