

PUTTING THE P-VALUE IN ITS PLACE

Beth L. Chance
Cal Poly – San Luis Obispo

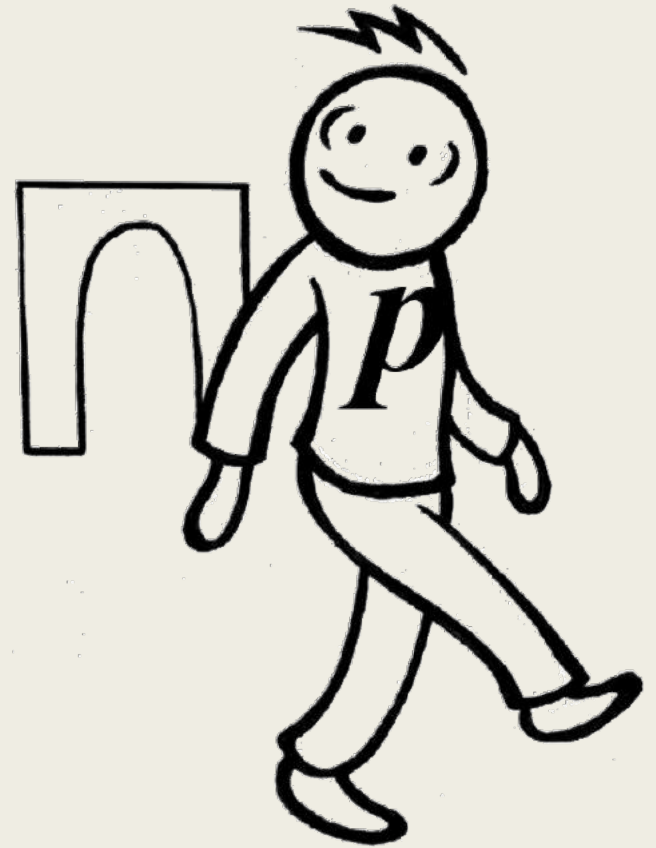
Introductions

- Meet my friend the p-value
- Since 1900, p-value has helped guide us in deciding whether our results are meaningful
- Has been the *gold standard* of statistical significance



Over time

- Many have misinterpreted small p-values
 - *The probability the null is true*
 - *The probability the data are by random chance alone*
- Many have misinterpreted large p-values
 - *Evidence for the null hypothesis*

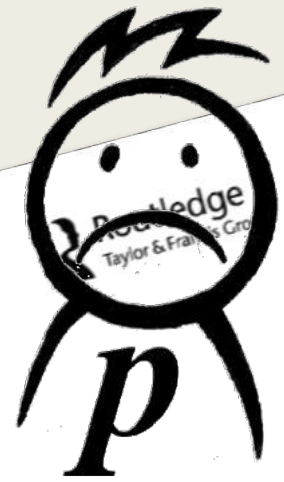


Over time

- Many have misused small p-values
 - *The results can be trusted!*
 - *The results are important!*
 - *The difference is large!*
- And large p-values
 - *Ignore the study!*



