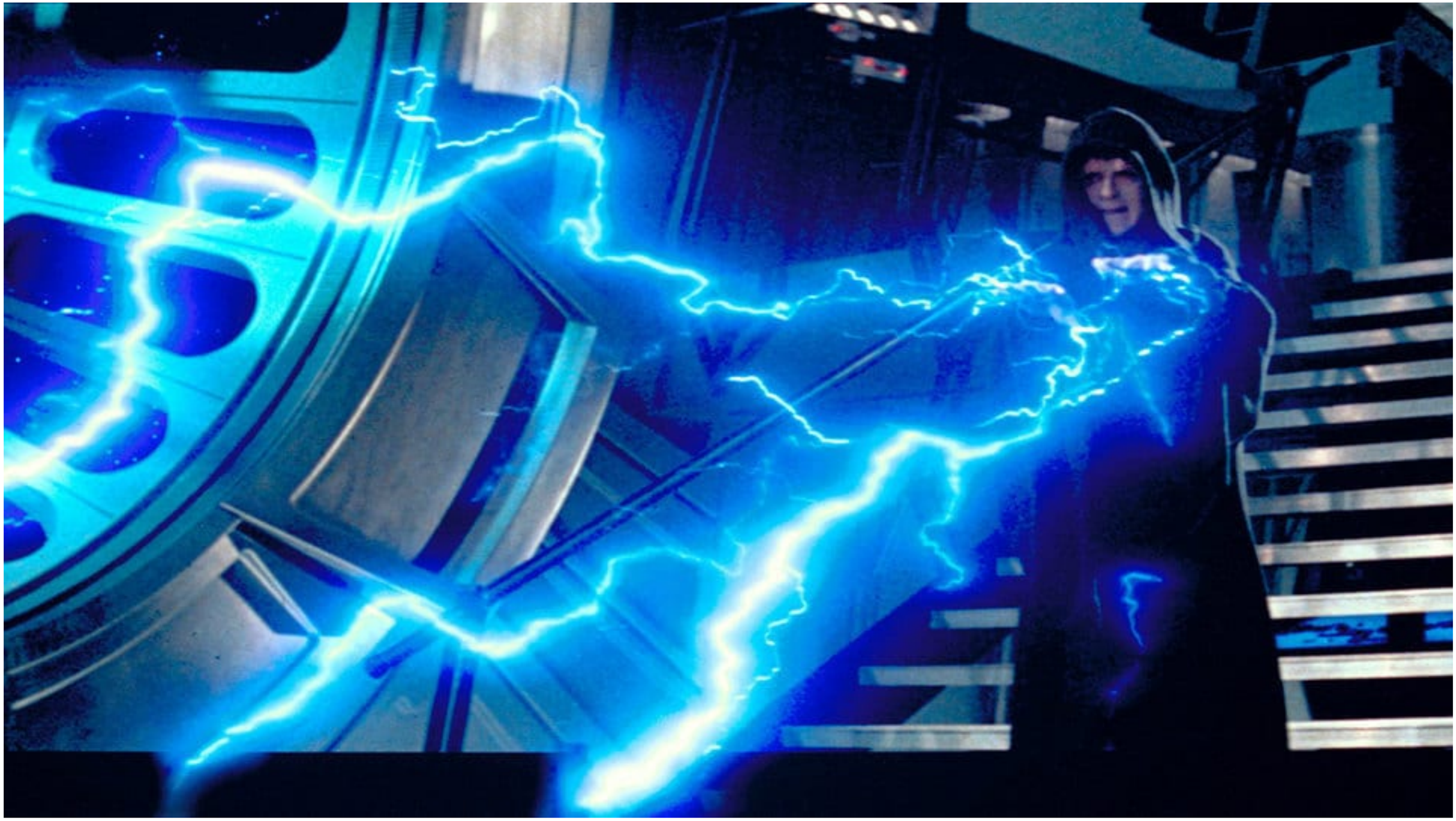
experiment sandbox



resource: experimental design 4 the life sciences 4e

@cjlortie

power thinking in experimental design

how much data do you need to collect?

