

# MRM course wrap-up

29 April 2020

*Modern Research Methods*



**Everyone completed their poster and presentations – Congrats!**

# More details about the poster session tomorrow

- Poster session from 4:30 to 6pm tomorrow (Thursday)
- Each group will be in their own Q&A Zoom room, and the judges and other community members will come to you.
- Be in your room ready to go at 4:25
- At 5:30, everyone goes to the Celebration room, and awards will be given.

## Research Methods in Psychology Poster Session

Edit

Meet in this [zoom room](#) at about 5:45pm for a Poster Wrap-Up and announcement of poster awards. All are welcome in this room at any time (a course TA will be there to answer questions).

Poster	Time	Title and Link to Preview Materials	Student Names	Q&A Room - Zoom Link
A1	4:30	<a href="#">The Effects of Visual Coffee Cues on Cognitive Performance</a>	Lin, C., Yu, K., & Friedman, A.	<a href="https://cmu.zoom.us/j/98169406613">https://cmu.zoom.us/j/98169406613</a>
A2	4:37	<a href="#">The Effects of Processing Tasks on Attentional Memory Encoding</a>	Aruede, D. & Miao, I.	<a href="https://cmu.zoom.us/j/96549260857">https://cmu.zoom.us/j/96549260857</a>
A3	4:44	<a href="#">The Effects of Music on Word Recall</a>	Kim, Y. & Soong, P.	<a href="https://cmu.zoom.us/j/94383202527">https://cmu.zoom.us/j/94383202527</a>
A4	4:51	<a href="#">Effects of Complexity and Pictures on Visual Memory</a>	Choi, J., Mirpuri, K., & Zhang, S.	<a href="https://cmu.zoom.us/j/93236350188">https://cmu.zoom.us/j/93236350188</a>
A5	4:58	<a href="#">A Meta-Analysis of the Conjunction Fallacy</a>	Bournias, T., Casey, N., Chan, F., Fu, Y., Marshall, Z.	<a href="https://cmu.zoom.us/j/9279299364">https://cmu.zoom.us/j/9279299364</a>

WRAP-UP	5:30-6:00	Celebration of all Research Methods students, and poster awards about 5:45	p.s. this room will be open 4:30-6pm with a TA available to help people navigate the virtual poster session.	<a href="https://cmu.zoom.us/j/93332551838">https://cmu.zoom.us/j/93332551838</a>
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# More details about the poster session tomorrow

- Judges will evaluate your oral presentation and responses to questions
- Document with questions to be prepared for.

In your Q&A poster session, judges and community members will ask you questions about the research you did. Here are some questions you should be prepared to answer:

[\[Google doc with questions\]](#)

1. What's an effect size?
2. What does a positive effect size mean? What does a negative effect size mean?
3. What's a moderator?
4. Are there other moderators that you didn't code that you think might be interesting?
5. Explain the flow diagram to me. What does "Records screened" mean?
6. What does a meta-analysis tell you that a literature search does not?
7. What are those bars on the forest plot? What is a confidence interval?
8. Is this a small, medium or big effect size?
9. What does the red diamond stand for?
10. Why are the squares different sizes on the forest plot?
11. What is publication bias?
12. Explain to me what the funnel plot means. What would evidence for publication bias look for?
13. What are some limitations of your study?

\* 10 points extra credit for winning an award

# Final Project Write-up

- Take everything you've done over the course of Assignments 6-8 and the poster, and write it up into a single document
- Each person must complete their own write-up
- There's a template on RStudio cloud for the write-up
- And, lots of information on the website about how to do the writeup itself
- Due May 8<sup>th</sup> at 5pm.

85311 MODERN RESEARCH METHODS:  
CUMULATIVE SCIENCE, BIG DATA, AND META-ANALYSIS

[SYLLABUS](#)   [SCHEDULE](#)   [RESOURCES](#)   [RSTUDIO.CLOUD](#)   [FINAL PROJECT](#)

## META-ANALYSIS FINAL PROJECT

For the remaining portion of the semester, we will be working on your final projects – an original meta-analysis on a question in developmental, cognitive, or social psychology. You will complete your project in groups of ~4, and you will decide on your topic in consultation with me and your group members. The goal is that you could go on to publish your meta-analysis with a little more work beyond this class.

