PSYC 640 Grad Stats

Open Science

Fall 2023

Outline

Scientific Method

- Asking Questions

Past & Present of Science

- Replication / Reproducibility

Future Directions in Psychology

- Open Science
- Registered Reports

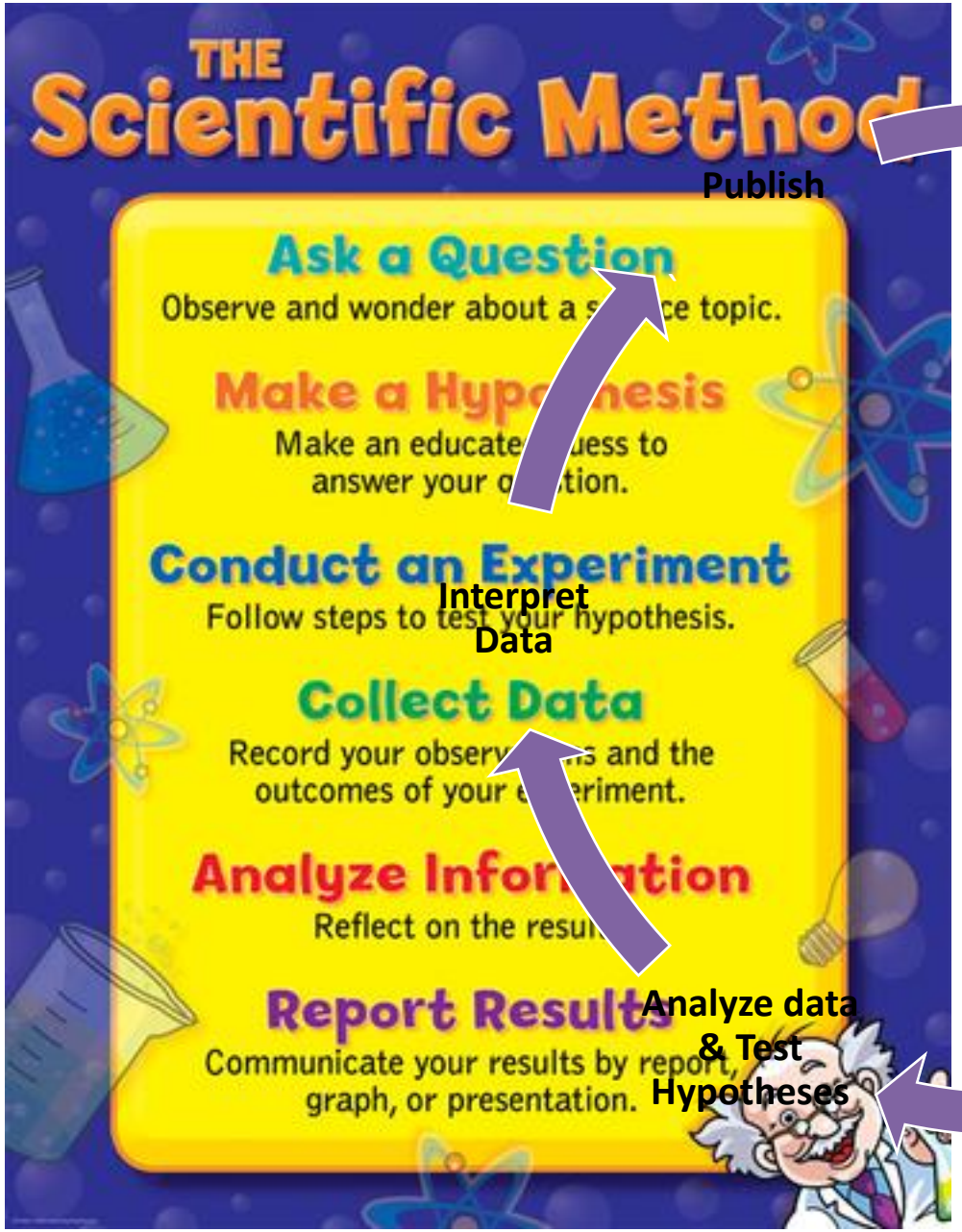
What Can I Do?

Research

What are the goals of science?

What's the goal of science?

- Describe a phenomenon – *What is it?*
- Explain a phenomenon – *Why does it happen?*
- Prediction – *What things lead to it happening?*
- Application – *How can we manipulate this thing?*



Publish

Generate & Specify Hypotheses

Design Study

Collect Data

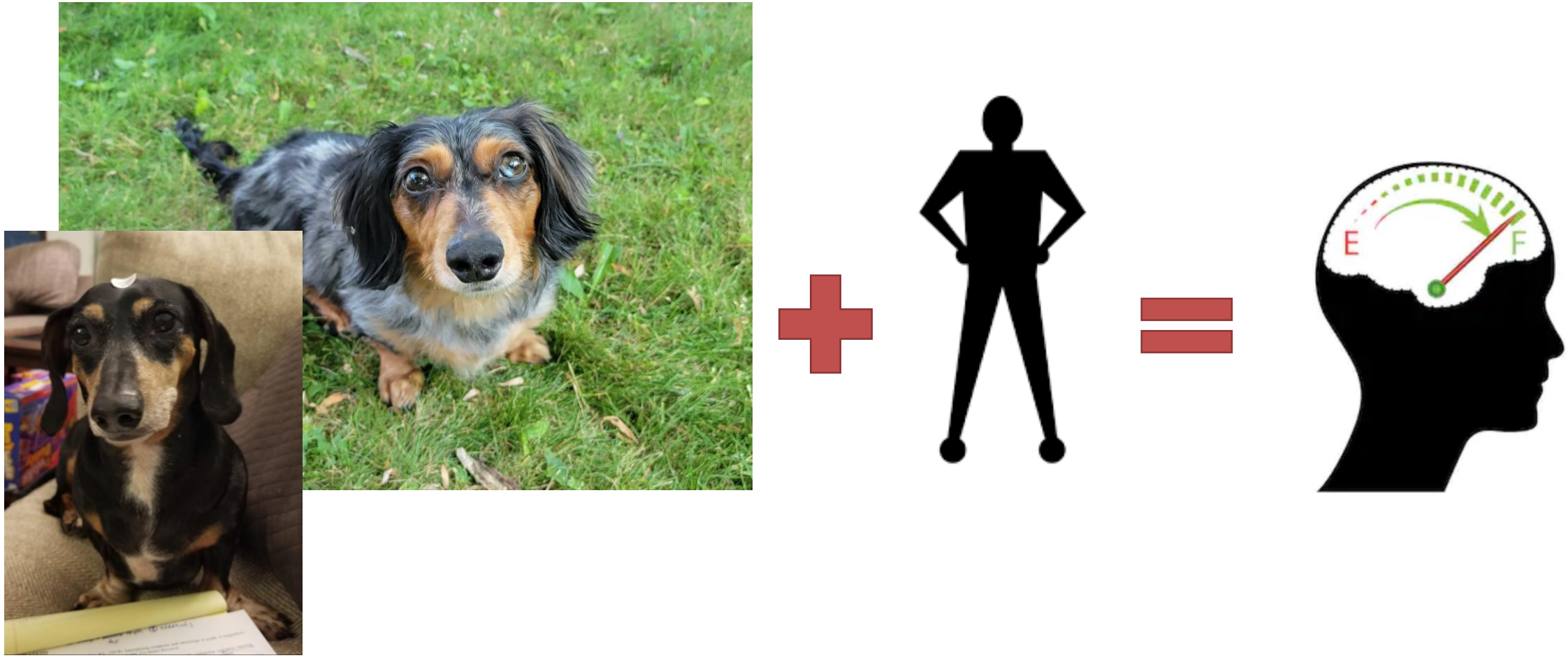
Analyze data & Test Hypotheses

Interpret Data

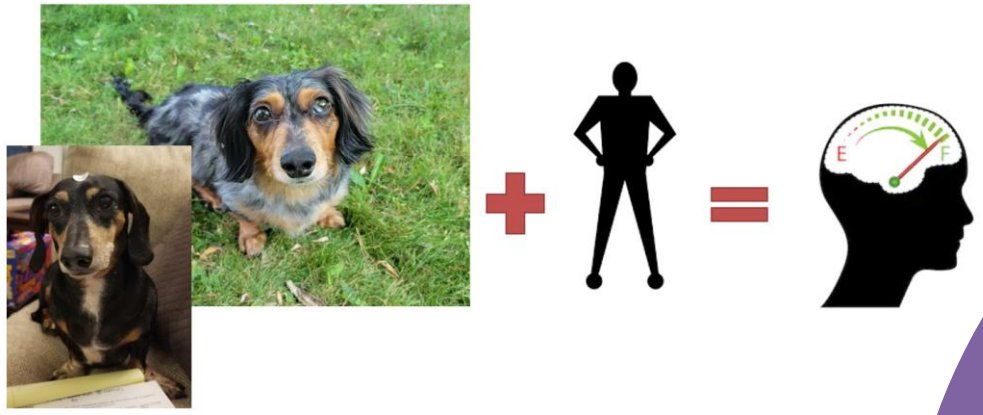
The peer review process

Scribbr

PUP Effect



PUP Effect



Generate & Specify Hypotheses

Design Study

Collect Data

Analyze data & Test Hypotheses

Interpret Data

Publish

Reproducibility vs. Replicability

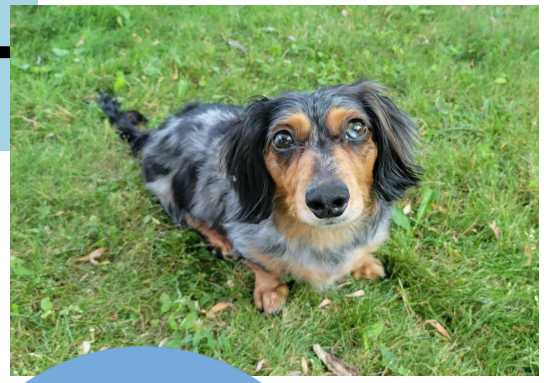
Reproducibility:

