10-17

L-69

2: Experimental Design

2.1: Randomized Controlled Experiments

Two types of data-gathering:

1. sample surveys
2. experiments

(independent) $\underline{X}$ (supposedly causal factor): psychological environment

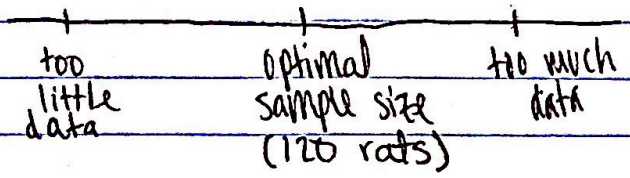
(dependent) $\underline{Y}$ (outcome variable): brain anatomy

$\underline{X} \xrightarrow{?} \underline{Y}$ Does X cause Y

Subjects: rats (male)

★ Sample size determination ★

to decrease uncertainty, get more good information (data) (i.e. increase n)



L-71 $\bar{y}_T = 683$ mg difference: $\bar{y}_T - \bar{y}_C = 36$mg

$\bar{y}_C = 647$ mg

Q1. Is this difference large in practical (biological terms?
A1 best
Is this difference practically significant?

Q2. Is this difference large in Statistical terms?
A2 approx. Is this statistically significant?

$$\frac{\bar{y}_T - \bar{y}_C}{\bar{y}_C} = \frac{683mg - 647mg}{647mg} = \frac{36}{647} = 5.6\%$$

The enriched rats had cortex weights that were 5.6% heavier on average than deprived rats.

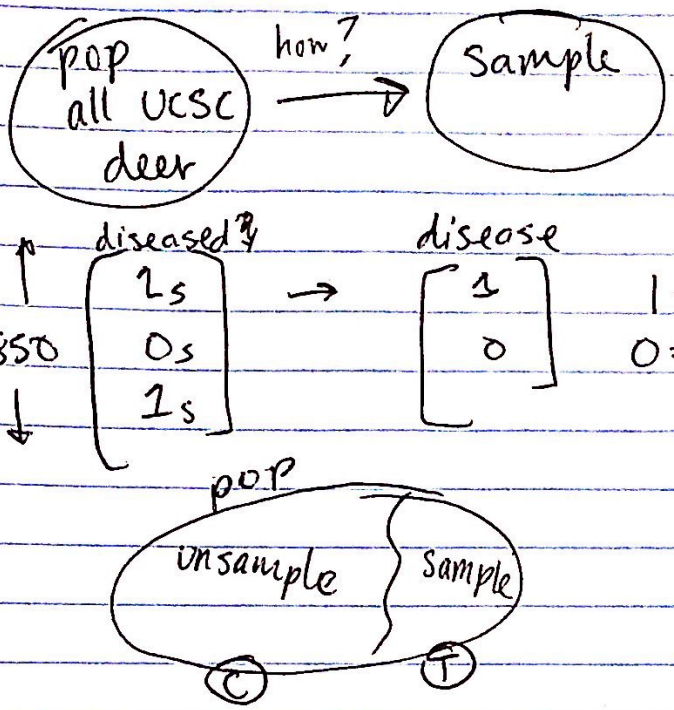
No universal rule of form if relative difference > #% than prac sig. Answer is context specific

K neurons → $\frac{k(k-1)}{2}$ possibly synapses

5.6% weight + $(5.6\%)^2$ increase
= 28%
big in biological terms ∴ practsig
(can't determine causation from this experiment)

Q. How to assign rats to T or C?

goal: try to make groups as similar as possible in all relevant ways, except for T/C distinction



* Simplest method is choosing T/C at random.

controlled experiment + random T, C → randomized controlled experiment

bias: systematic tendancy to over or under estimate the truth
↳ good data is unbiased

X = treatment = $\begin{cases} 1 & \text{if T} \\ 0 & \text{C} \end{cases}$

Y = cortex weight

Z = genetics, potential confounding factor, bias

RCT is valid: no bias

placebo: same as T but no active ingredient

blind: good idea to blind patients / subject, experimento

↳ placebo effect: idea of being treated