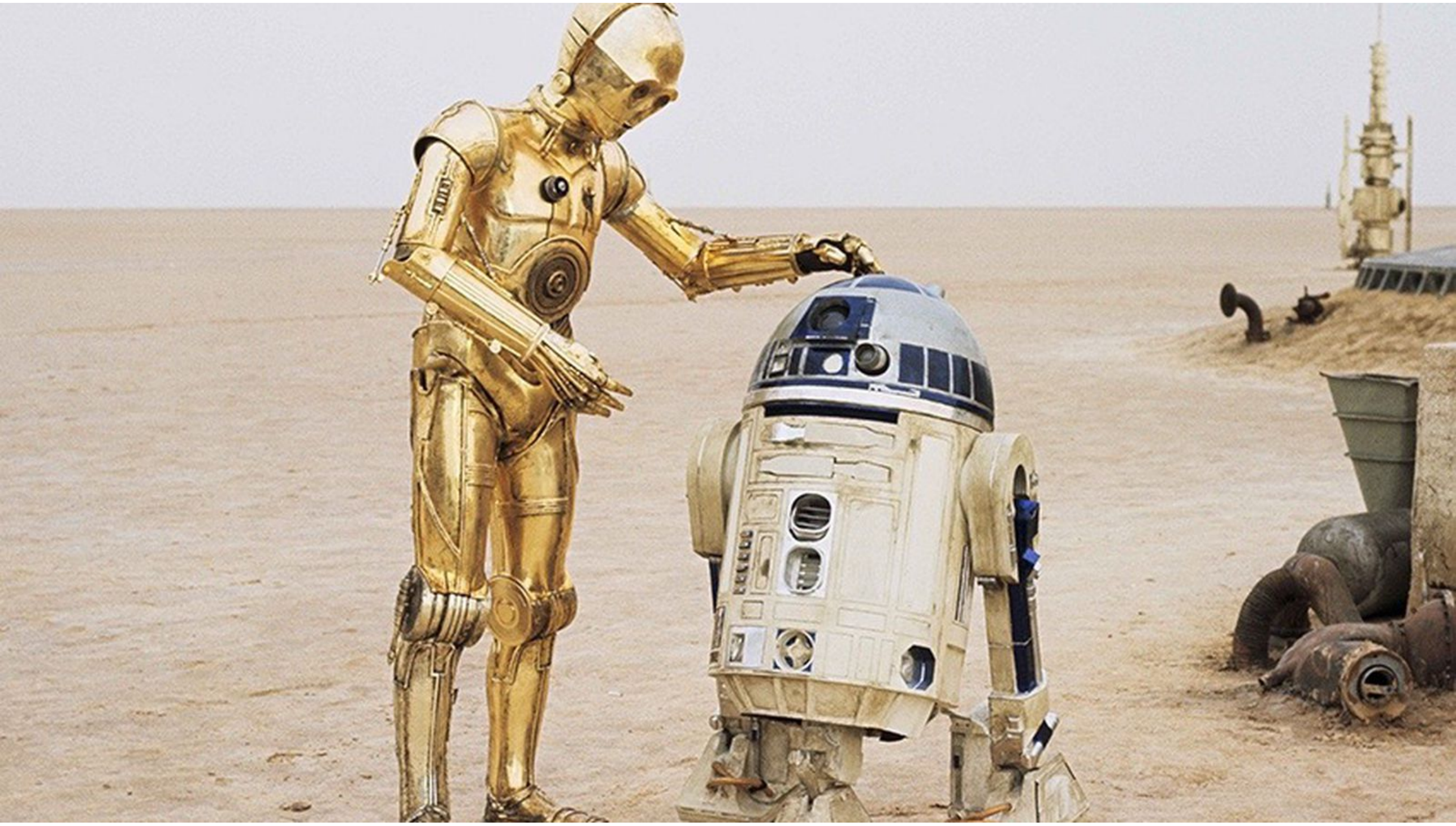
experiment sandbox



resource: experimental design 4 the life sciences 4e

@cjlortie

variation, replication, and designations

goal is to minimize **variation**
(or at least comprehend to some extent)