This has led to revolt



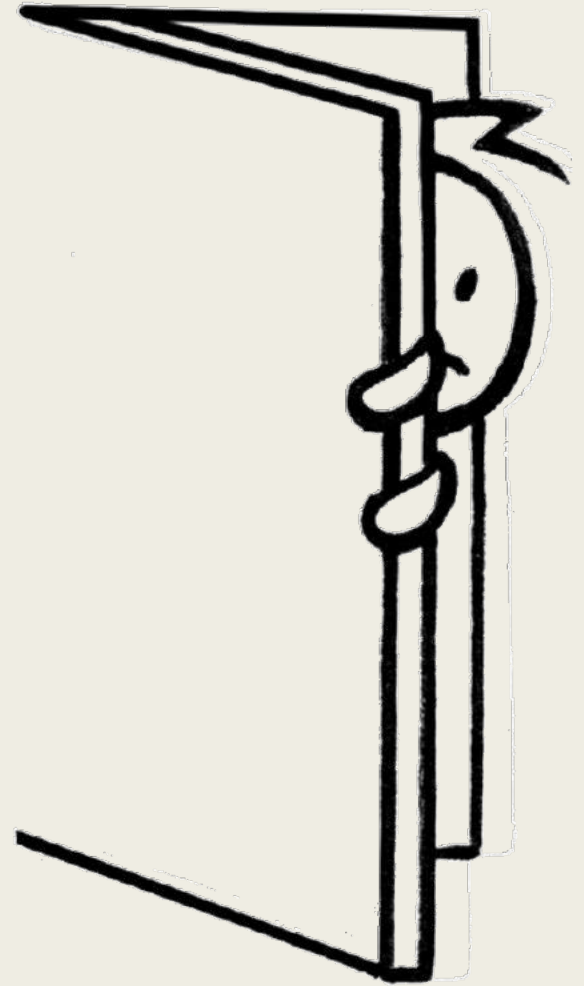
...OLOGY, 37:1-2, 2015

**Banning p values? The journal
'Political Analysis' does it**

Posted on February 3, 2018 by Geoff Cumming Posted in NHST, The New Statistics — 3 Comments ↓

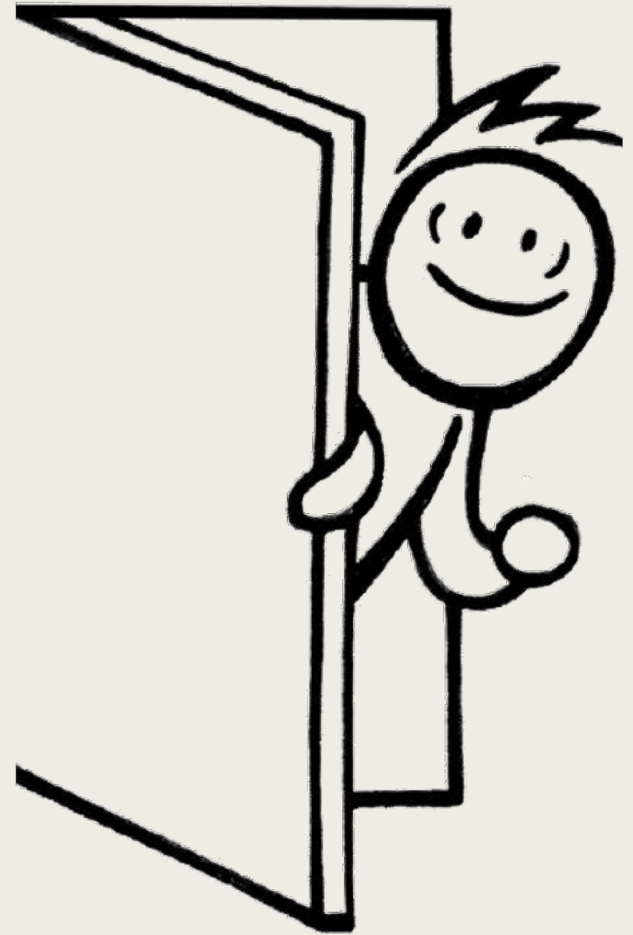
"From now on, BASP is banning..."

