

Pre-registration

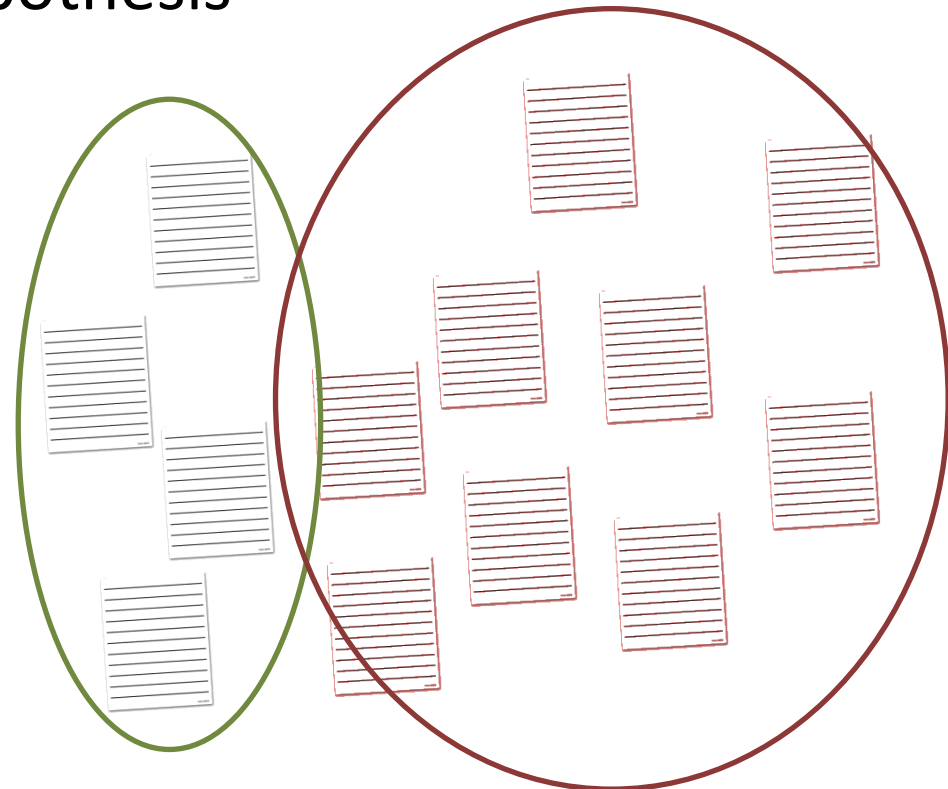
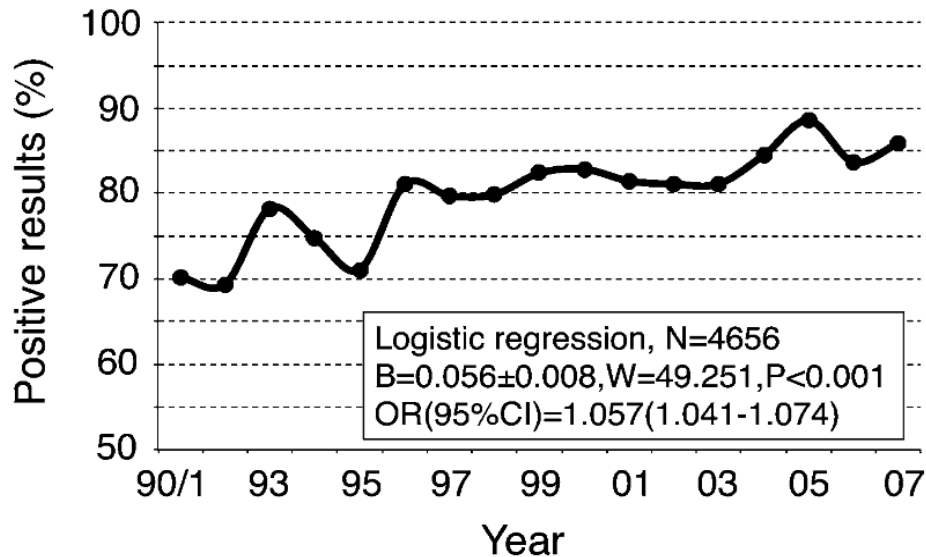
A short introduction to a big problem

The problems

- Publication bias
- Harking (Hypothesis after results are known)
- Analyses degrees of freedom
- Wrong incentives produce wrong outcomes

Publication bias

- A paper is deemed worthy of publishing if:
 - They have significant results
 - They are novel
 - Results support the hypothesis



Consequences of publication bias

- Medium problem: We do not see a particular set of results
- Big problem: We will find ways to publish our papers because...
 - Academic careers are measured by papers published



Degrees of freedom

- Every time I reanalyze in new ways, I am rerolling the dice (kind of).