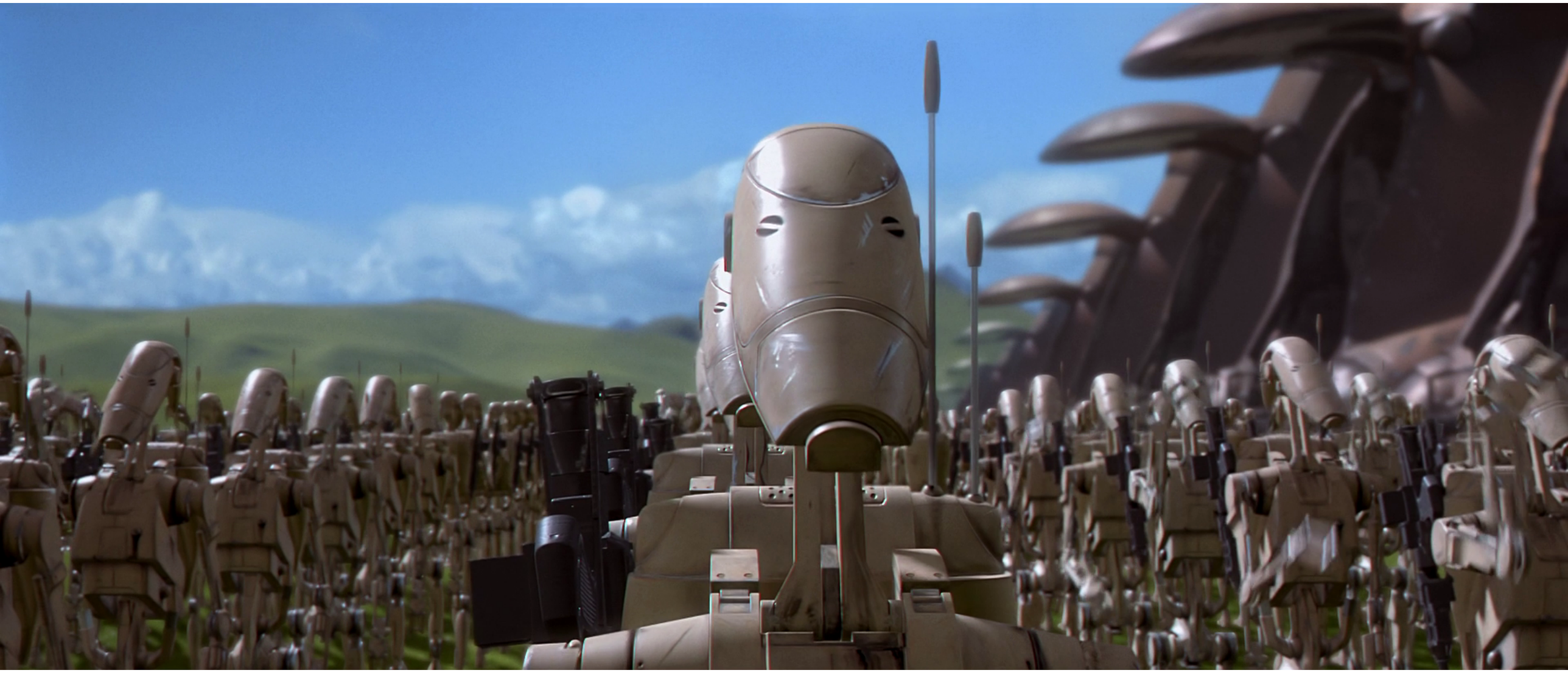
response = dependent variable

factor = independent variable

random variation is inherent variation
in a system that cannot be explained
by the independent variables or factors

between versus within variation patterns

one solution is **replication**



replication is repeated sampling typically on different subjects

replication can be wide
or narrow

(defined as extent
that the goal of replication
is to sample
inherent variation)

what is a p-value?

The p-value is the level of **marginal significance** within a statistical hypothesis test representing **the probability of the occurrence of a given event**.