workflow for extent of replication

1. structured observation
2. check literature
3. power analysis

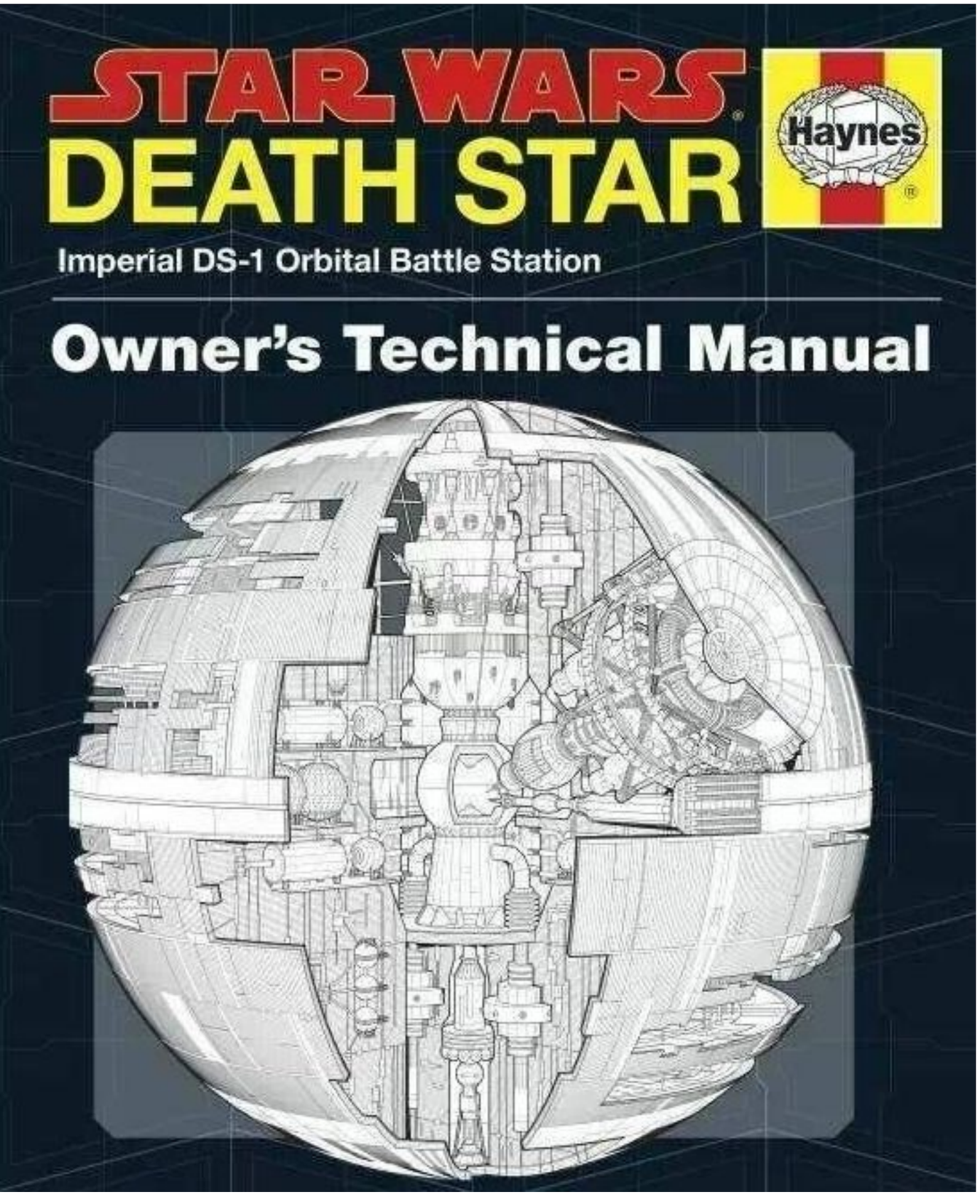
power criteria checklist

effect sizes
random variation
number of replications (n)