- Taking all materials from a study and coming to the same conclusions

Replicability:

- The process of applying the same methodology with a different sample and research group

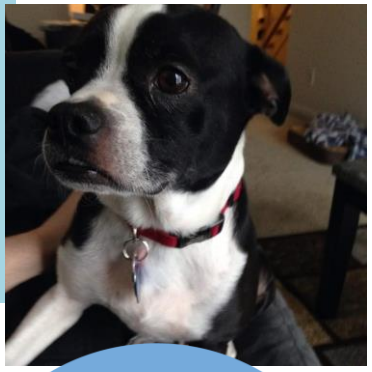
Reproducibility vs. Replicability



REPRODUCIBILITY	
Study 1	***Study 2***
Population	Population
Research Question / Hypothesis	Research Question / Hypothesis
Study design	Study design
Study personnel (e.g. outcome assessor)	Study personnel (e.g. outcome assessor)
Data	Data
Analysis plan	Analysis plan
Code	Code
Analyst	Different Analyst

Study 2 has successfully ***reproduced*** Study 1 if the estimates from both studies are consistent

Reproducibility vs. Replicability

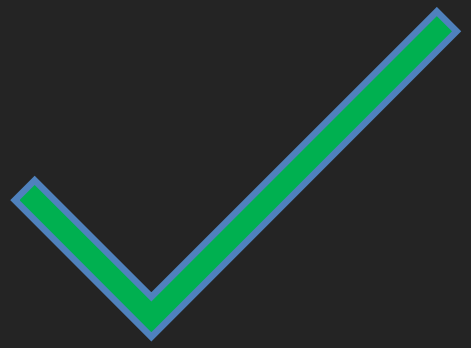


REPLICABILITY

Study 1	Study 2
Population	Population
Research Question / Hypothesis	Research Question / Hypothesis
Study design	Study design
Study personnel (e.g. outcome assessor)	Different Study personnel
Data	New Data
Analysis plan	Analysis plan
Code	New Code
Analyst	Different Analyst

Study 2 has successfully ***replicated*** Study 1 if the estimates from both studies are consistent

What happens if it doesn’t work?



Article Discussion

RESEARCH ARTICLE

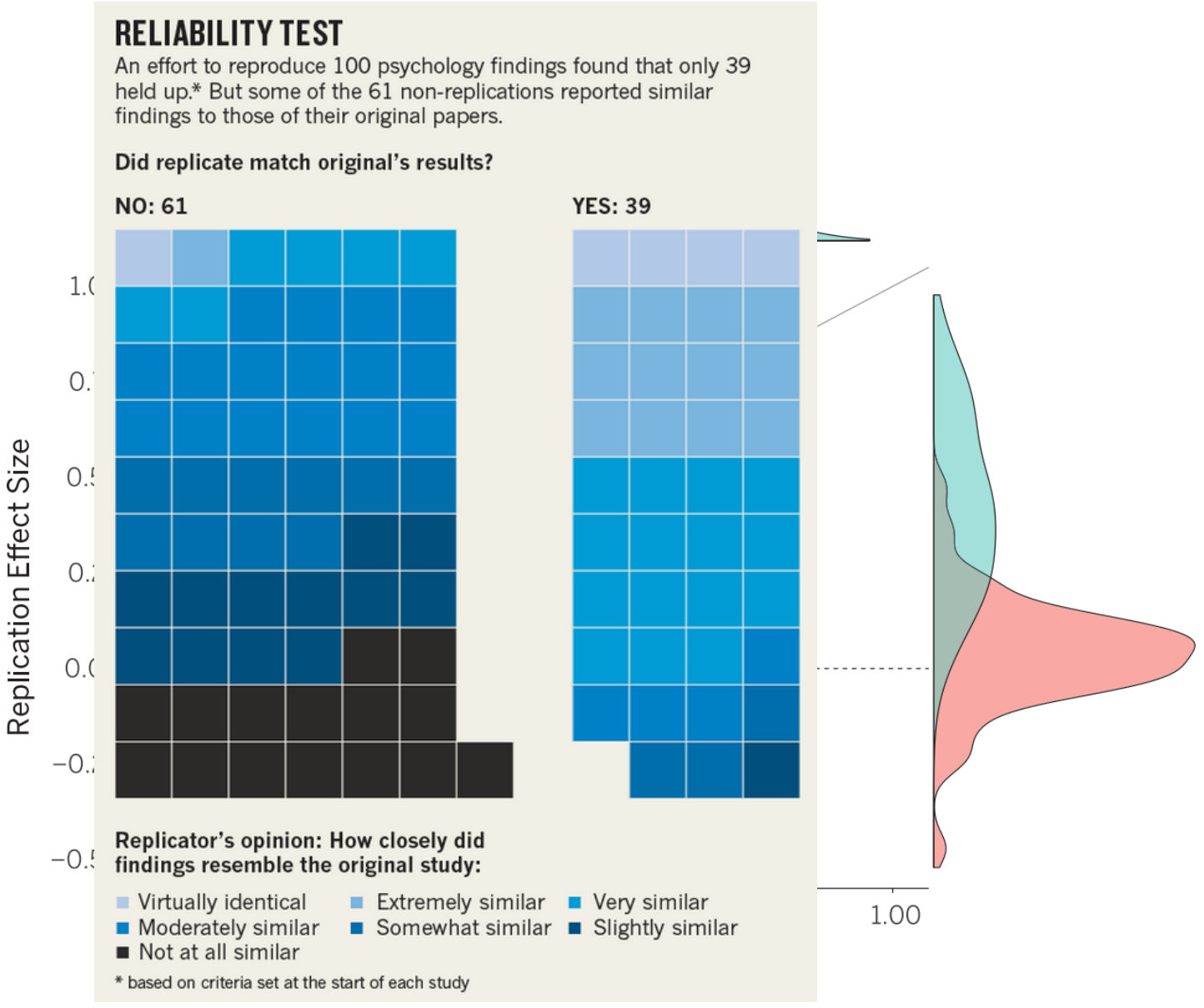
Estimating the reproducibility of psychological science

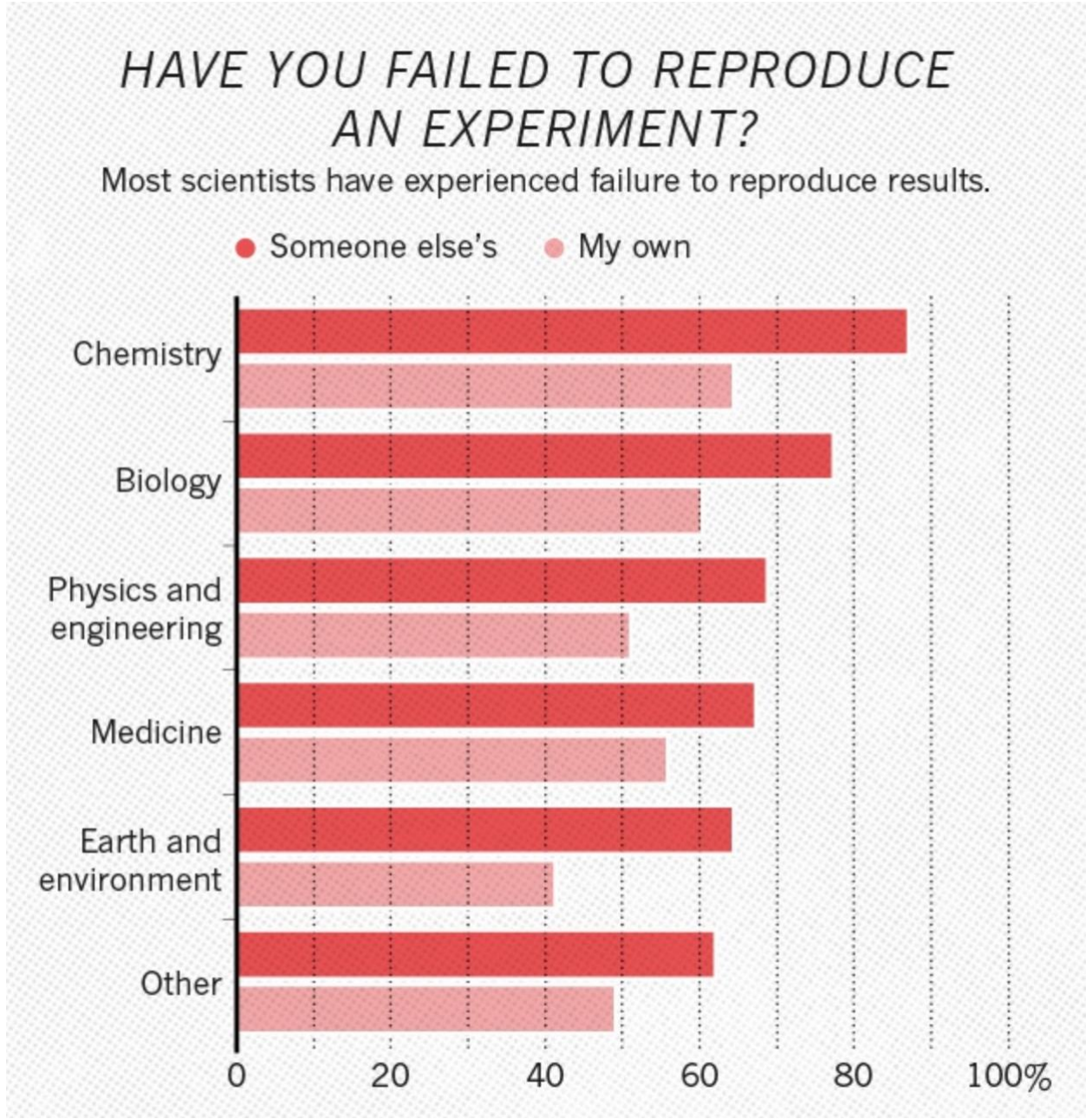
Open Science Collaboration*,†
+ See all authors and affiliations