There are broadly five steps to conducting a meta-analysis:

1. Identify topic
2. Conduct literature search
3. Code studies and calculate effect sizes
4. Plot and analyze data
5. Report and discuss results.

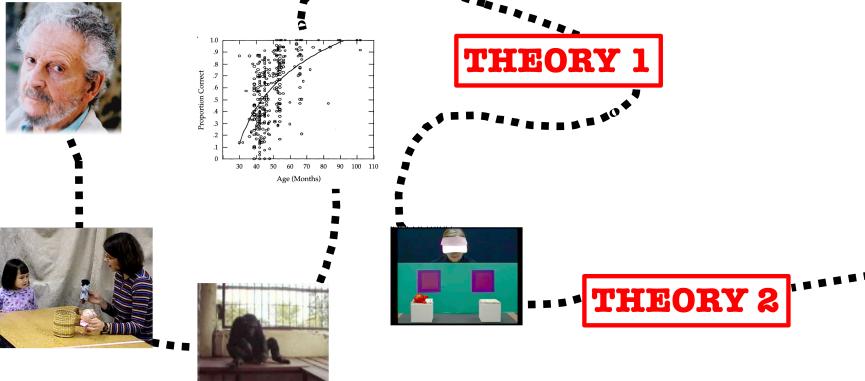
# Other logistics

- **Course evaluations** – should have gotten an email about this, please take a few minutes to feel this out.
- **Summer research** – I'm in the process of putting together a remote course for this summer
  - Course will be project focused – we'll collect and analyze large datasets
  - Skills you've learned in this class will be immensely helpful, will also do more advance R stuff
  - 9-12 units of credit, tuition free
  - Be on the lookout for more information if you're interested!

# Topics we've covered

- 1) Philosophy of Cumulative Science
- 2) The Single Experiment – Experimental data, tools in R for working with data and plotting data, reproducibility
- 3) Repeating an Experiment – Intro to statistical concepts, replication of experiments
- 4) Aggregating Many Experiments – Meta-analysis

# Philosophy of Cumulative Science



# The Single Experiment

Population



Question



Hypothesis



Exp. Design



Experimenter



Data

01100  
10110  
11110

Analyst



Code



Estimate



Claim



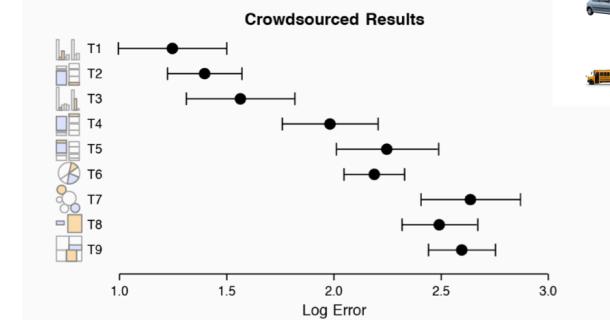
Here is a rab.



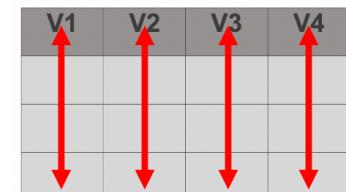
Can you give Mr. Frog all the other rabs?



simple  complicated  
[Next](#)



Each variable is its own column



Each observation is its own row



CONTINUOUS

measured data, can have  $\infty$  values within possible range



I AM 3.1" TALL  
I WEIGH 34.16 grams

DISCRETE

observations can only exist at limited values, often counts

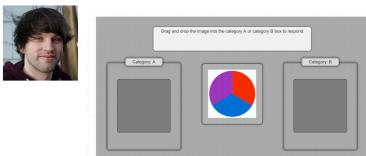


I HAVE 8 LEGS  
and 4 SPOTS!