effect size is the strength of an intervention
or a factor in an experiment

magnitude and sign

random variation is the variation between samples/subjects



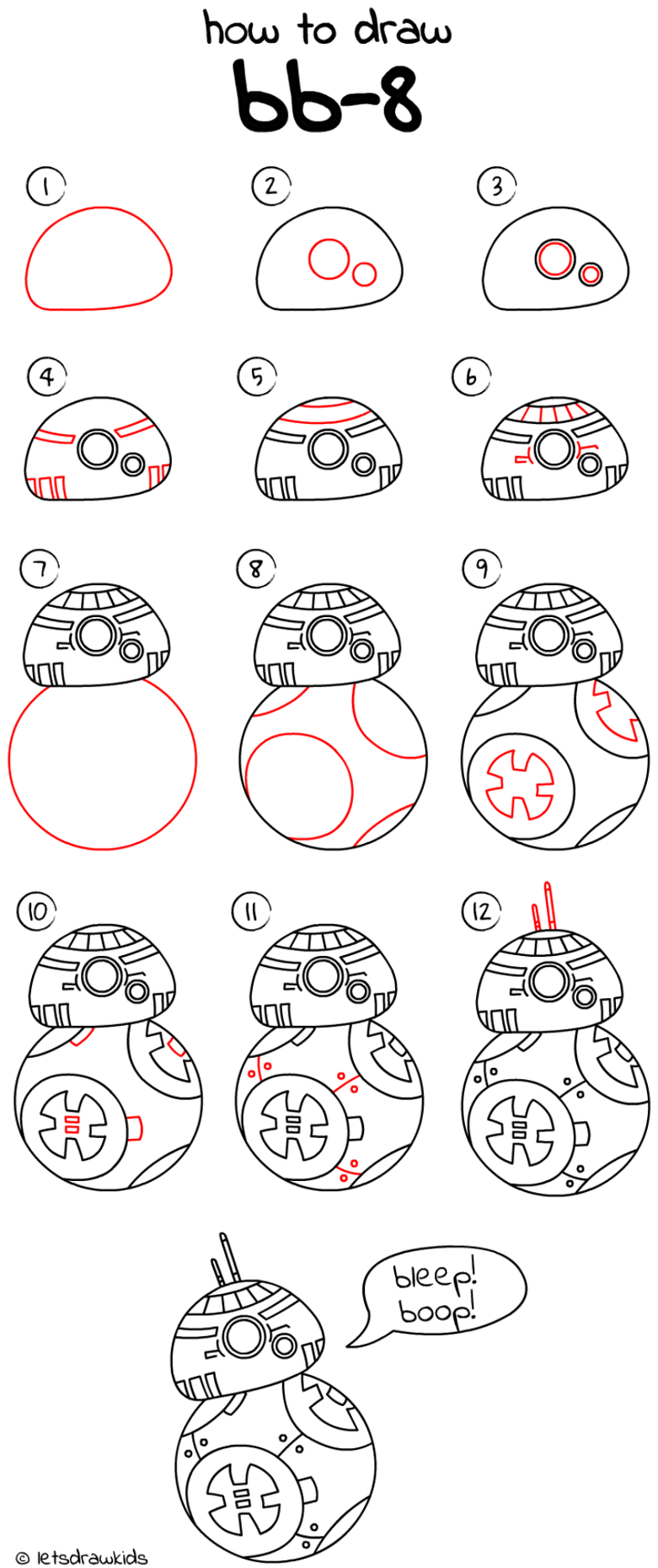
tools

estimate strength of
treatment effects

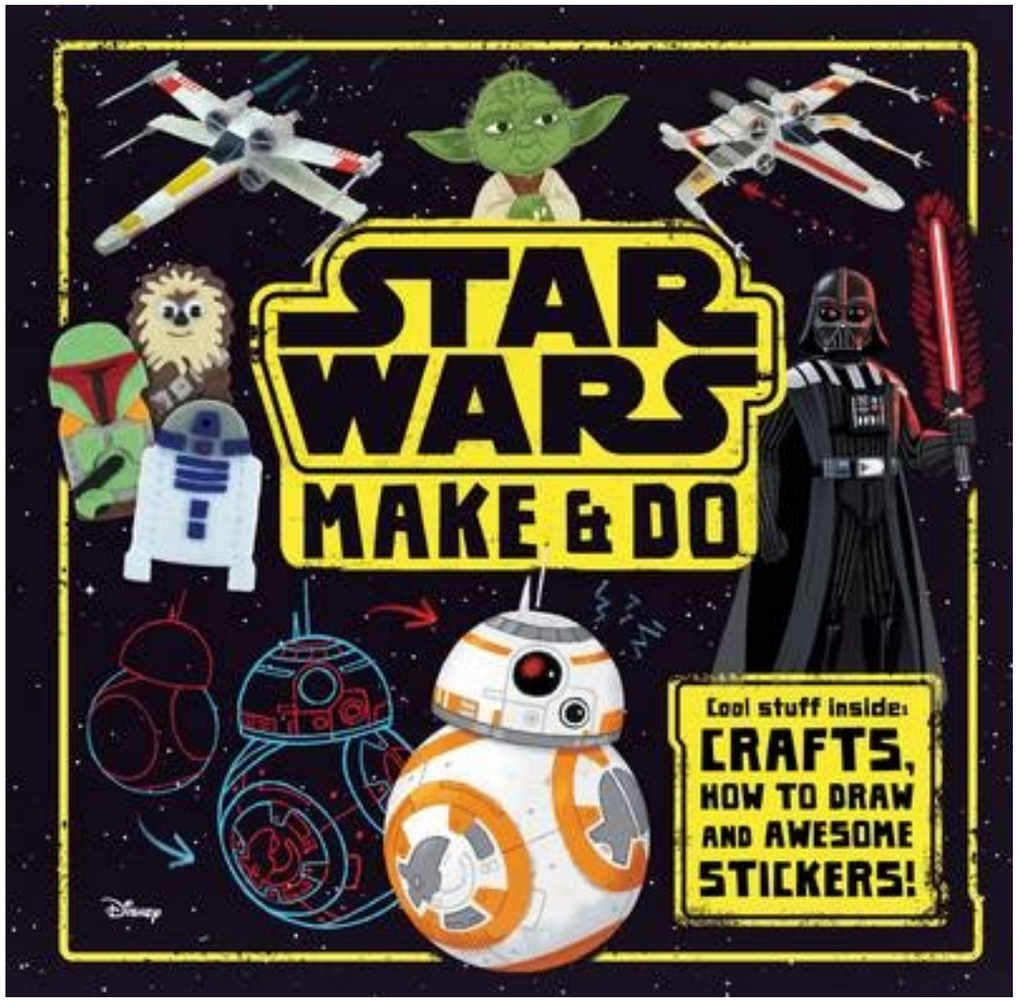
literature
pilot experiment
mechanism