100 Replication Studies
Adequately Powered

Original Studies:
Mean Effect: 0.403
% with p<.05: 97%

Replication Studies:
Mean Effect: 0.197
% with p<.05: 47%




HAVE YOU FAILED TO REPRODUCE AN EXPERIMENT?
Most scientists have experienced failure to reproduce results.
Someone else's
My own
Chemistry
Biology
Physics and engineering
Medicine
Earth and environment
Other
0
20
40
60
80
100%

Opinions

Diederik Stapel: The Lying Dutchman

A top Cornell food researcher has had 15 studies retracted. That's a lot.

Brian Wansink is a cautionary tale in bad incentives in science.

By Brian Resnick and Julia Belluz | Updated Oct 24, 2018, 2:25pm EDT

Daryl Bem Proved ESP Is Real

Which means science is broken.

MAY 17, 2017 • COVER STORY

Questionable Research Practices

Selective reporting of dependent variables

Deciding whether to collect more data after looking to see whether the results will be significant

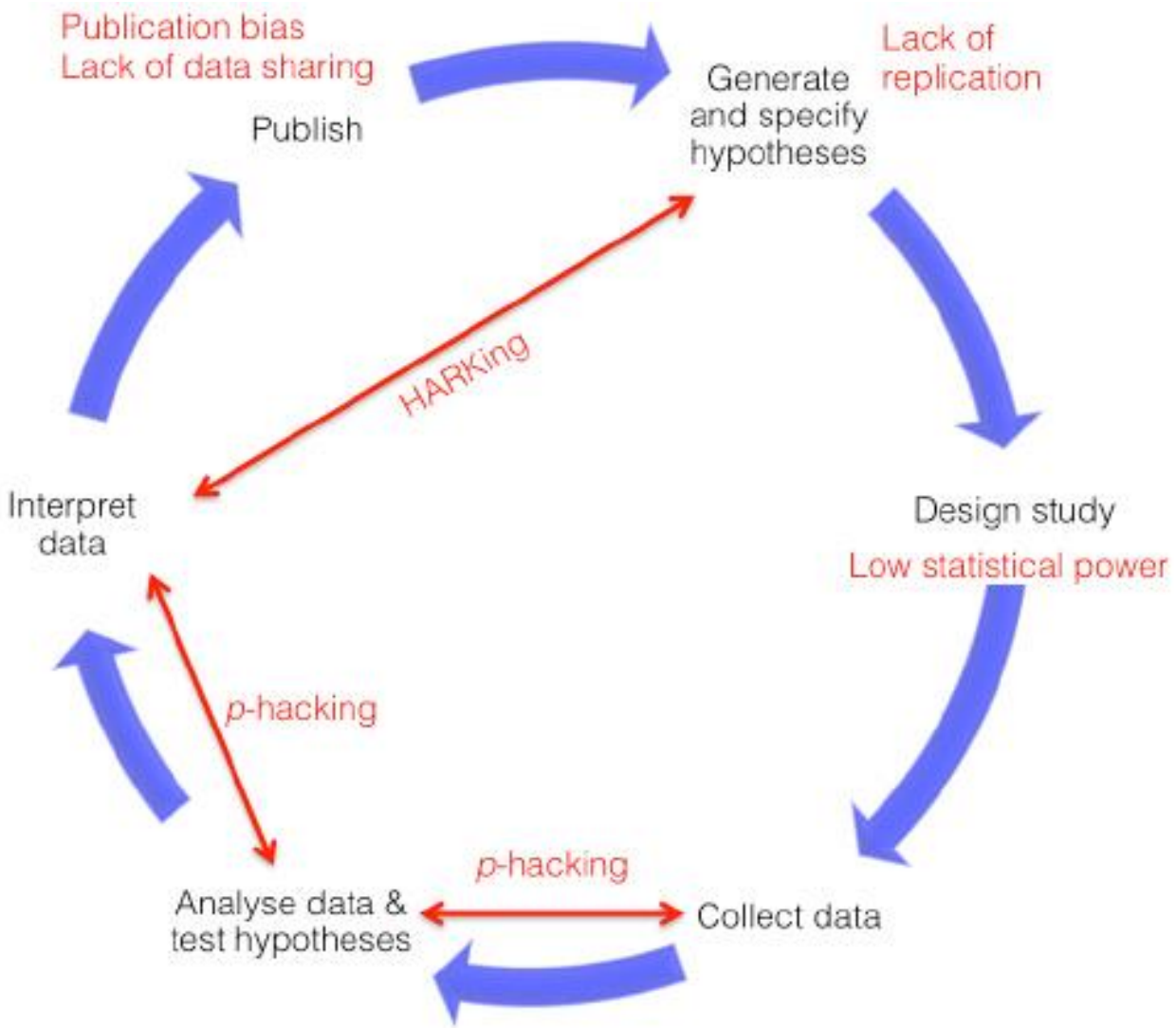
Failing to disclose experimental conditions

In a paper reporting selectively studies that worked

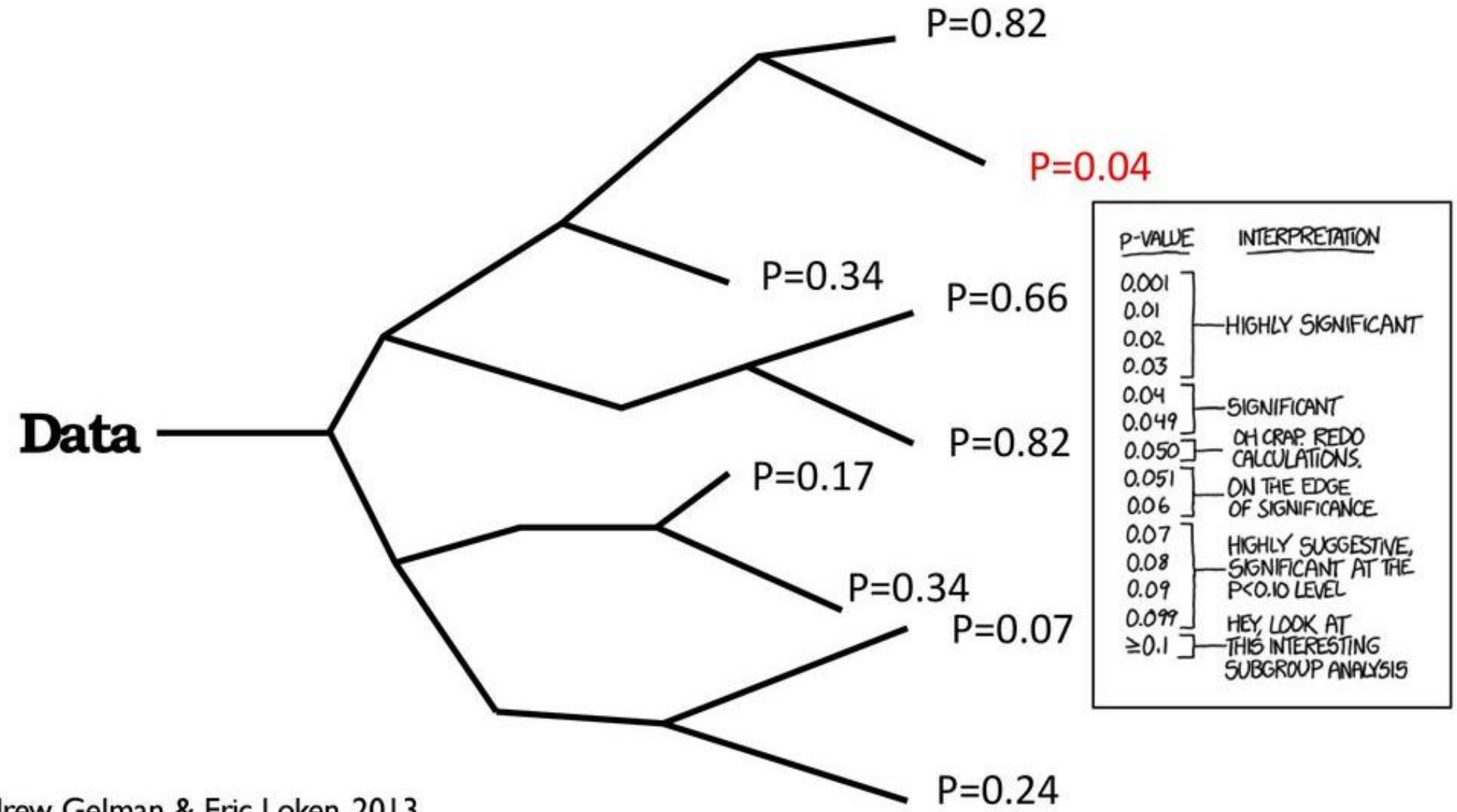
Reporting an unexpected finding as having been predicted from the start