gillianhard

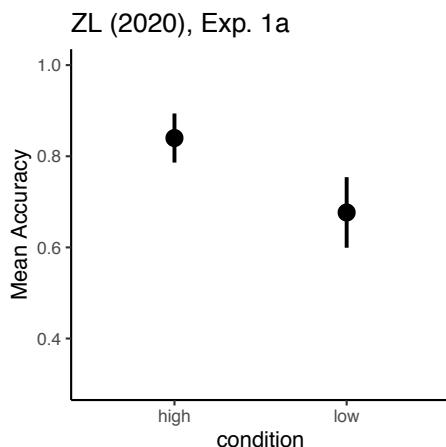
# Repeating an experiment

Original

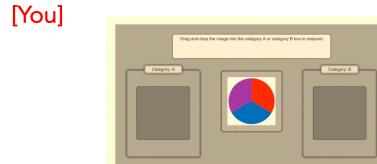


predicting participants' trial-by-trial accuracy on training trials from condition, including a by-subject random intercept.<sup>13</sup> We used the lme4 package version 1.1-21 in R (version 3.6.1) to fit all models (D. Bates & Maechler, 2009; R Development Core Team, 2019). Participants in the High Nameability condition ( $M = 84.0\%$ , 95% CI = [78.6%, 89.4%]) were more accurate than participants in the Low Nameability Condition ( $M = 67.7\%$ , 95% CI = [59.9%, 75.4%]),  $b = 1.02$ , 95% Wald

(Zettersten & Lupyan, 2020)

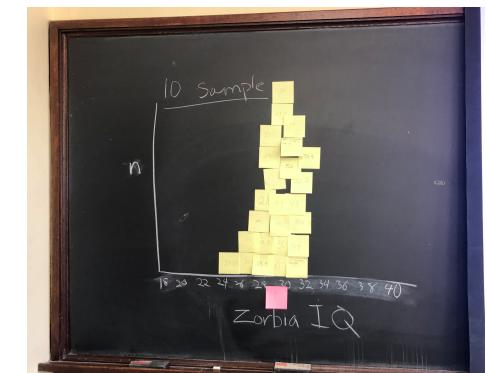
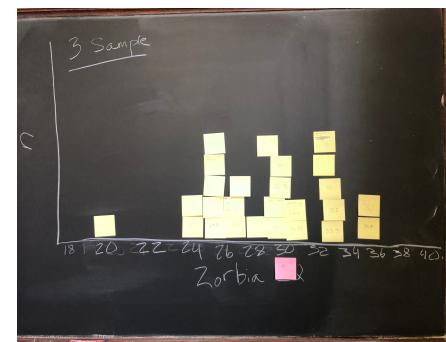


Replication



High Nameability Condition = 75%  
Low Nameability Condition = 69%

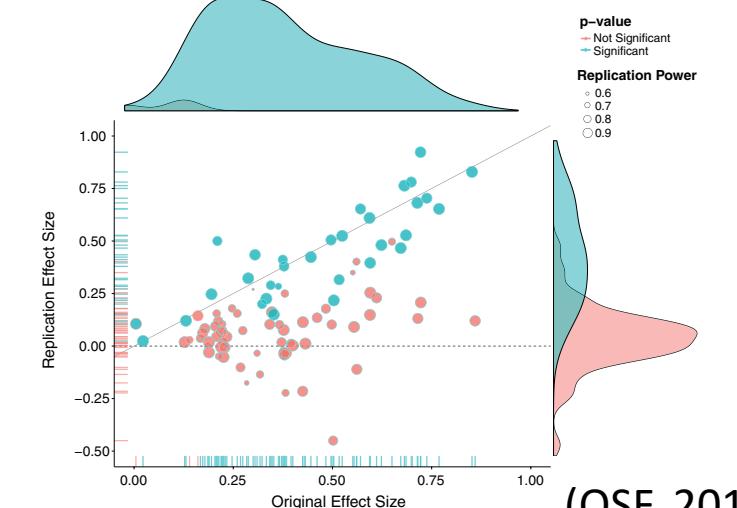
More samples -> less variance -> more certainty