re-sampling random data

repeat estimation of effect sizes as needed
& test for different designs too

random draw
to plot treatment differences
or generate more formal
power curves



tools



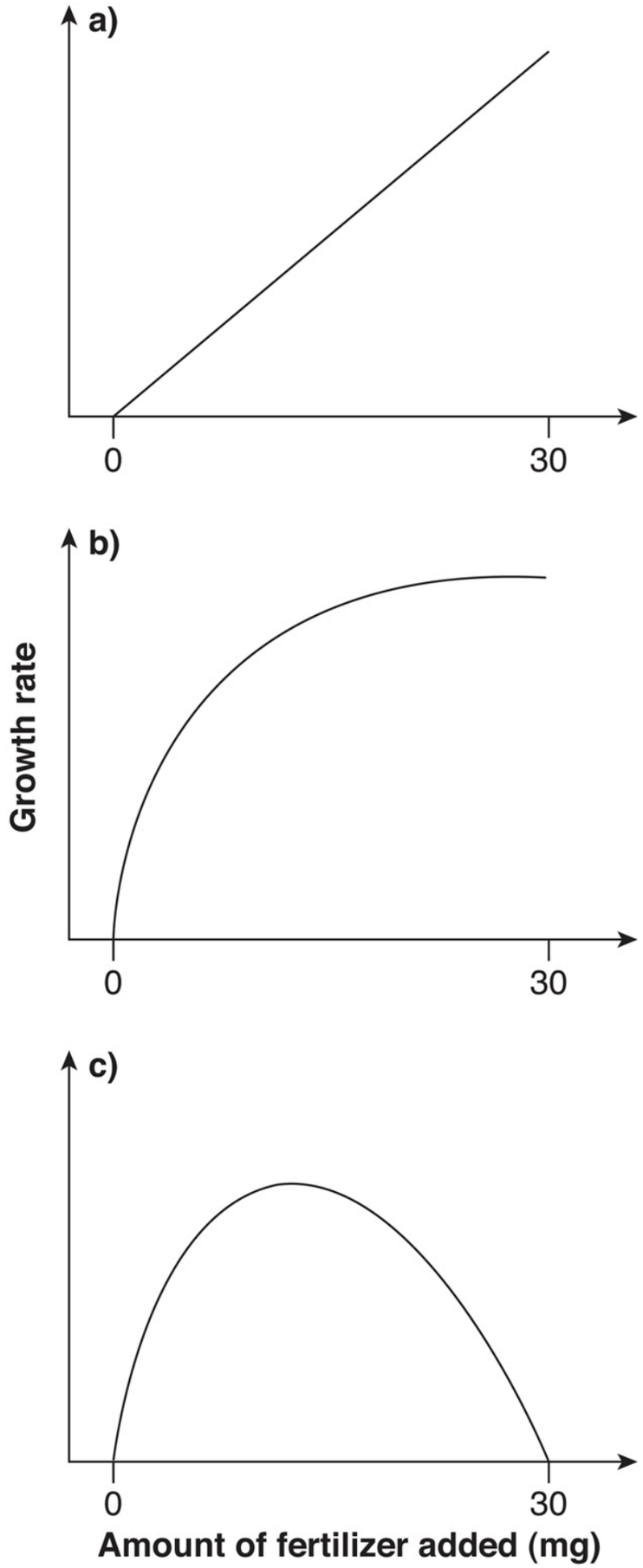
many other tools to solve challenge of increasing power (i.e. likelihood of detecting differences)