Falsifying Data

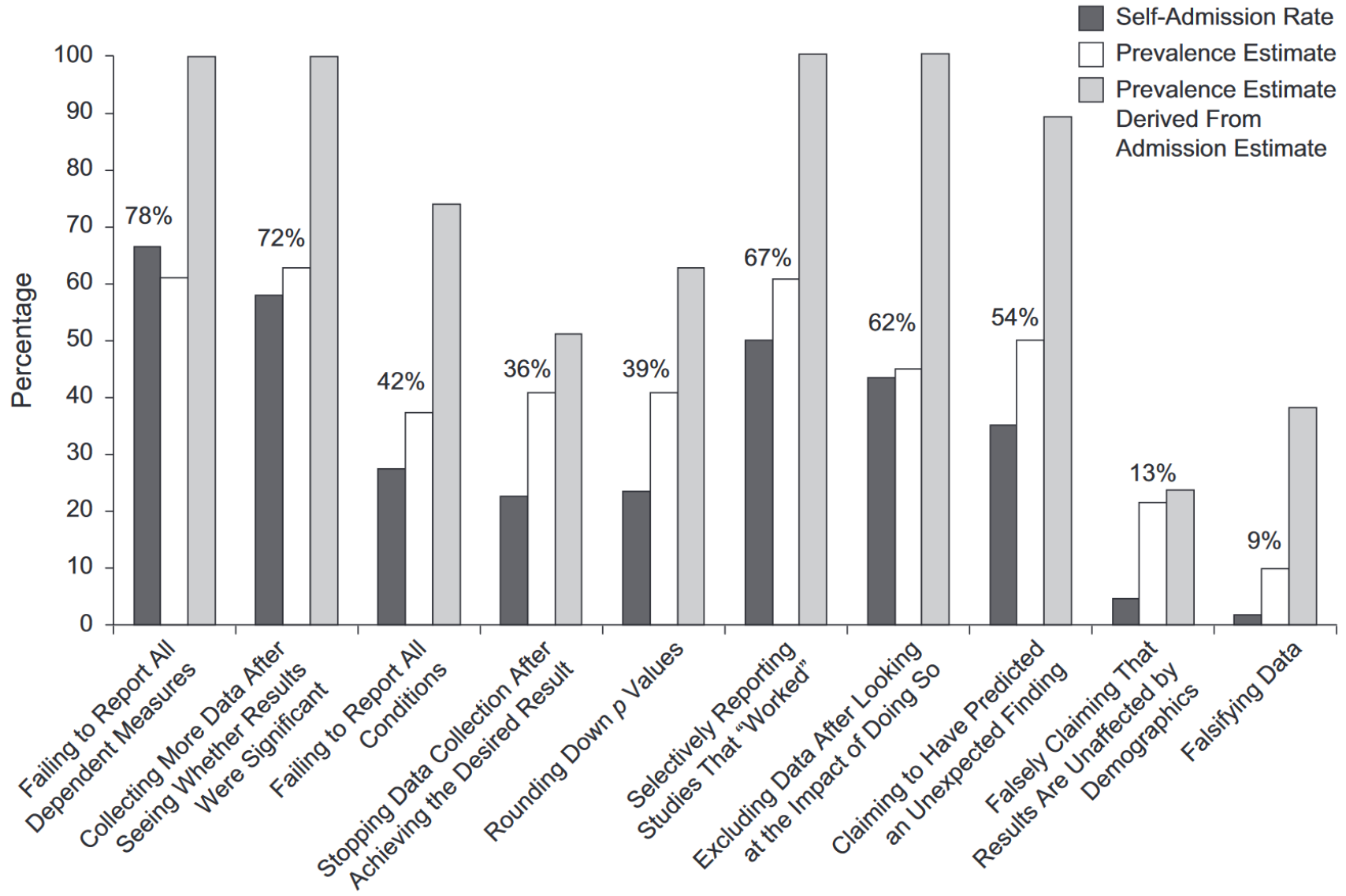
Scientific Process & QRP's



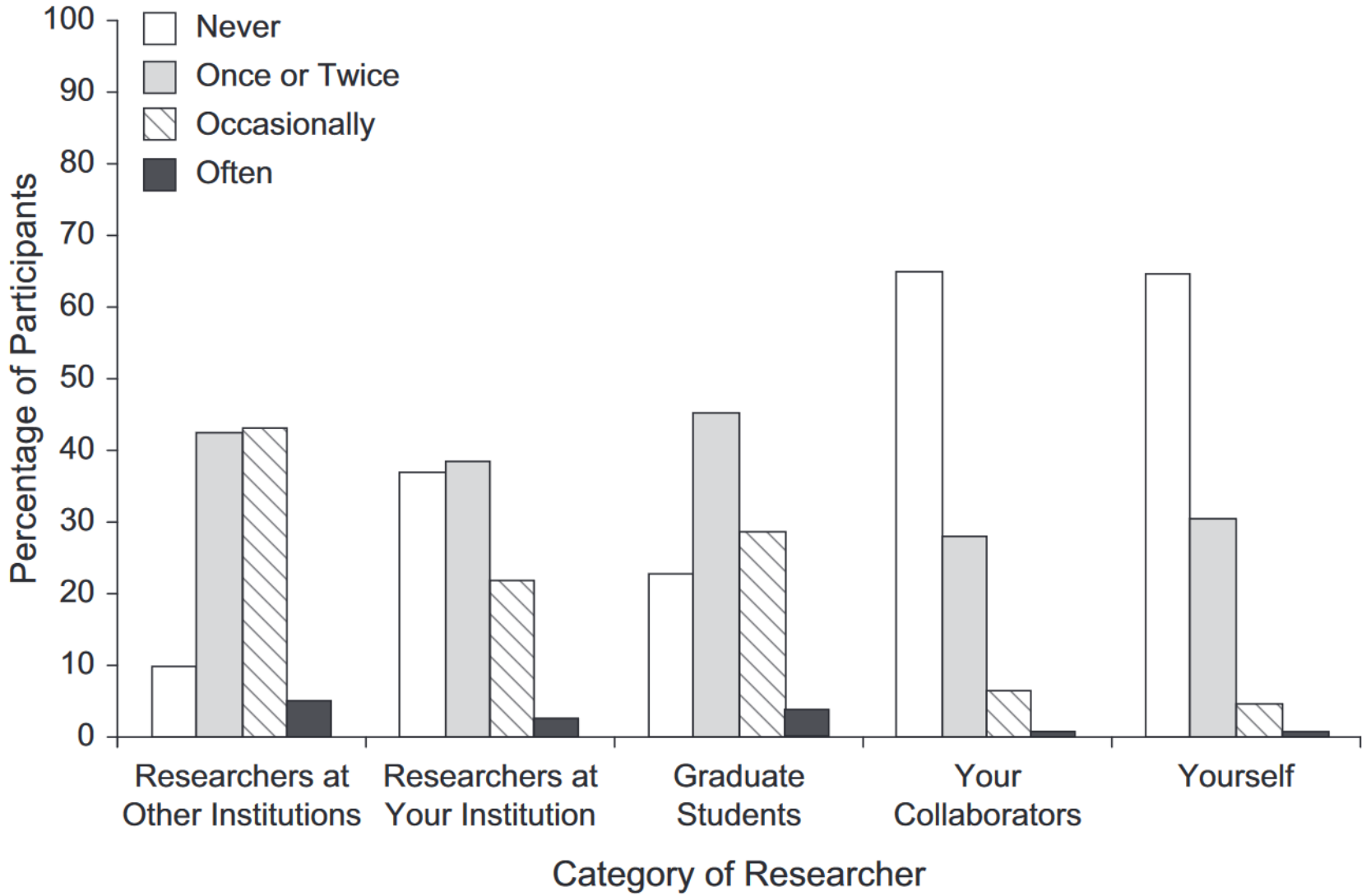
Garden of Forking Paths



Andrew Gelman & Eric Loken, 2013



John, L. K., Loewenstein, G., & Prelec, D. (2012). Measuring the prevalence of questionable research practices with incentives for truth telling. *Psychological science*, *23*(5), 524-532.


Never
Once or Twice
Occasionally
Often
Percentage of Participants
100
90
80
70
60
50
40
30
20
10
0
Researchers at Other Institutions
Researchers at Your Institution
Graduate Students
Your Collaborators
Yourself
Category of Researcher

Go to Link

Good Research Practices

Questionable Research

Fabrication Falsification Plagiarism

'Ideal' Sloppy Un- tion Fabrication


THIS IS FINE.