- We do not discard studies with non-significant results
- We discard analyses with non-significant results
- We run several analyses until our results becomes significant
- This produces an increase in the false-positive rate

Table 1. Likelihood of Obtaining a False-Positive Result

Researcher degrees of freedom	$p < .05$
Situation A: two dependent variables ($r = .50$)	9.5%
Situation B: addition of 10 more observations per cell	7.7%
Situation C: controlling for gender or interaction of gender with treatment	11.7%
Situation D: dropping (or not dropping) one of three conditions	12.6%
Combine Situations A and B	14.4%
Combine Situations A, B, and C	30.9%
Combine Situations A, B, C, and D	60.7%

I don't have to do it! I just need to think it!

- If it works at my first try, it doesn't matter!
- If I was willing to do it other ways in case it didn't work!

Solution

- I can write how I am going to run my studies in advance
 - How many people
 - Which conditions
 - What statistical analyses
 - What will be considered an outlier
 -

Hypothesizing after results are known

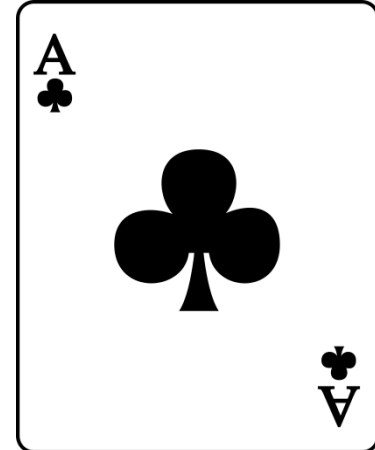
- I am good magician! I can tell you which card you have in your hand!

Hypothesizing after results are known

- I am good magician! I can tell you which card you have in your hand!
- It's a ten of hearts!

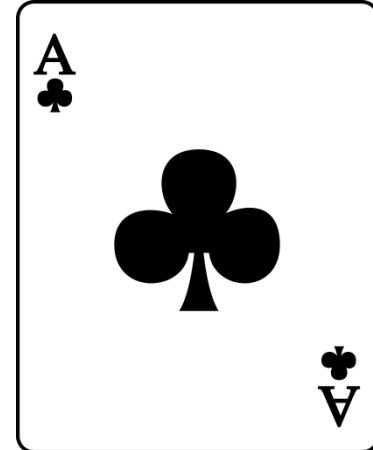
Hypothesizing after results are known

- I am good magician! I can tell you which card you have in your hand!
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Hypothesizing after results are known

- I am good magician! I can tell you which card you have in your hand!
- ~~It's a ten of hearts!~~
- It's an ace of clubs!



Hypothesizing after results are known

- Hypothesis: Bright colors will attract men more often than dark colors. They are used by nature everywhere to attract birds.
- I am gonna test Red, Pink, Black, Dark purple.
- I run the study.
- Result: Black is the color that attracts men the most.
- Rehypothesize: Dark colors attract men more often, as they contrast more with the bright colors present in nature.

Hypothesizing after results are known

- Hypothesis: Insula is involved in word articulation, as said by et al. 2017 therefore as my task involves word articulation, insula must be activated.
- Result: Insula is not activated, but Superior Temporal Sulcus is.
- Rehypothesize: Superior Temporal Sulcus is involved in memory retrieval, as said by et al. 2014 therefore as my task involves memory retrieval articulation, STS must be activated.

Hypothesizing after results are known

- Circular reasoning.
- The observed data is used to generate a prediction that explains the obtained result.

Solution

- I can write down what my hypothesis is, before starting my study.
- As well as what I am going test.
- As well as the methodology explained before.

Cartoon problem

The problem



John P. Hack

Log-Median



Condition A



Condition B

$p=0.061$



Outliers?

But why!?

Inverse?

John two weeks ago

No transform

~~Mean~~



Katia Transformañez

Inverse

$p=0.047$



3 to 2 SD

$p=0.057$

```
176 return function(c, d) { a = a.substr(
177 return(c[a] < d[a] ? 1 : c[a] > d[a]
178 );
179 }
180 function performanc(a, b, c) {
181 if (0 == b.length) {
182 var d = 100, f = 0;
183 for (c = c ? 1 : b.length;;) {
184 if (f == a.indexOf(d, 0), 0 == f) {
185 d++, f = c;
186 } else {
187 break;
188 }
189 }
190 return d;
191 }
```

Solution

- Pre-register everything before starting
- Hypothesis and methods
- Write down your whole study
 - Most of the time you can write everything down until results and conclusions
- Less work when writing the paper
- Less prone to errors
- Better outcome
- Less false positives in literature

Other Benefits

- Some journals offer the possibility of reviewing the study before it is run.
- If hypothesis and methods are approved, the paper will be published regardless of the results.
 - A paper is deemed worthy based on the interest and viability of the methods and the idea.
 - No need to “massage” my data until something is significant

Common questions

- After seeing my data, I have come up with a new hypothesis that would explain them better can I write?
 - Yes, but clearly separated from your a priori hypothesis in a post-hoc section
- After running the experiment, I have found a new analysis that is supposed to work better than the one I am doing now, and it is significant! Can I include it?
 - Yes, but clearly separated from your a priori analysis in a post-hoc section
- I want to include “write something here” after the study is run:
 - Yes, in the post-hoc section, specifying that it was not planned a priori and it happened based on the results after data collection.

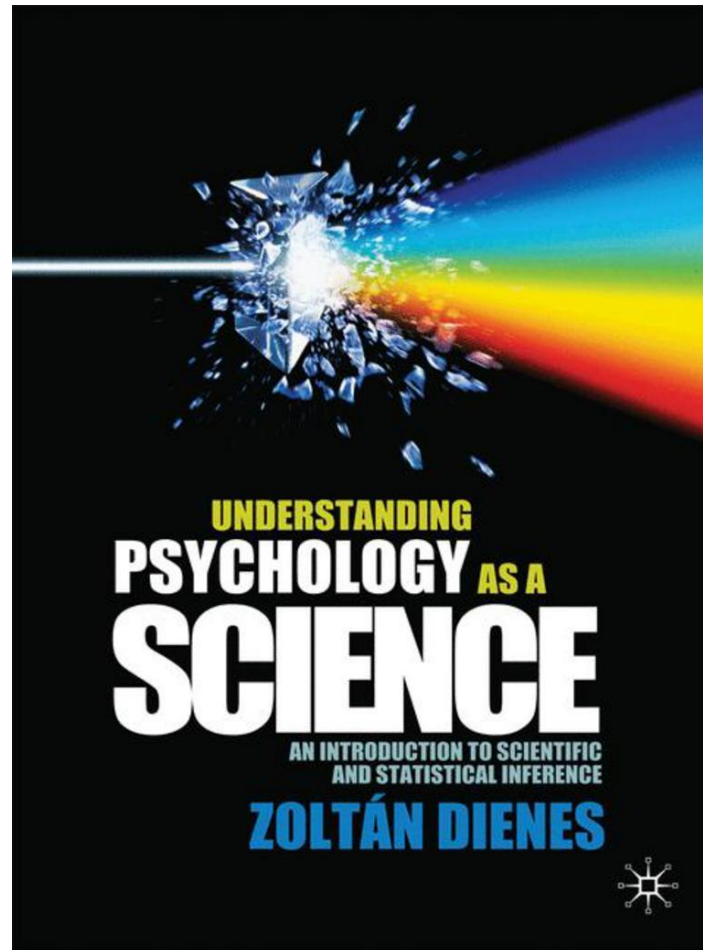
I want to do exploratory studies!

- Awesome!
- Do them they are very important!
- But they should not be confused with confirmatory studies, they are something different.

Where can I do pre-registers?

- <https://osf.io/>
- <https://aspredicted.org/>
- Many journals: <https://cos.io/rr/>
- In your lab notebook! (not official but important!)
- <https://osf.io/zab38/wiki/home/>

I like the topic what else can I read?



No conflict of interest!