design thinking

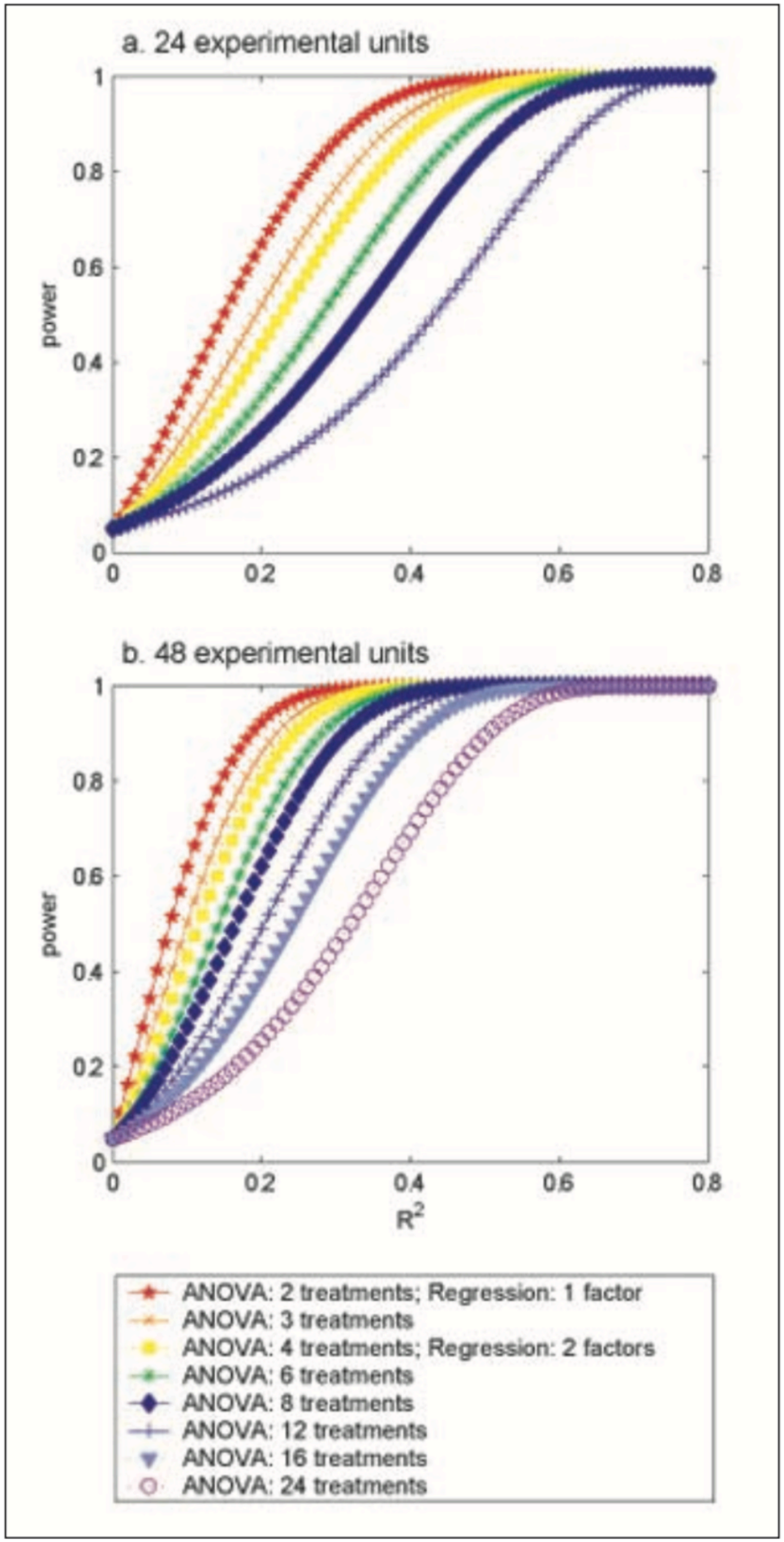
reduce random variation
improve experimental techniques
homogenize conditions
limit subset of population sampled
block variation
apply/sample treatments that the most different

how you spread out replications across a gradient

(replication AND how many levels you test)