But I'm here to say



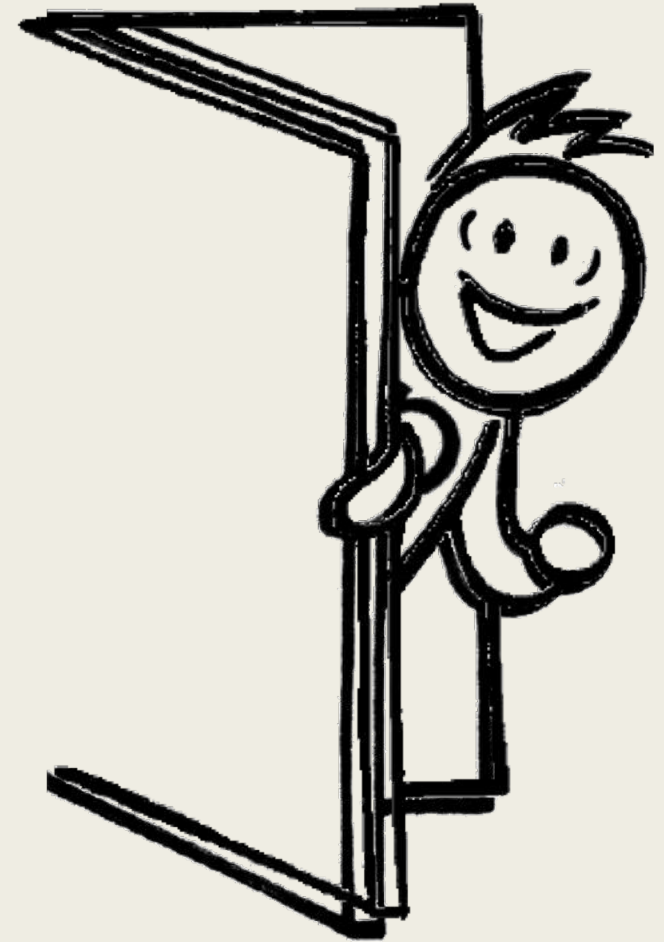
But I'm here to say

- It's not your fault!

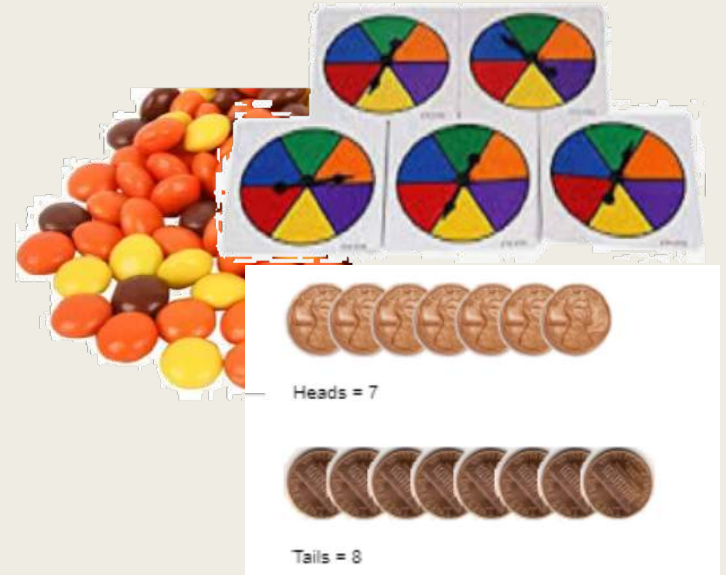


But I'm here to say

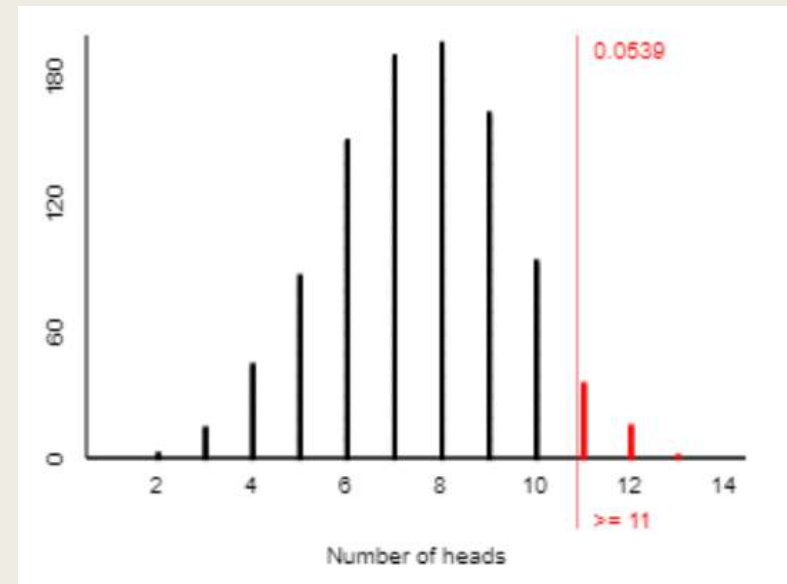
- It's not your fault!
- All you promised was helping us determine what could plausibly be explained by chance
- You have done your job well
- **We** need to do better



Can we do better?



