this time:	experimental design	read: DD book (B) ch. 7-8
next time:	probability	today LN pp. L-6a

AMS 7
19 Apr 17

①

treatment variable X

(independent) variable

(supposedly causal factor) : treatment group (T) enriched psychological environment vs. control group (C) deprived environment (qual. nominal dich)

outcome variable Y

(dependent) variable

(response variable)

cortex weight (quant. cont. ratio) measured after childhood finished

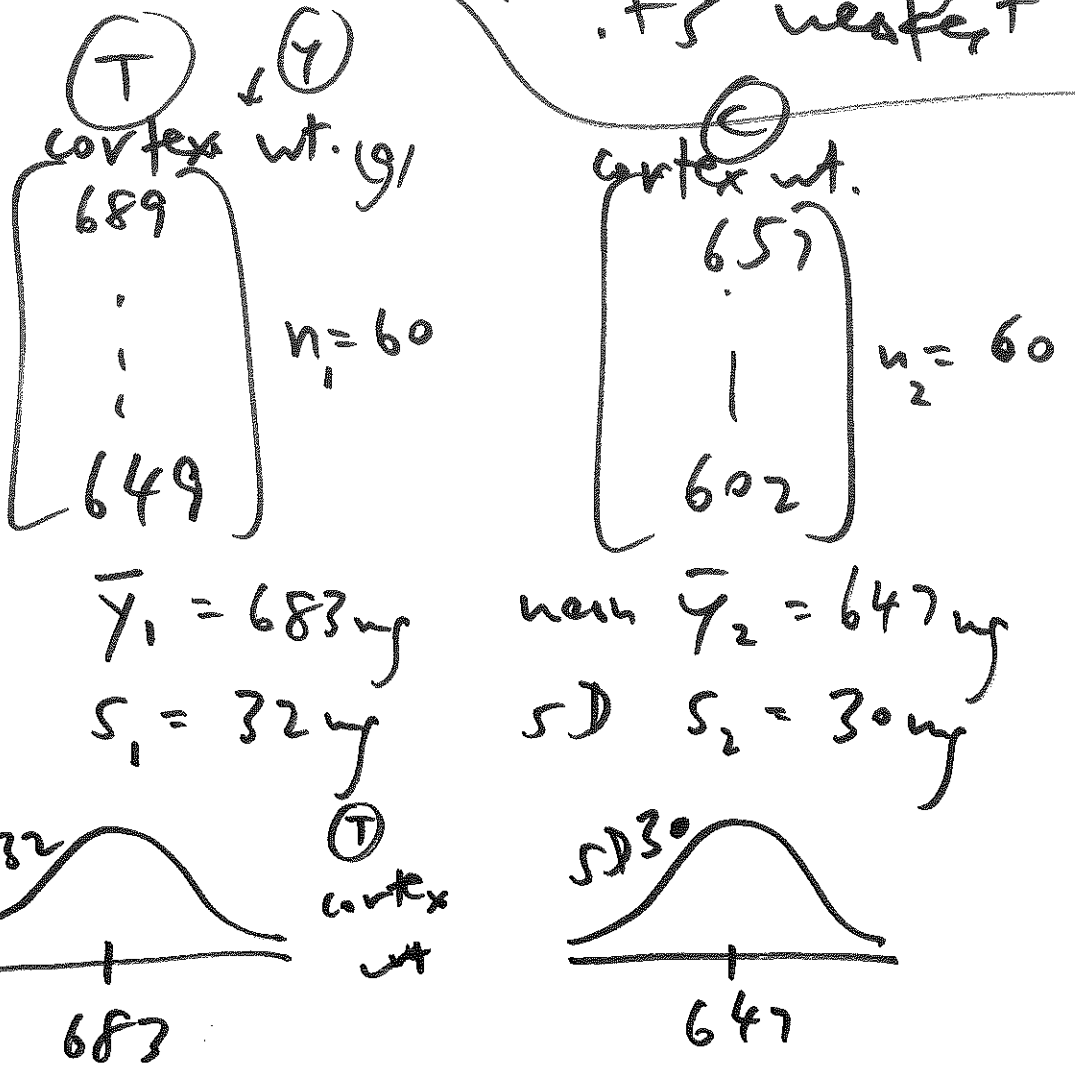
individuals: lab male rats | how many?