The p-value is used as an alternative to rejection points to provide the smallest level of significance at which the **null hypothesis would be rejected**.

distributional (versus point) **design thinking**

a)

Standard eggs

GM eggs

Null hypothesis true
(Feed does not affect shell thickness)

Frequency of occurrence

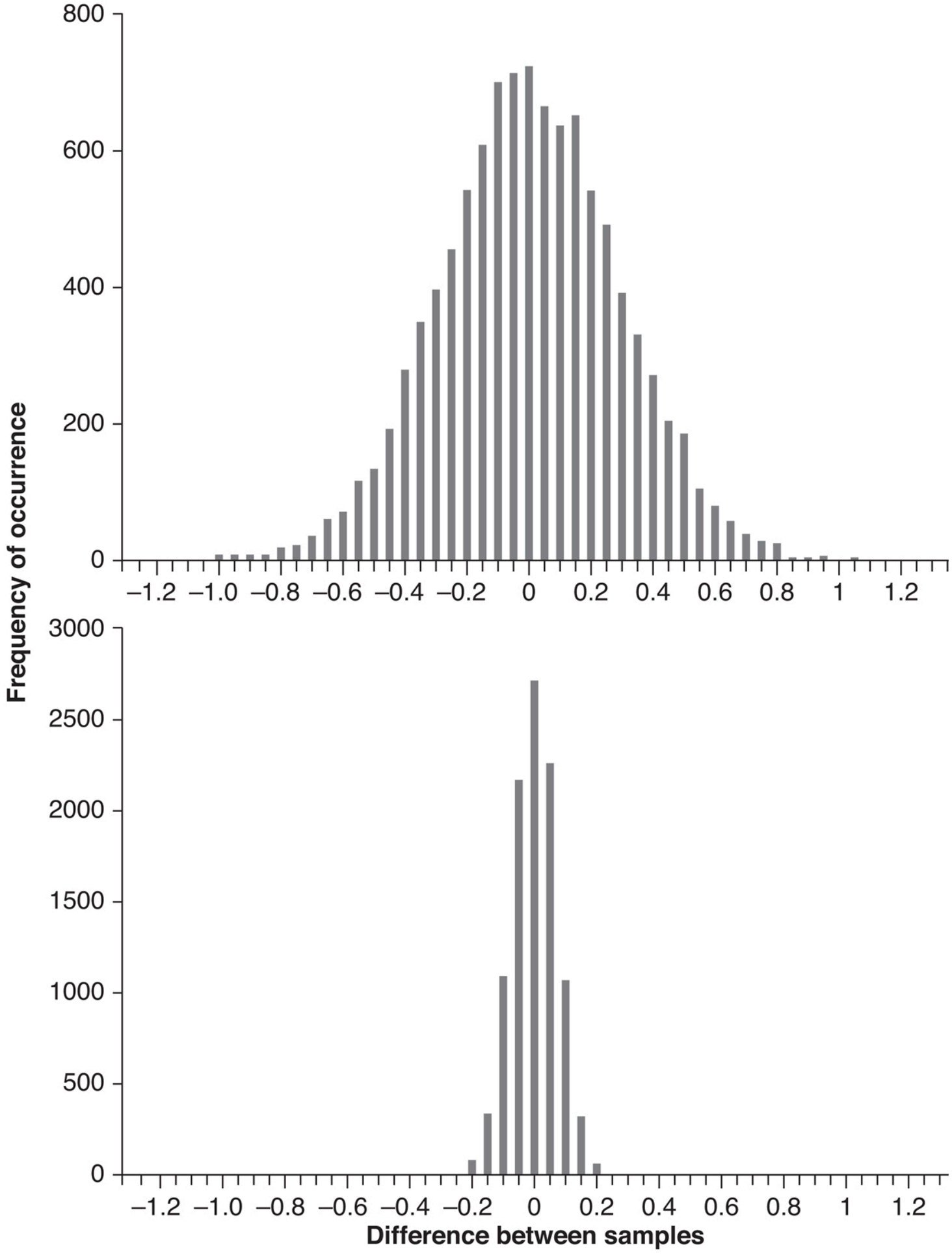
2.6 2.8 3.0 3.2

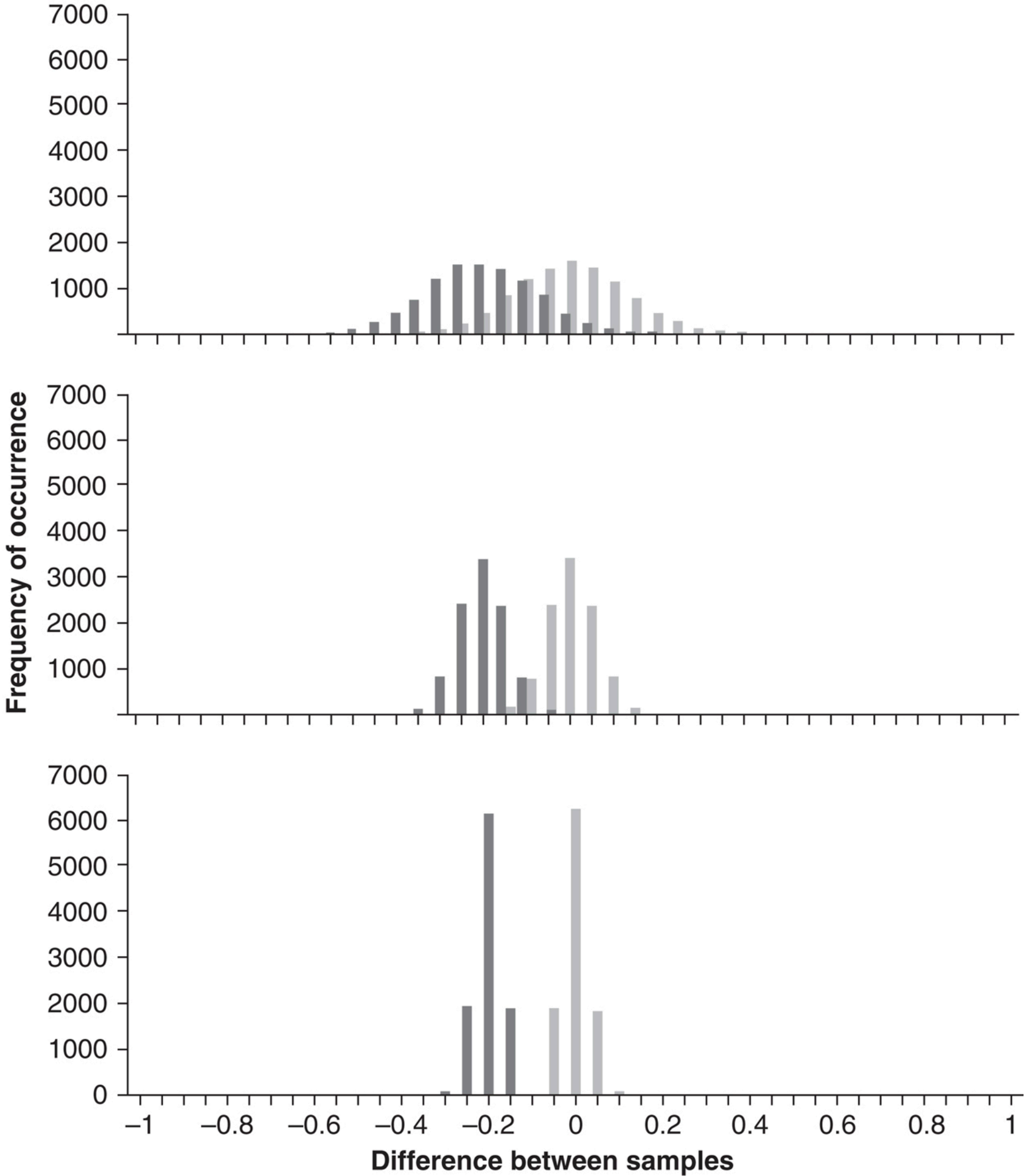
b)

Null hypothesis false
(Feed does affect shell thickness)

2.6 2.8 3.0 3.2

Shell thickness


Frequency of occurrence
800
600
400
200
0
–1.2 –1.0 –0.8 –0.6 –0.4 –0.2 0 0.2 0.4 0.6 0.8 1 1.2
3000
2500
2000
1500
1000
500
0
–1.2 –1.0 –0.8 –0.6 –0.4 –0.2 0 0.2 0.4 0.6 0.8 1 1.2
Difference between samples


7000
6000
5000
4000
3000
2000
1000
Frequency of occurrence
7000
6000
5000
4000
3000
2000
1000
7000
6000
5000
4000
3000
2000
1000
0
–1
–0.8
–0.6
–0.4
–0.2
0
0.2
0.4
0.6
0.8
1
Difference between samples

distributional design thinking
seeks to use replication to
facilitate detection of
'true' differences between
groups of subjects/samples

design options

a. simple random
b. random stratified
c. cluster
d. convenience

random versus haphazard
&
selection bias with external validity
are key criteria to consider
for better design thinking

never neglect independence
i.e. a measure on one subject
should not predict/influence the
measurement of another individual