

Beyond *all-or-nothing* Statistics

Reduce Research Waste and improve 3Rs (include less animals)

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Bet against the null hypothesis

Estimated effect: 1 \rightarrow $\delta = 2$ α : 5% \rightarrow n = ?
 Standard deviation: 0,5 power: 80%

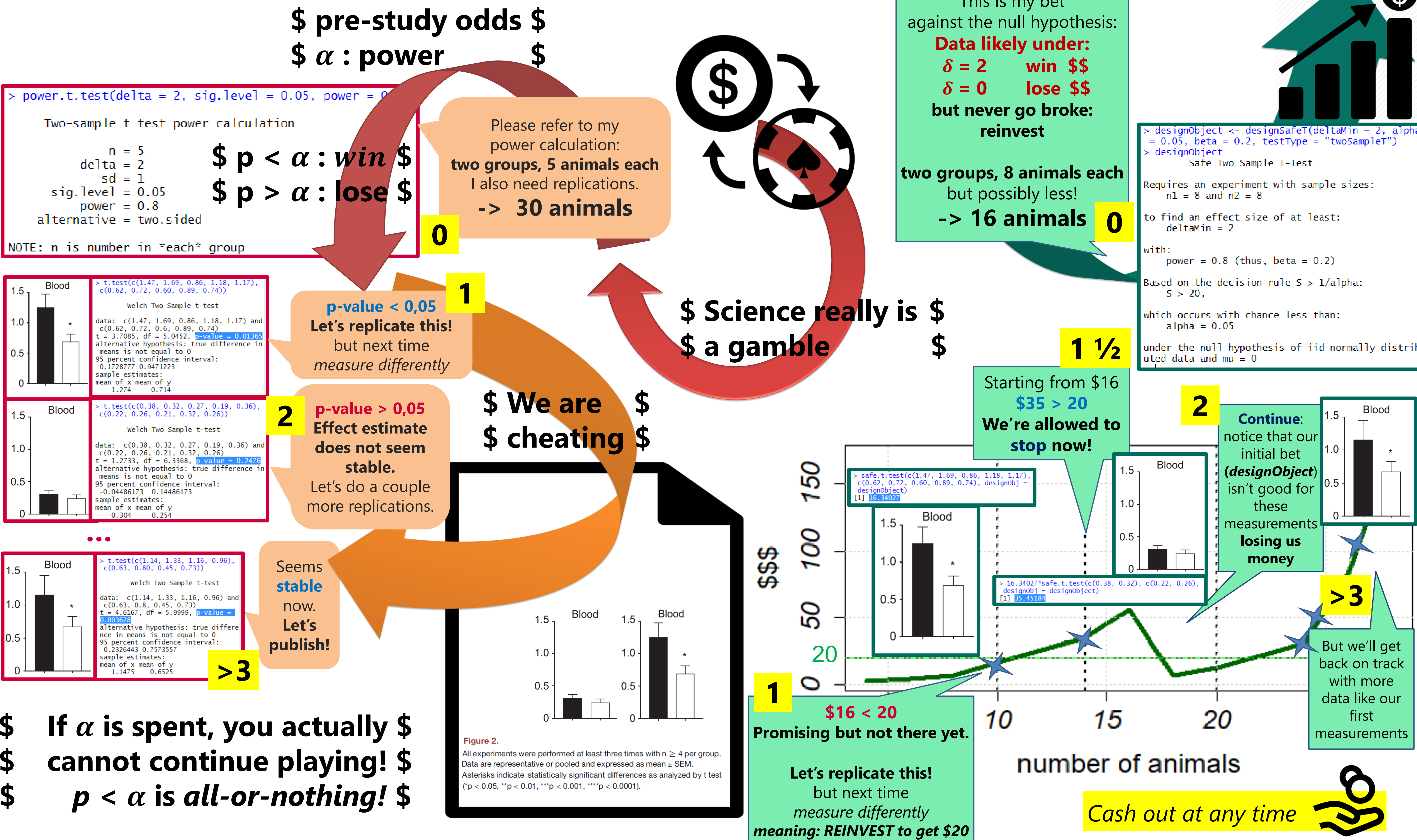
Current practice

"Two-out-of-three" rule (p-values)

Frommlet, F. & Heinze, G. (2020) Experimental Replications in Animal Trials. *Laboratory Animals*. (in print)