**Effect size as unit of analysis:**  
Quantitative, scale-free measure of an effect.

Cohen's  $d$ :

$$\text{Effect Size} = \frac{\text{diff. between means}}{\text{standard dev.}}$$

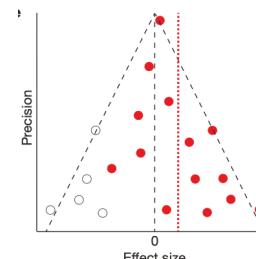
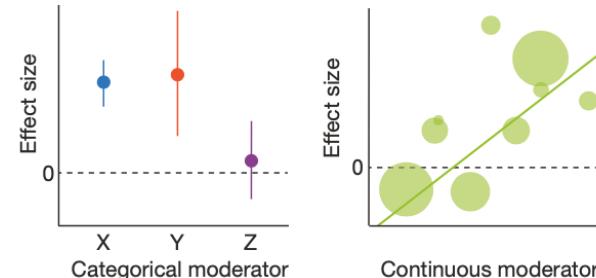
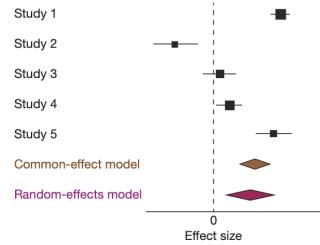
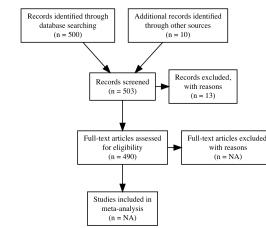


(OSF, 2015)

# Aggregating Many Experiments

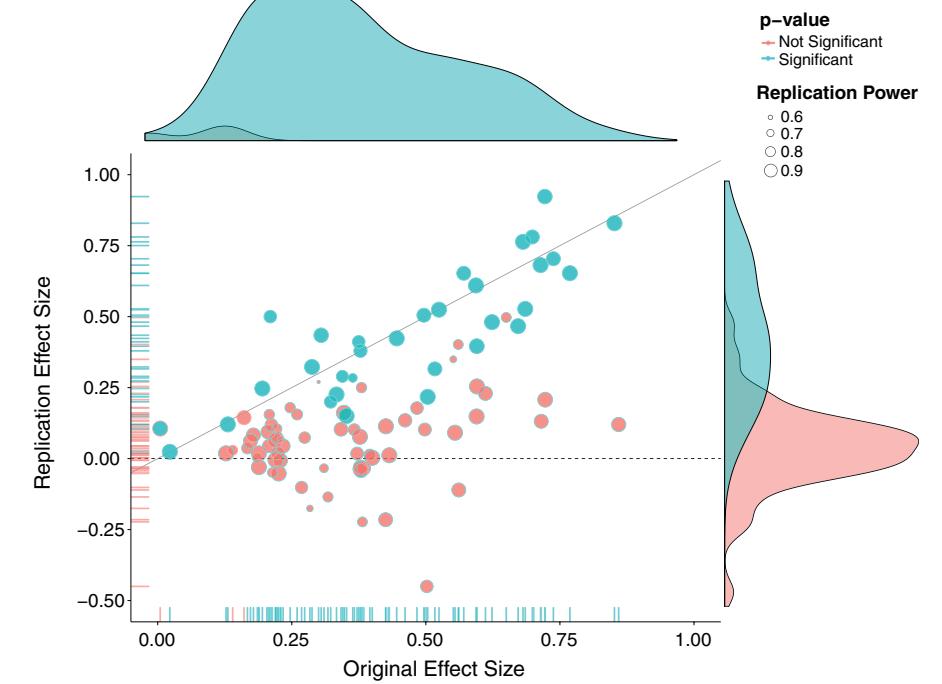
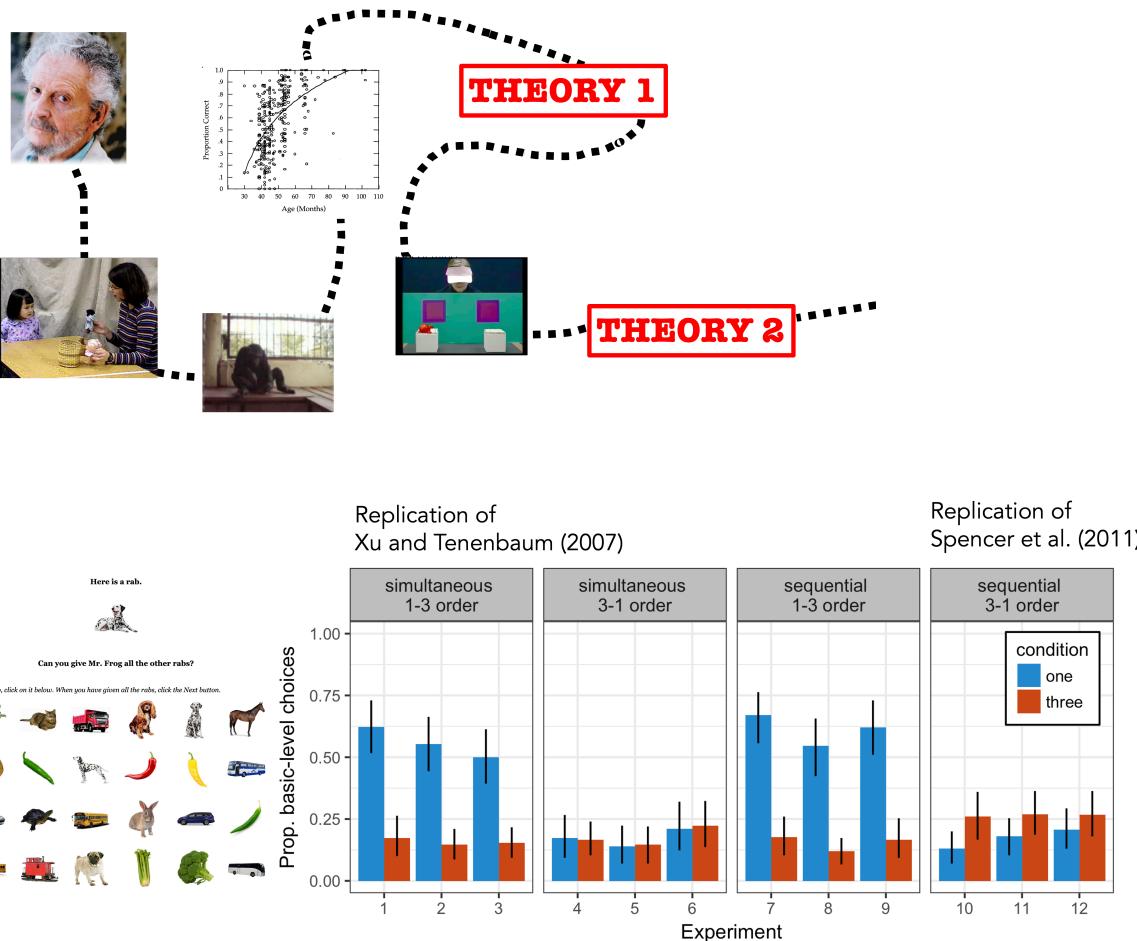
Meta-analysis: A quantitative approach to summarizing results across studies using effect sizes