this is a sample size determination problem

A: 120

How long? | just wait until adulthood ②

How many in ①, ②? | 60/60 is best (chain is only as strong as its weakest link)



Q.1 Is the difference between $\bar{y}_1$ & $\bar{y}_2$ large in practical terms? (practically significant)

ie., Is this diff. practically significant?

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

Q: is that big enough to matter?

A: Hard to say with our current knowledge, but:

Q': How much bigger is 683 than 647 in relative terms?

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

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

2 heuristics:

① A small relative change (e.g., 1%) can become big if it accumulates over time.

② It may mean a relative change of ≥5%* or more is practically significant.

* but exceptions exist

5.6% cortex at $T \approx 5.6^2\% \approx 31\%$ increase in synapses (connections between neurons)

may be

new Q: How assign subjects (rats) to T or C?

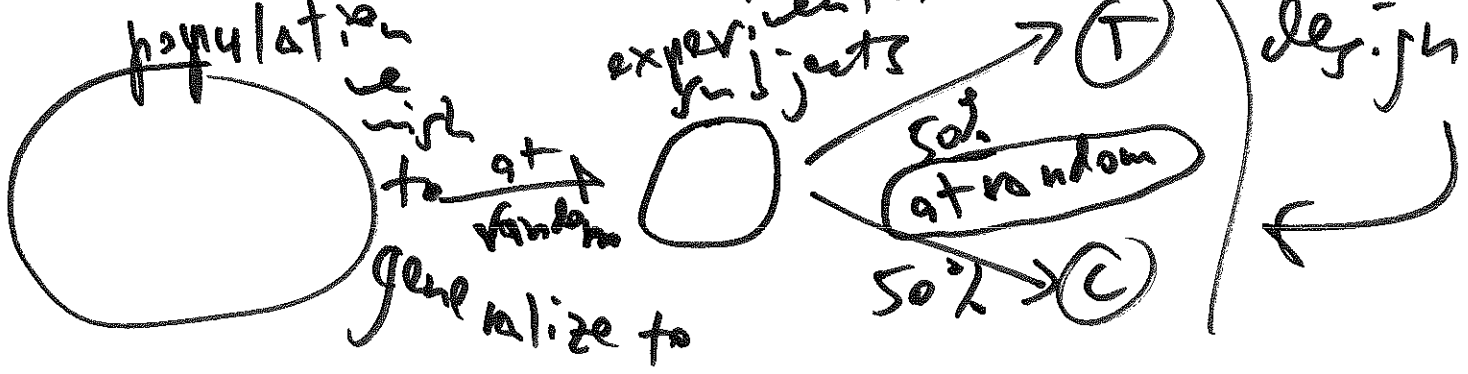
simplest answer: A — at random (just as with simple surveys)

The result is called a randomized controlled trial (RCT)

A

T, C groups

another name: completely randomized design



outcome Y = cortex wt. (5)

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treatment X = enriched (T) vs. deprived (C)

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potential confounding factors (PCFs)

Z_1 = genetics

Z_2 = ⋮

Z_k

Definition of a PCF: Z

any kind variable (not X, no Y) that satisfies:

(1) Z and Y may be associated

(2) Z and X may be associated

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quant. Z & quant Y associated:

as $Y \uparrow$, Z tends to $\uparrow$ or $\downarrow$ on average & vice versa

Rich X & quant Z associated:

mean Z for $X = 0$ (c) & mean Z for $X = 1$ (+) are different

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can't break link between Z & X, but can break link between Z and X: 2 methods for doing so

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