Outline

Scientific Method

- Asking Questions

Past & Present of Science

- Replication / Reproducibility

Future Directions in Psychology

- Open Science
- Registered Reports

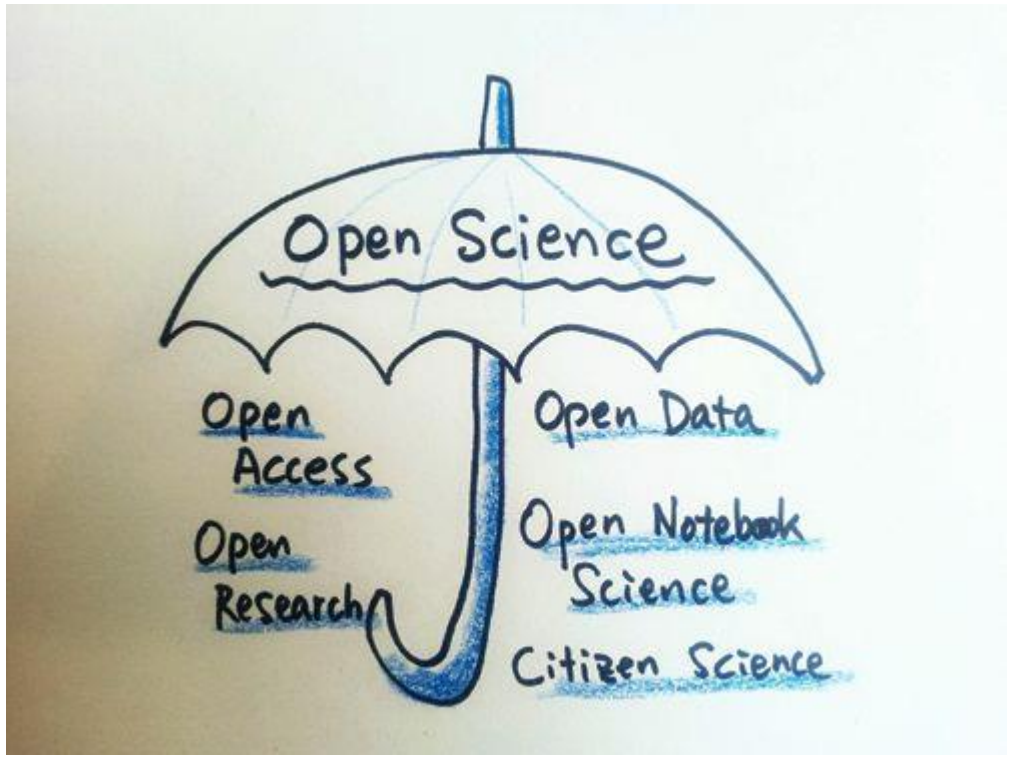
What Can I Do?

Research

What is “Open Science”?

Open Science

Open Science



COS

CENTER FOR OPEN SCIENCE

OSF


NeuroVault
DRYAD
OJS
Open Journal Systems
ubiquity press
open scholarship
VIVO
connect • share • discover
zenodo
figshare
Zotero
The Dataverse Network Project
MENDELEY
TEX
Publish Report
Search and Discover
Develop Idea
Design Study
Acquire Materials
Collect Data
Store Data
Analyze Data
Interpret Findings
Write Report
OSF
DMPTool
GitLab
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ownCloud
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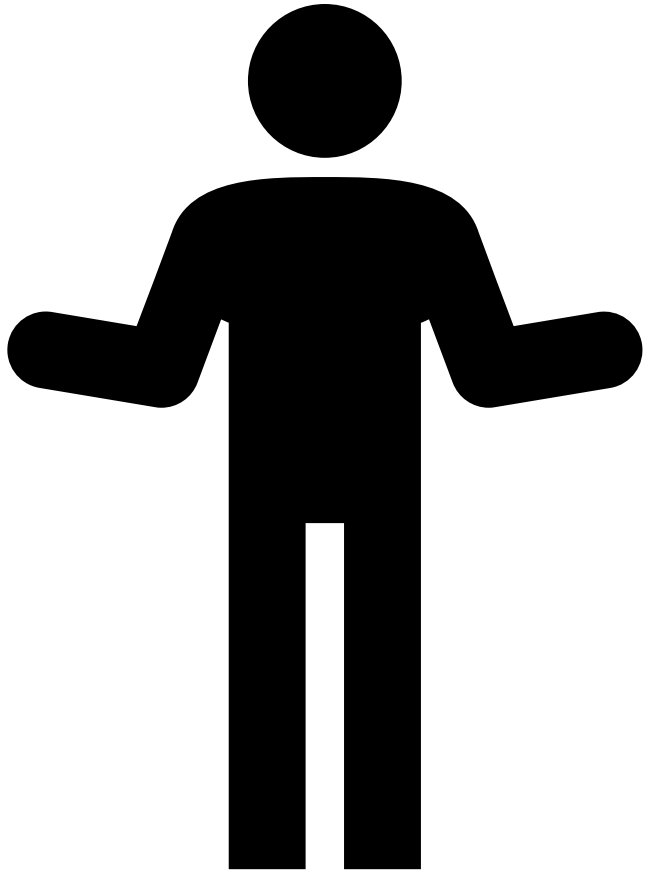
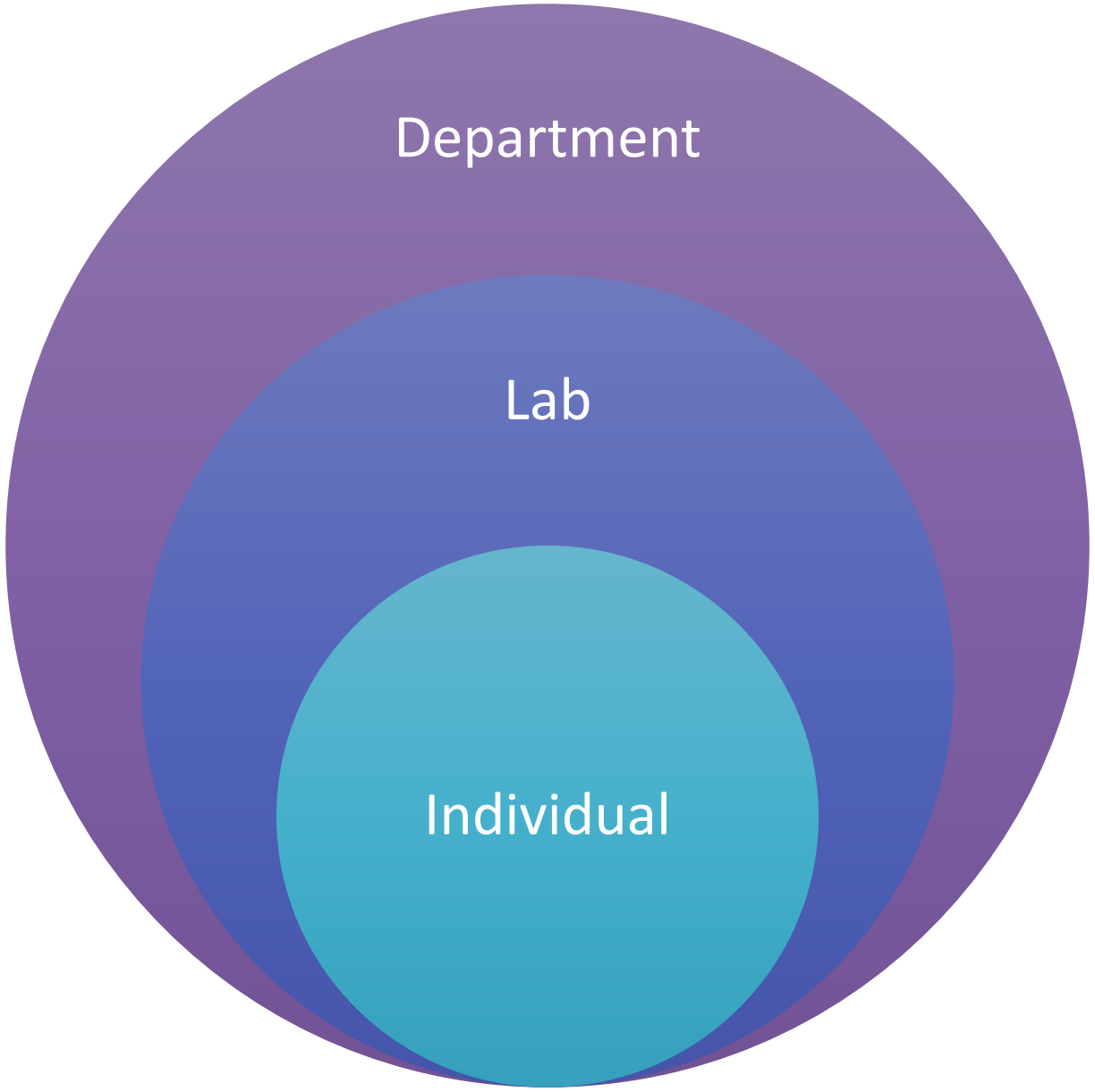
Galaxy
OneDrive
amazon web services
box

What can I do?




Department
Lab
Individual

Open Science

- Preregistration
- Open Data
- Open Materials

OSF
PREREGISTRATION

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

OSF PREREGISTRATION

- **AsPredicted registration:**
-
  1. Have any data been collected for this study already? (optional)
     - Yes, at least some data have been collected for this study already
     - No, no data have been collected for this study yet
- 2. What's the main question being asked or hypothesis being tested in this study? (optional)
- 3. Describe the key dependent variable(s) specifying how they will be measured. (optional)
- 4. How many and which conditions will participants be assigned to? (optional)
- 5. Specify exactly which analyses you will conduct to examine the main question/hypothesis. (optional)
- 6. Any secondary analyses? (optional)
- 7. How many observations will be collected or what will determine the sample size? No need to justify decision, but be precise about exactly how the number will be determined. (optional)
- 8. Anything else you would like to pre-register? (e.g., data exclusions, variables collected for exploratory purposes, unusual analyses planned?) (optional)
- https://osf.io/zab38/wiki/home/

Main Goal = Reproducibility

Past you is your worst collaborator

Registered Reports

Registered Reports

- Current Number of Participating Journals: Over 300!