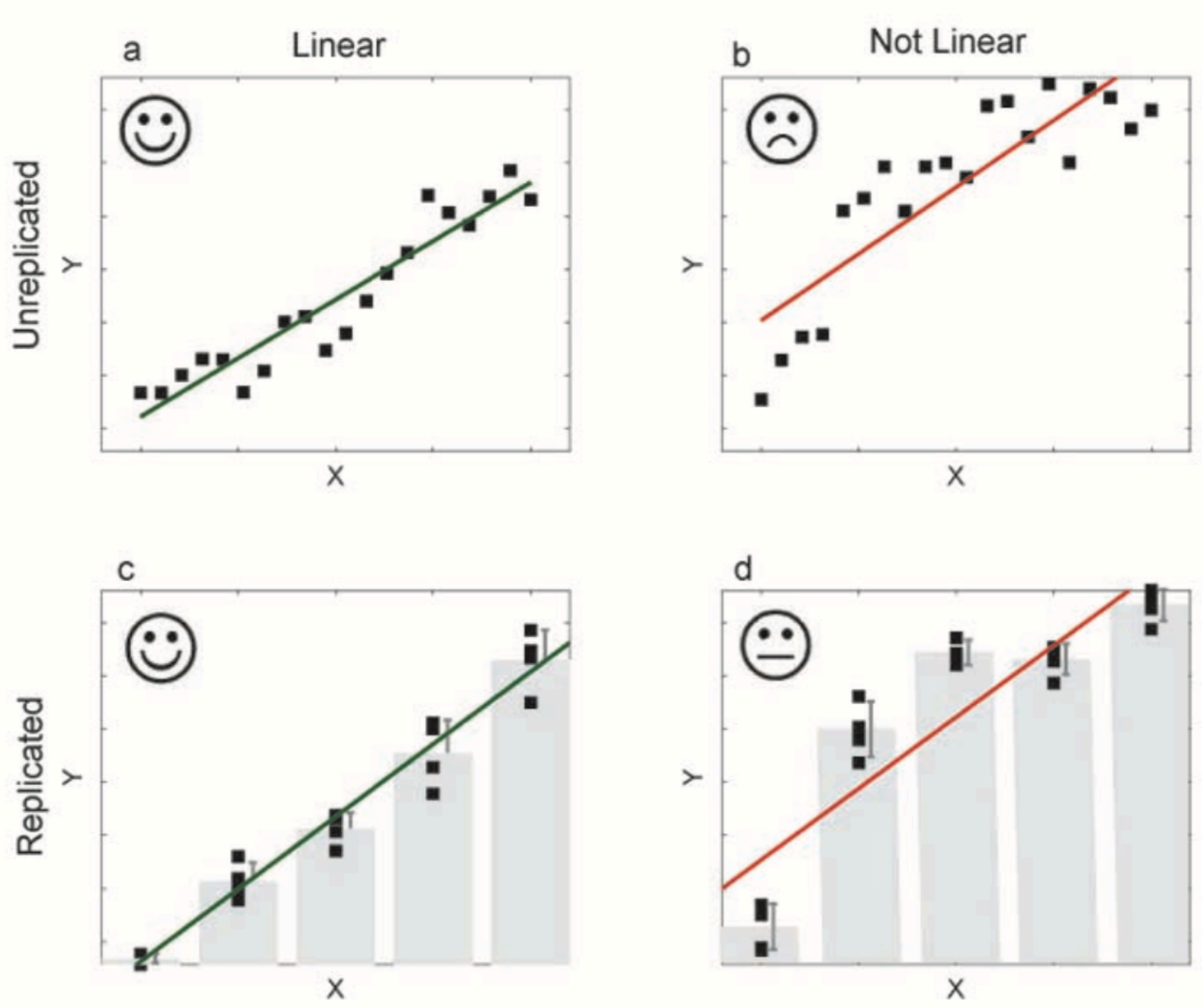


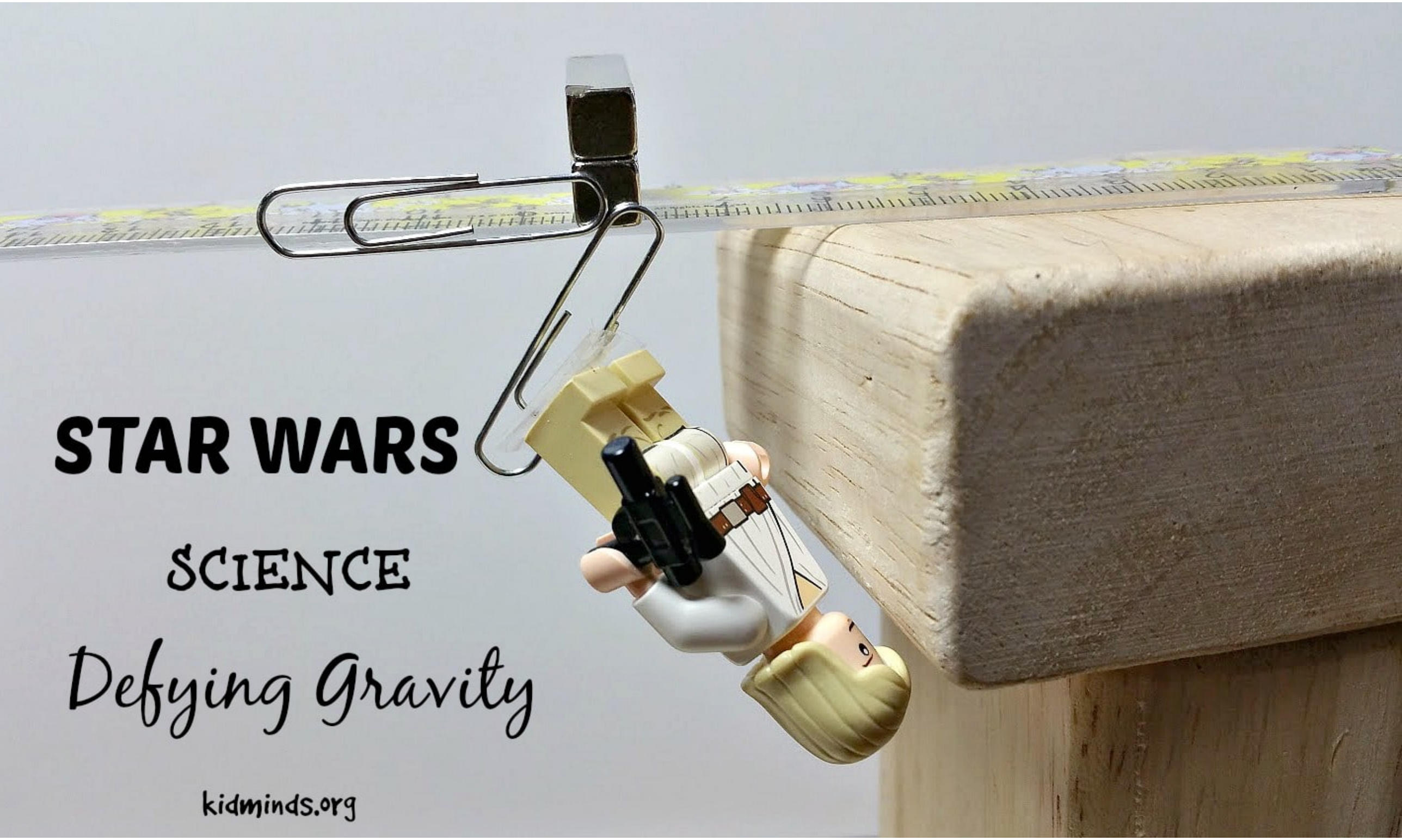
shape of curve
critical concern



replicated regression is an incredible solution for natural sciences

Cottingham et al. 2005


a
Linear
b
Not Linear
Unreplicated
Y
X
Y
X
c
d
Replicated
Y
X
Y
X



experiment with designs before experimenting

Type I Error

false positive

Type II Error

false negative

	H_0 True	H_0 False
Reject H_0	Type I Error	Correct Rejection
Fail to Reject H_0	Correct Decision	Type II Error

too many replicates can be a crime