April 19, 2017

This time: experimental designs
Next time: probability
read: OD book

Treatment Variable
(independent variable) (X)
(~~suppered causal factor~~) ? ~~phy~~
(supposed causal factor)

Outcome variable
(dependent variable (Y)
(response variable)

→ quant, continuous, ratio — histogram ✓ mean ✓
cortex weight (g) after childhood finished

* enriched ~~physos~~ psychological environment → treatment group (T)
vs. — qual, nominal, dich
deprived environment → controlled group (C)

Individuals: lab male rats / how many

This is a sample size determination problem

[A:] 120

How long? → just wait until adulthood

How many in (T), (C)? → 60/60 is the best choice (chain is only as strong as its weakest link)

(T) → cortex width (mg)

689
⋮
649

$n_1 = 60$

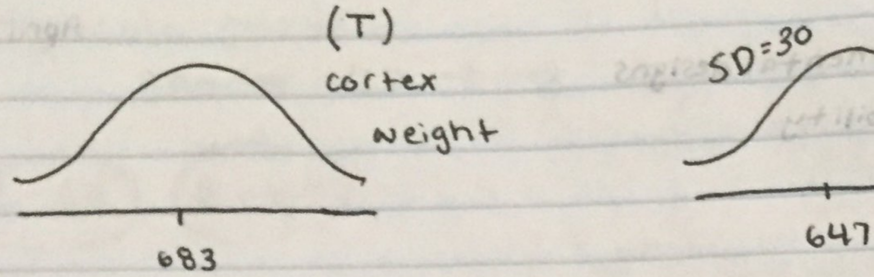
(C) → cortex width (mg)

657
⋮
602

$n_2 = 60$

mean $\bar{Y}_1 = 683mg$ — mean $\bar{Y}_2 = 647mg$

SD $s_1 = 32mg$ — $s_2 = 30mg$



Q 1: Is the difference between $\bar{y}_1$ + $\bar{y}_2$ large in practical terms?

i.e. Is this diff. practically significant? (pratsig)

$\bar{y}_1 - \bar{y}_2 = (683mg - 647mg) = 36mg$

[Q1:]

Is that big enough to matter?

A1: Hard to say w/ our ~~content~~ current knowledge

but: [Q.] How much bigger is 683 than 647 in relative terms?

$\frac{683mg - 647mg}{647mg} = \frac{36}{647} = 5.6\%$

(T) mean is 5.6% bigger than (C) means

2 heuristics: (1.) a small relative change (ex. 1%) can become big if it accumulates over time.

(2) It ~~may~~ many cases, a relative change of <u>5%</u> diff. is practsig., but exceptions exist

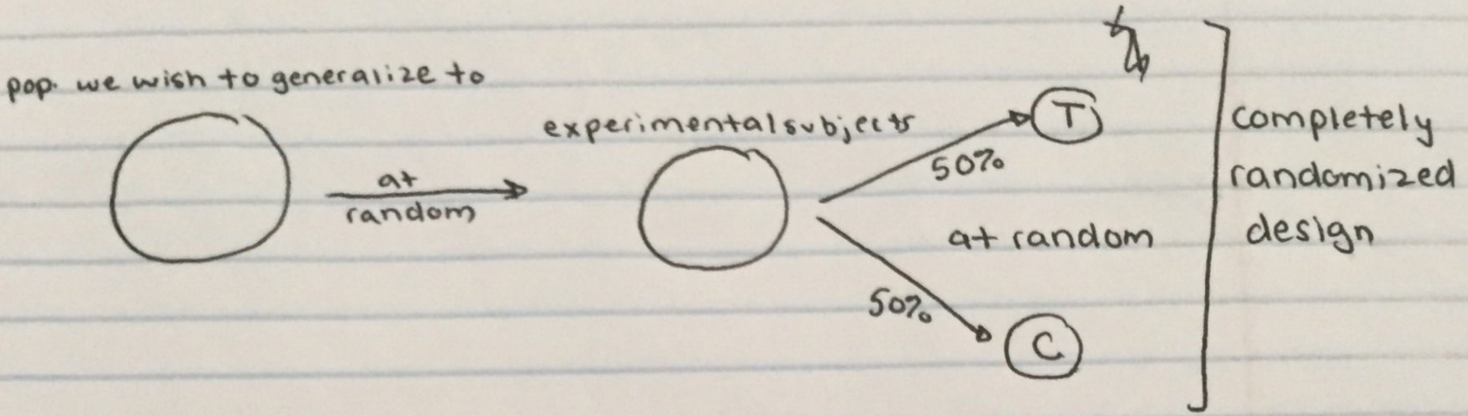
5.6% cortex weight → $\approx 5.6^2\% = 31\%$
increase in synapses (connections between neurons)

[new Q]

How assign subjects (rats) to T or C?

A] at random (just ~~w/~~ as w/ sample surveys the result is called a randomizes controlled trial (RCT)

T, C groups



outcome Y = cortex weight
treatment X = enriched vs. deprived
(T) (C)

Z = genetics

Potential confoundity factors (PCFs) Z_2 = ⋮ Z_k

↓

Def: any third variable Z, not X or Y that satisfies:

1.) Z + Y may be ~~ss~~ associated
2.) Z + X may be associated

quant. Z + quant. Y associated:
as Y ↑, Z tends to ↑ or ↓ on average + vice versa

dich X + quant. Z associated: mean Z for X = 0 (C) + mean Z for X = 1 (T) are different

Can't break link between Z + Y but can break link betwee Z + X