Psychological Science

Behavioral Neuroscience

Affective Science

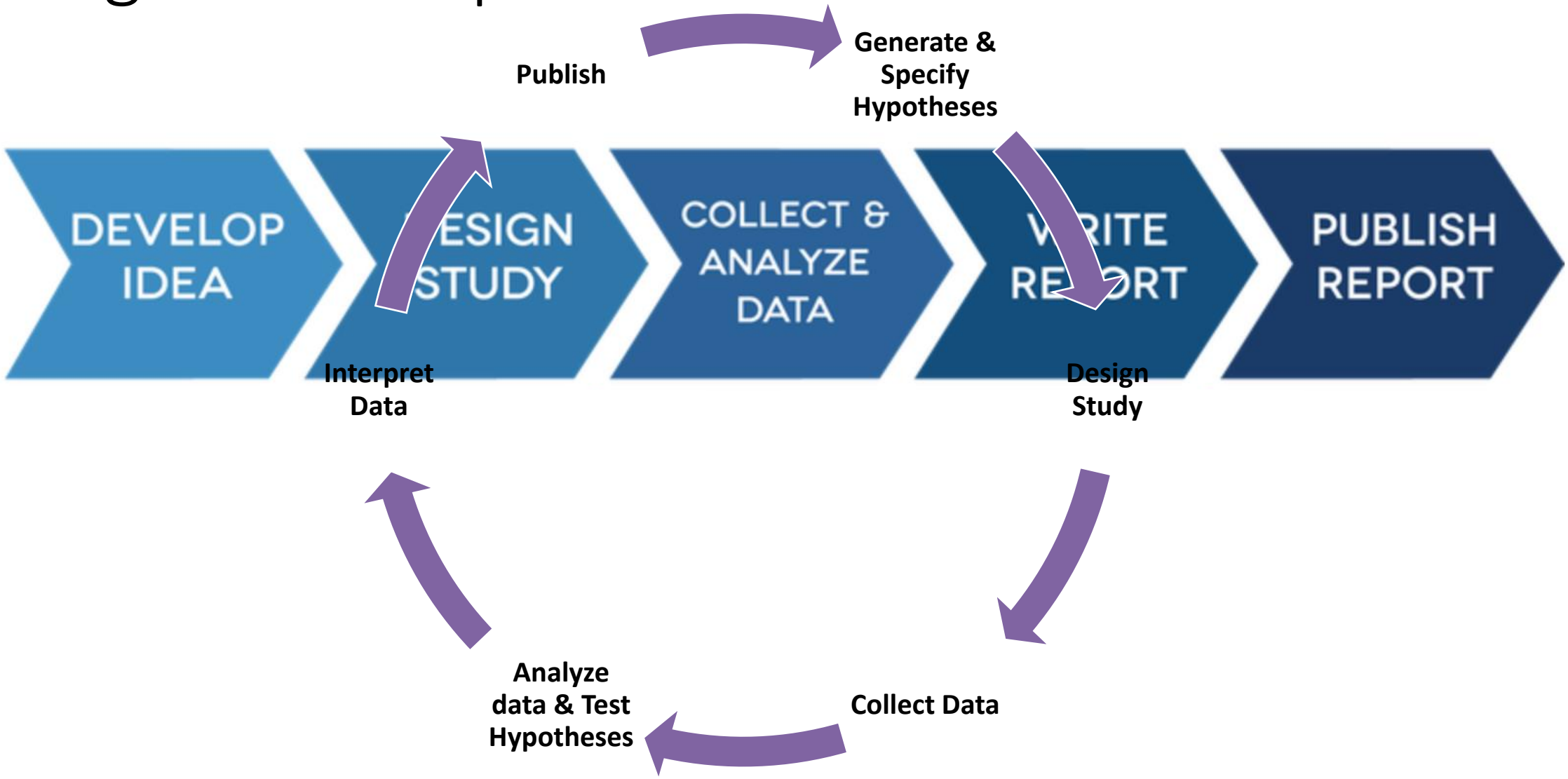
Cognition and Emotion

Assessment

British Journal of Clinical Psychology

Journal of Research in Personality

Registered Reports



Registered Reports

Registered Reports

Lab Policies

- Lab policies as to how data is handled
  - Stopping rules
  - Data collection procedures Data storage
  - Documentation of own decisions (keeping track of everything)
  - Open Code

Department Policies

Dissertations as Registered Reports

Consideration in hiring decisions (quality over quantity)

Training

- Statistical Methodology
- Data management
- Open Science Practices

Universal rules and procedures for how these things are done and documented (the Bus factor)

Consequence of practicing open science

Potential Drawbacks:

- Slower to start projects
  - Possibility of sunk time
- Less Publications

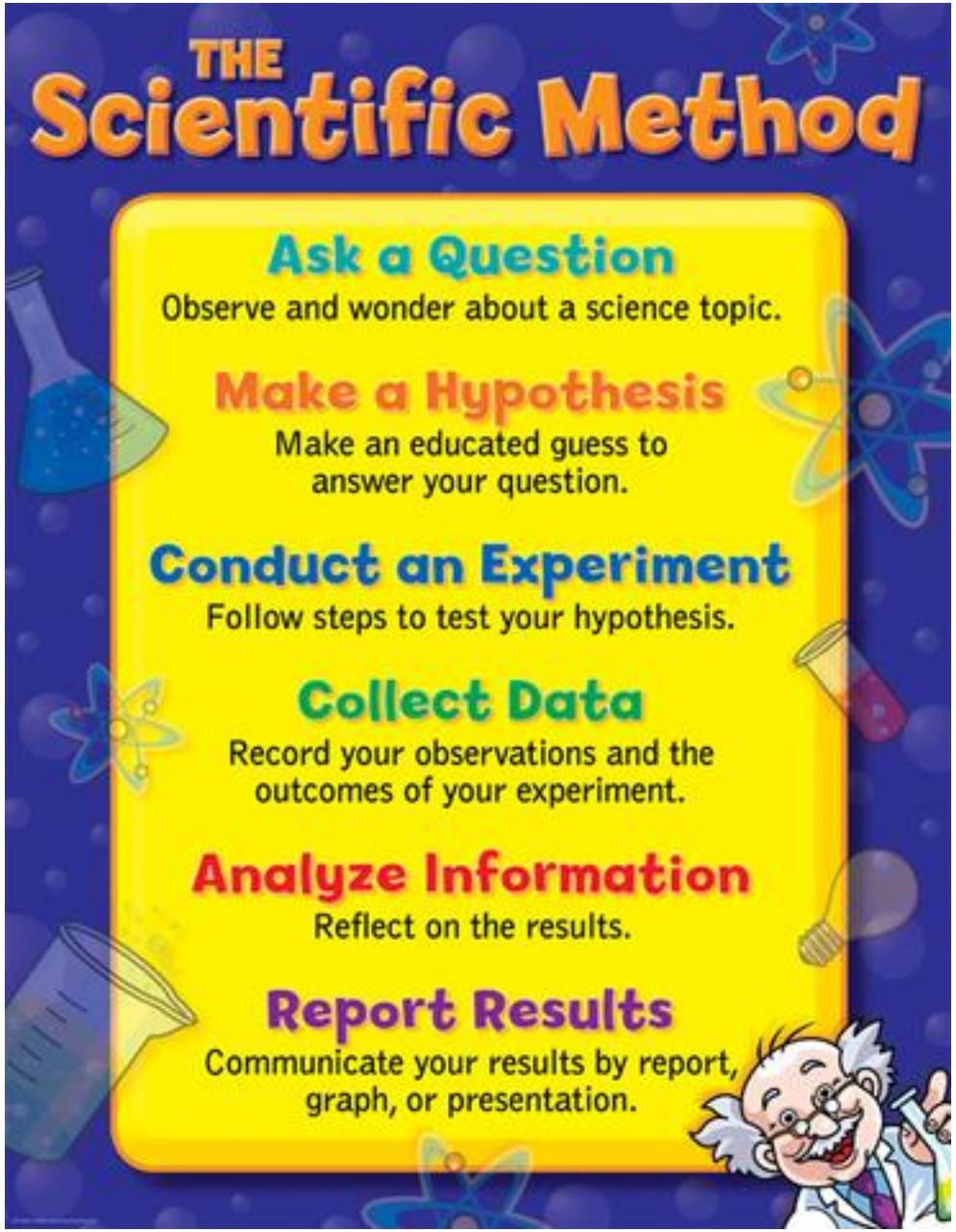
Positives

- Thoughtful methods
- Prepared when asked for materials from editors or colleagues
- Forces having clear hypotheses
- Projects go smoothly
  - Paper is already done

Non-significant finding… Now what?