1. Identify Topic
2. Conduct literature search
3. Code studies and calculate ES
4. Plot and analyze data
5. Report and discuss results



Three core ideas I hope you take away  
from this course

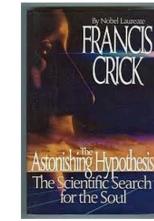
# Core Idea 1: Science is messy



(Lewis & Frank, 2018; OSF, 2015)

# Core idea 2: It's important to be a critical consumer of a science

- And this class has given you a lot of tools for doing so
- When you hear about a new finding, you should ask questions like,
  - How big is the effect?
  - Do I sense p-hacking?
  - Has it been replicated by another group?
  - Is their data and code available so I can check it out?
  - Is there a meta-analysis on the topic? Is there an effect in the meta-analysis? Is there evidence for publication bias?



[Read Passage](#)

Anti-free-will  
essay

Consciousness  
essay  
(control)



# Core idea 3: R and the tidyverse provide a rich set of tools for doing data analysis

You've now learned the basics.

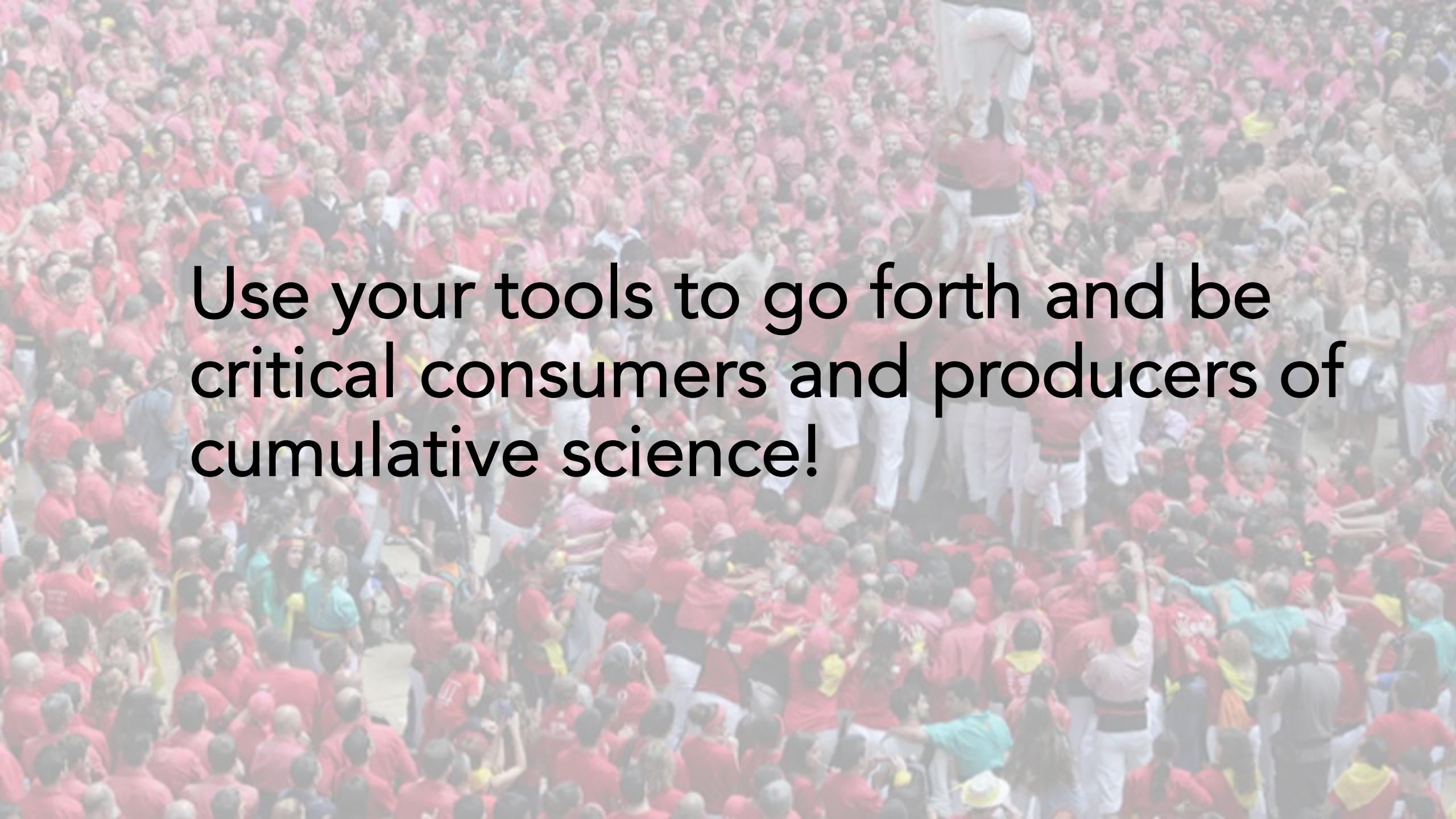
- dplyr (tidyverse)
- ggplot (tidyverse)
- metafor
- R Markdown
- R Studio

And you have the foundation to learn more

<https://education.rstudio.com/>



Artwork by @allison\_horst

A large, dense crowd of people, many wearing red shirts, filling a stadium or large outdoor space. The scene is slightly hazy, suggesting a large gathering.

Use your tools to go forth and be  
critical consumers and producers of  
cumulative science!

# See you tomorrow night!

Hope you have a  
safe and happy  
summer!

Office Hours: 5:30-  
6:30pm Today