- Can college, high school, and middle school students learn informal inferential reasoning?
 - Yes
 - *Simulation-based inference*
 - *Scientific investigation process*

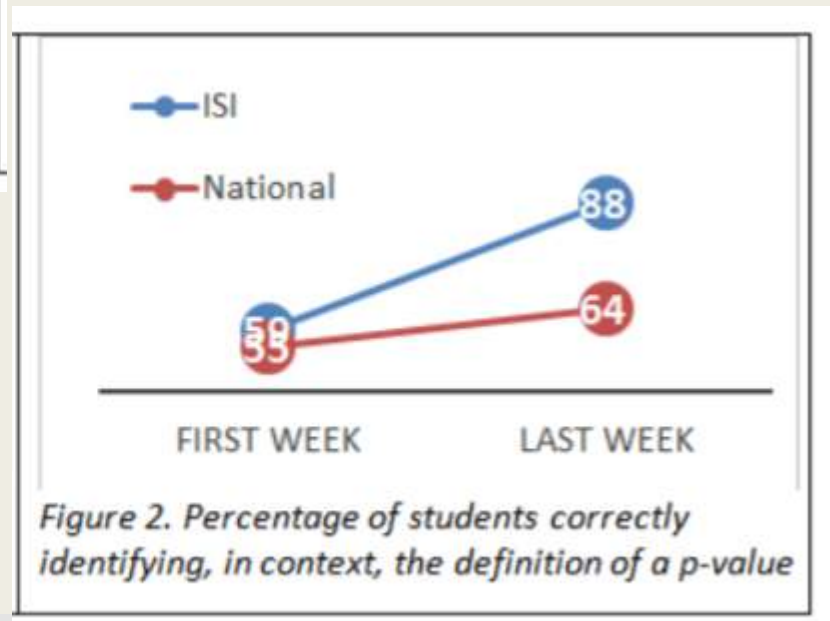
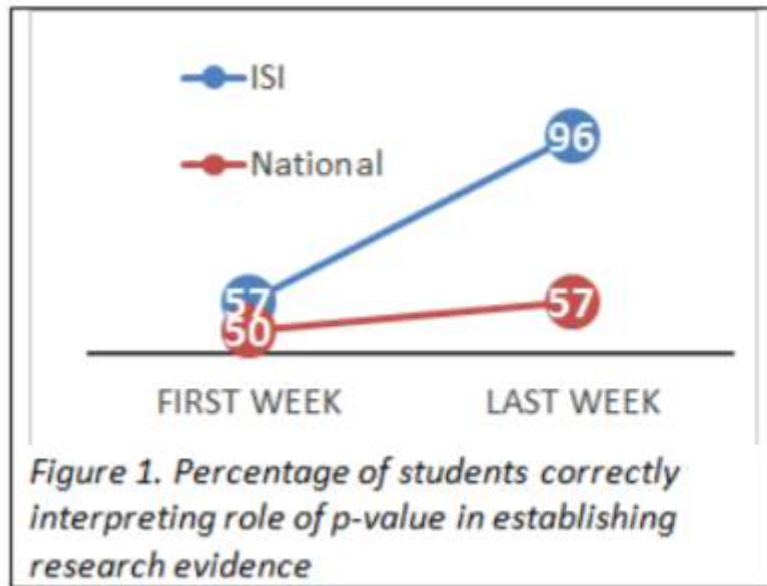


Do I have evidence?

- Have you ever had a student come to office hours the last week of the course, diligently studying for the final...
- ... “I have my p-value. ...
- ...Do I want it to be large or small?”

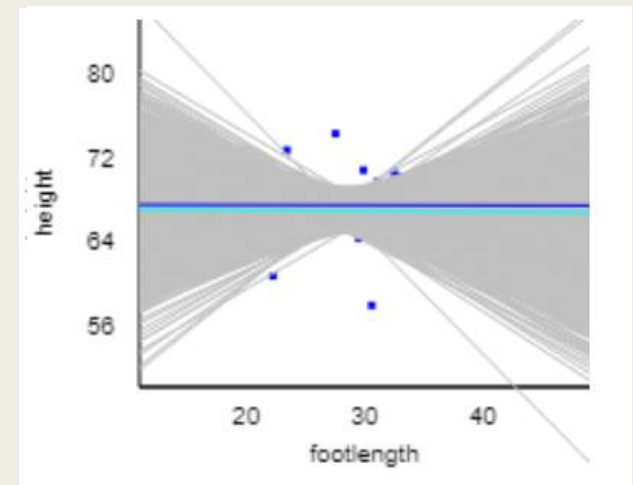
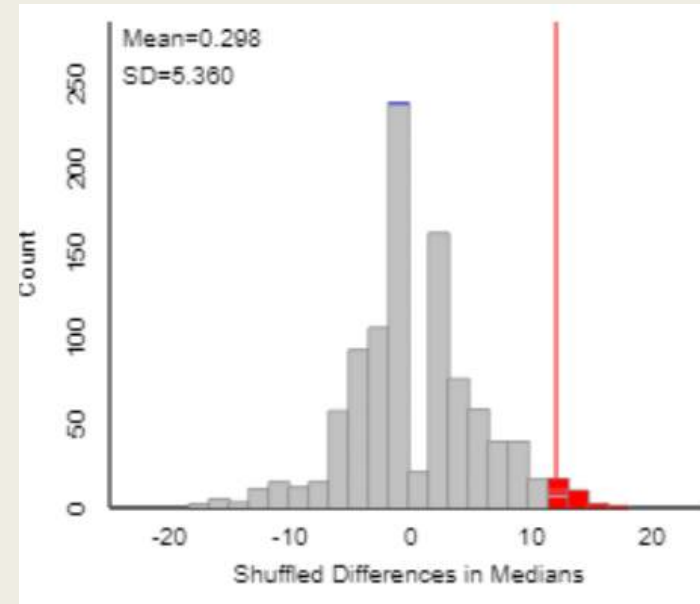


Do I have evidence?



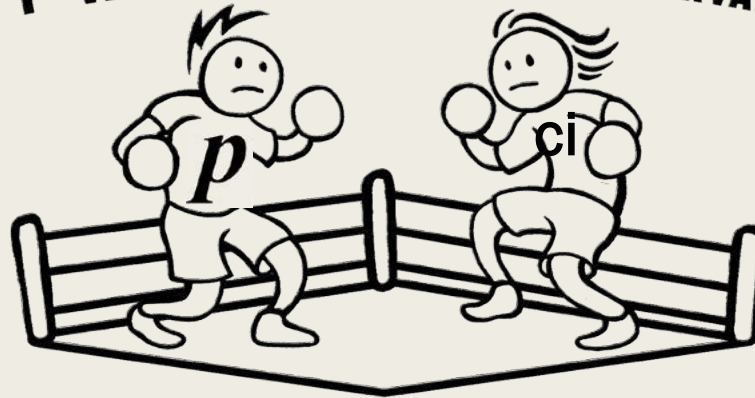
Better yet

- Students have tools to explore new directions
 - *Why did we stop talking about the median? Can I get a p-value for a median?*
 - *Does random assignment look different than random sampling?*
- But don't stop there

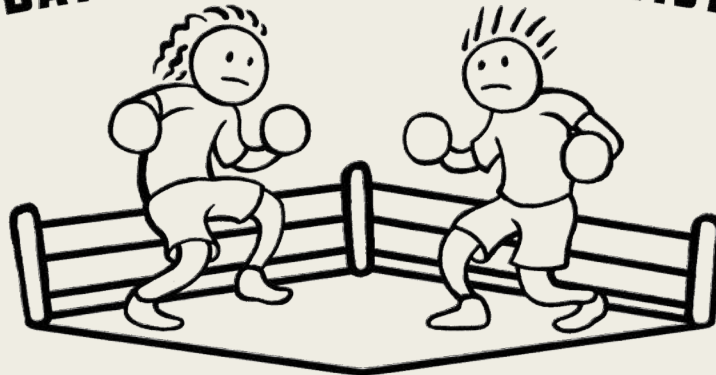


Instead of

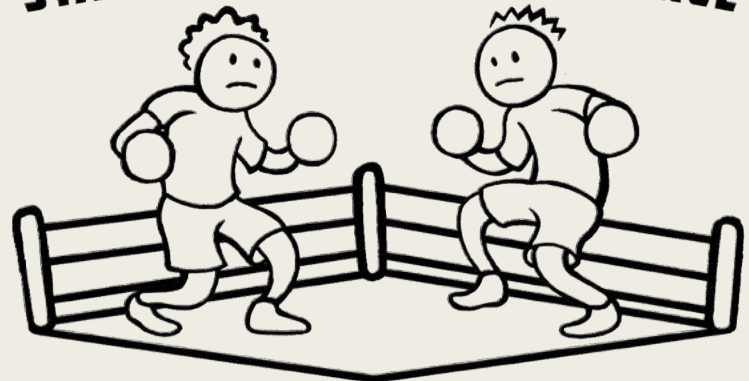
P-VALUE VERSUS **CONFIDENCE INTERVAL**



BAYESIAN VERSUS **FREQUENTIST**



STATISTICS VERSUS **DATA SCIENCE**



Instead of

Yes or No?

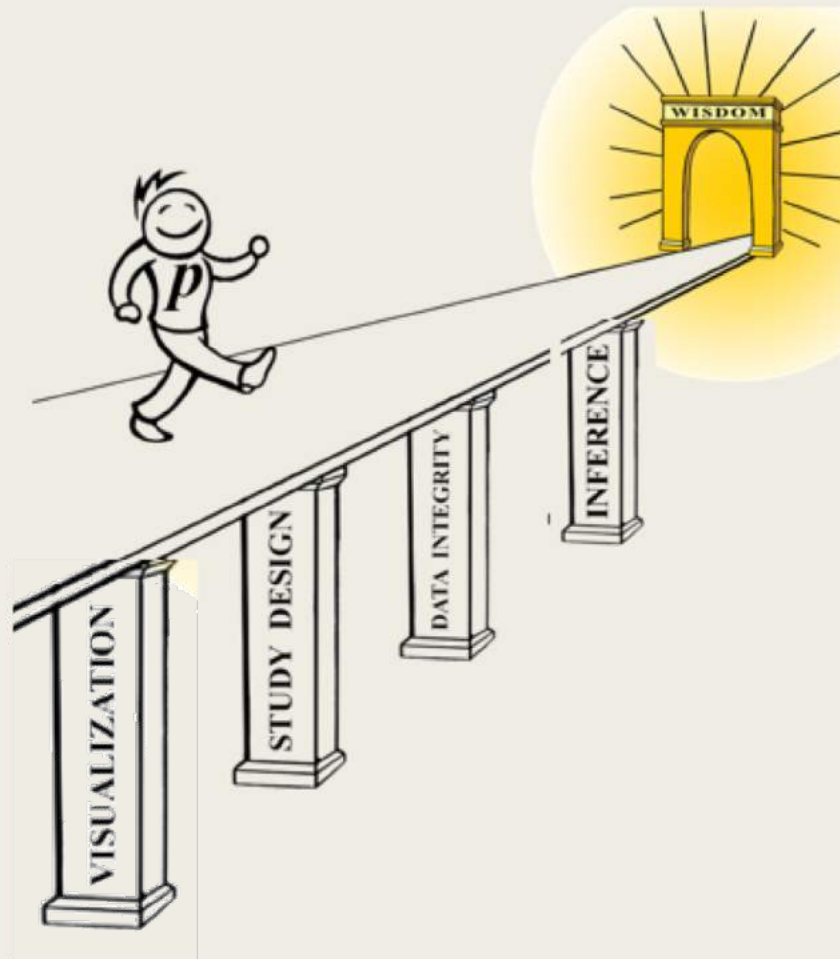


We all work together



- Context
- Audience
- Historical evidence
- Effect size
- Replicability
- Robustness
- Generalizability
- Utility

And support each other



And learn from each other



Thank you!

- Special thanks to
Matthew Drissell,
Associate Professor of Art,
Dordt University

www.mattdrissell.com