PsyArXiv

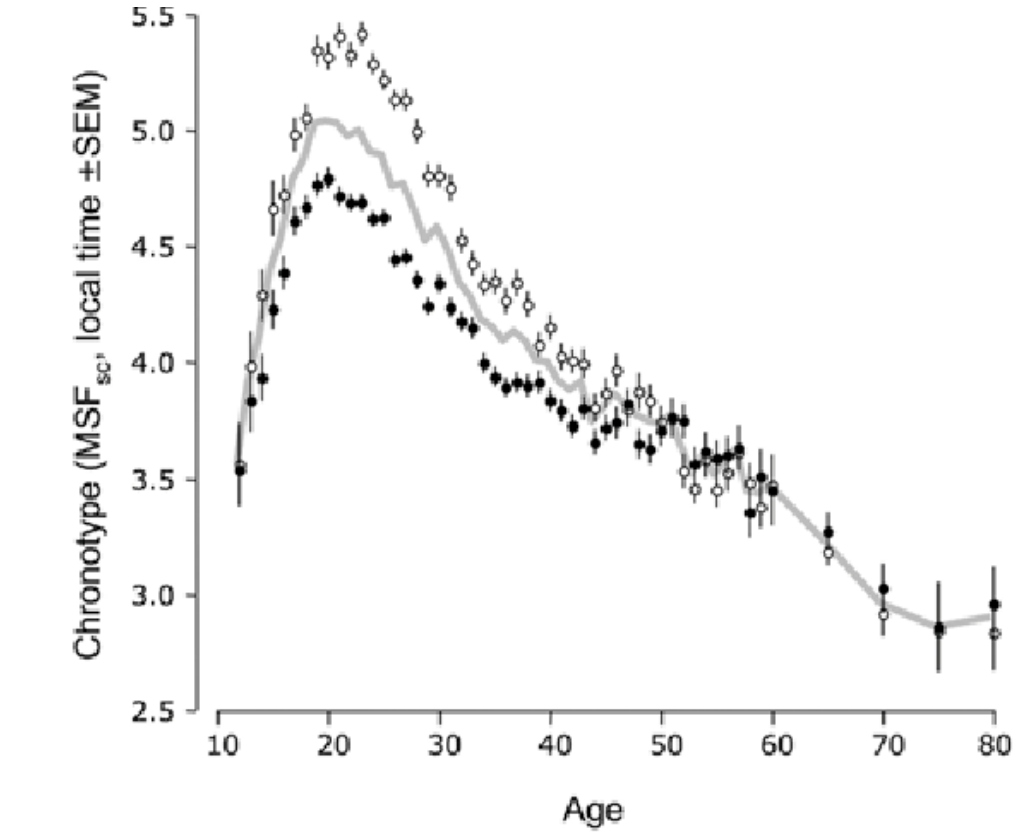
- If did registered report, it is still getting published


THE
Scientific Method
Ask a Question
Observe and wonder about a science topic.
Make a Hypothesis
Make an educated guess to answer your question.
Conduct an Experiment
Follow steps to test your hypothesis.
Collect Data
Record your observations and the outcomes of your experiment.
Analyze Information
Reflect on the results.
Report Results
Communicate your results by report, graph, or presentation.

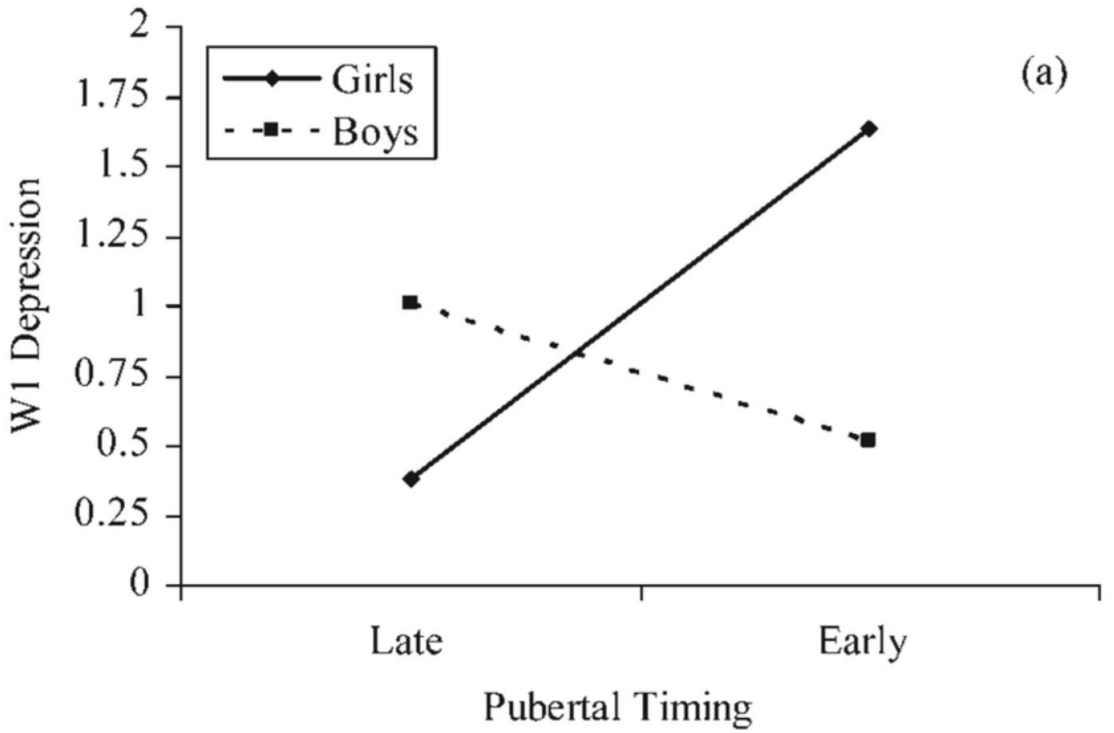

If we have time...

Chronotypal Timing: Failure or Phoenix?

Chronotype & Puberty



Roenneberg, T., Kuehnle, T., Juda, M., Kantermann, T., Allebrandt, K., Gordijn, M., & Merrow, M. (2007). Epidemiology of the human circadian clock. *Sleep medicine reviews*, *11*(6), 429-438.



Conley, C. S., & Rudolph, K. D. (2009). The emerging sex difference in adolescent depression: Interacting contributions of puberty and peer stress. *Development and psychopathology*, *21*(2), 593-620.

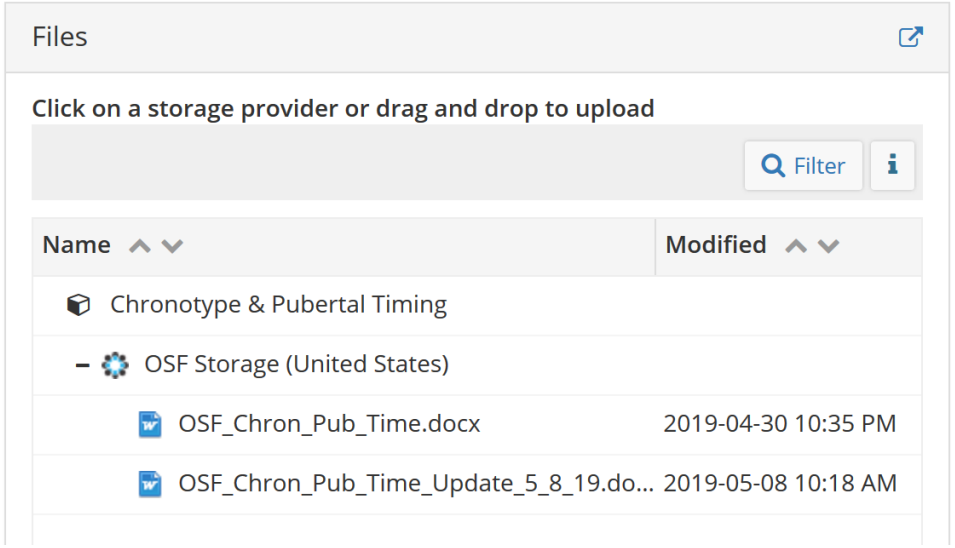
Step 1 - Preregister

Chronotype & Pubertal Timing

Contributors: **Dustin Haraden**, Elissa June Hamlat, Kathleen McCormick, Benjamin Hankin