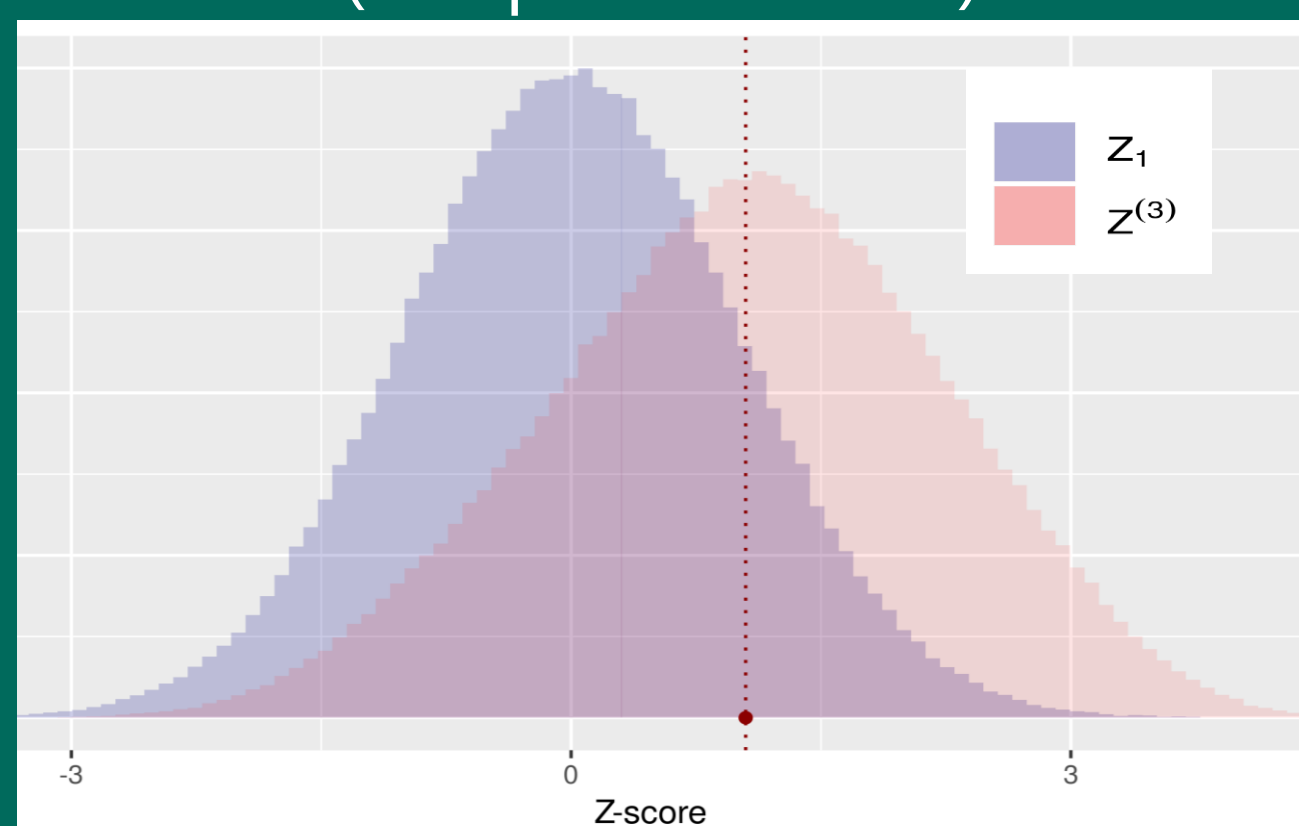
Proposed practice

Sequential Safe Testing



Accumulation Bias

(see poster P-054)



$p < \alpha$, current practice

- Representative experiment in publication?
 -> Publication Bias
- Pool in a meta-analysis?
 -> NO: Accumulation Bias
- 3Rs?
 -> at least 30 animals

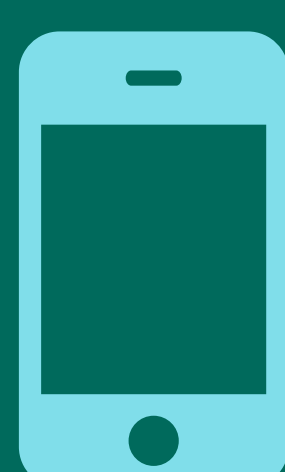
$\$ \$ > \frac{1}{\alpha}$, SAFE TESTS, proposed practice

- Strong on heterogeneous experiments:
 Compare casino $\delta = 0$ hypothesis; as heterogeneous as:
- Pool in a meta-analysis?
 -> Yes! Safe Meta-Analysis
- 3Rs?
 -> on average 15 animals



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Take a picture to download
 (1) the R package for Safe Testing
 (2) the paper on Accumulation Bias