Date created: 2019-04-30 10:30 PM | Last Updated: 2019-08-05 06:36 AM

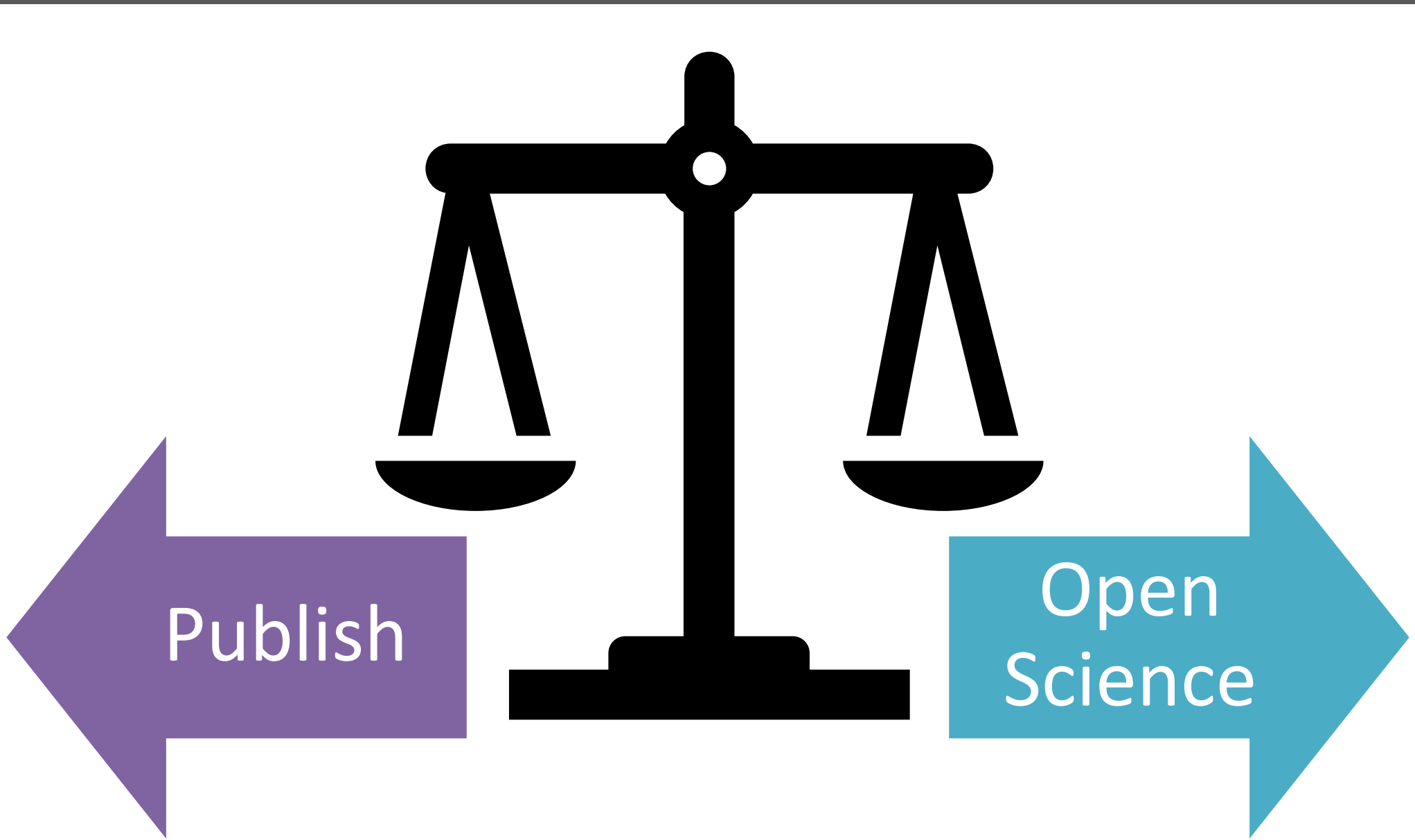
Category: Project



Step 2 – Analyses & Writeup

SRP
SOCIETY FOR RESEARCH IN PSYCHOPATHOLOGY

- Asked to provide more detail
- Decided to reproduce results


Publish
Open Science

RStudio®

GitHub

OSF

Circadian Preference Timing and Depressive Symptoms In Youth

Dustin A. Haraden, M.S.[a*], Kathleen McCormick, B.S. [a], Elissa Hamlat, Ph.D.[b], & Benjamin L. Hankin Ph.D.[a]

[a] Department of Psychology, University of Illinois at Urbana-Champaign; [b] Department of Psychiatry, University of California, San Francisco

INTRODUCTION

Preferences in bed and rise times are often referred to as "*chronotype*" ("owl" or "lark") [1]

Children tend to go to bed & wake early ("*morningness*"), then rapidly transition to staying up late & sleeping late during adolescence ("*eveningness*"), with a gradual decline back to morningness in adulthood[2,3]

The transition toward *eveningness* coincides with pubertal development, such that postpubertal youth are more likely to have an evening preference[3]

Having an evening preference in youth, has shown associations with history of depressive symptoms as well as concurrently and prospectively, above the influence of pubertal status[4,5]

The timing of the pubertal transition impacts the development of depression, suggesting a mismatch of rhythms as a potential risk factor [6]

The current study proposes a new examination of chronotype to investigate the timing of the developmental transition from morningness to eveningness – "chronotypal timing" – as it relates to symptoms of depression, which coincides with a recent call for new examinations of pubertal status

MAIN QUESTIONS:

Q1: History of Depression → Chronotypal Timing

Q2: Chronotypal Timing → Concurrent Depression

Q3: Chronotypal Timing → Prospective Depression

DATA ANALYTIC PLAN

Regress chronotype on pubertal status and save standardized residuals as a measure of "chronotypal timing" (similar to procedures for pubertal timing)

Given an individual's pubertal status (e.g., more developed), their chronotype is expected to be at a particular value (e.g., greater preference for evening). Therefore, the residual of this predicted value is how far they deviate from their expected score

Investigate the **three main questions** in separate regressions:

Q1 – Identify latent intercept of depression from BSL – 33mo to predict chronotypal timing

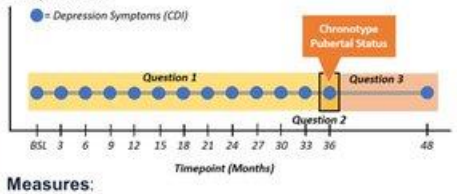
Q2 – Investigate concurrent relationships between chronotypal timing and symptoms of depression (at 36mo)

Q3 – Examine prospective relationships, such that chronotypal timing (at 36mo) predicts later symptoms of depression, one year later at 48mo)

METHODS

N = 180, 58% female, M_{age}=14.92, SD=2.33

Study Timeline



Measures:

Children's Depression Inventory (CDI)
Morningness-Eveningness Scale in Children (MESC)
Pubertal Development Scale (PDS)

RESULTS

Elevations in **symptoms of depression** (both history and concurrent) were negatively related **Chronotypal Timing**

- Youth with a greater evening preference compared to their pubertal status were related to greater symptoms of depression

Chronotypal timing predicted later individual differences in symptoms of depression although this finding was no longer significant when controlling for previous symptoms of depression

DISCUSSION

- Youth history of depression produces an ultimate mismatch in chronotypal timing such that elevations in depression show greatest mismatch

FUTURE DIRECTIONS

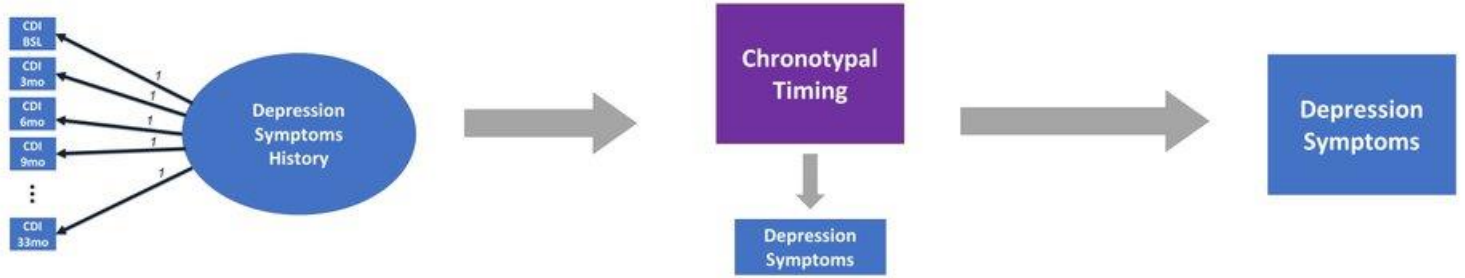
- The shift in chronotype may reflect a larger developmental transition, and is important to examine in conjunction with pubertal development
- Additional investigation of chronotypal timing within a younger sample so as to provide variability in terms of pubertal status

REFERENCES

1.Roenneberg, T. et al. Epidemiology of the human circadian clock. Sleep medicine reviews 11, 429 (2007).
2.Carskadon, M. A., Vieira, C. & Acebo, C. Association between puberty and delayed phase preference. Sleep (1993).
3.Roenneberg, T. et al. A marker for the end of adolescence. Current Biology 14, R1038 (2004).
4.Haraden, D. A., Mullin, B. C. & Hankin, B. L. The relationship between depression and chronotype: A longitudinal assessment during childhood and adolescence. Depression and Anxiety (2017). doi:10.1002/da.22682
5.Haraden, D. A., Mullin, B. C. & Hankin, B. L. Internalizing symptoms and chronotype in youth: A longitudinal assessment of anxiety, depression and tripartite model. Psychiatry Research 272, 797–805 (2019).
6.Brooks-Gunn, J., Petersen, A. C. & Eichorn, D. The study of maturational timing effects in adolescence. Journal of Youth and Adolescence 14, 149–161 (1985).

RESULTS

Note: All analyses controlled for gender



Q1: History of Depression → Chronotypal Timing

	b	Std Error	β	p-value
CDI History	-0.092	0.03	-0.337	0.002
Gender	0.264	0.145	0.128	0.068
CDI 36mo	0.001	0.021	0.004	0.972

Q2: Chronotypal Timing → Concurrent Depression

	b	Std Error	β	p-value
Chronotypal Timing	-1.265	0.37	-0.246	0.001
Gender	1.689	0.756	0.161	0.025

Q3: Chronotypal Timing → Prospective Depression

	b	Std Error	β	p-value
Chronotypal Timing	-0.957	0.4	-0.175	0.017
Gender	1.381	0.817	0.124	0.091

Correspondence for this poster can be directed to Dustin Haraden: haraden2@illinois.edu @ SleePhDad

Send Dustin an Email:

YOUTH EMOTION, DEVELOPMENT, & INTERVENTION LAB

Follow Dustin on Twitter: