this: controlled experiments;
time: observational studies

STAT 7
17 Oct 19

next time: probability

read: DD (A) ① ch. 1-3; (B) ch. 1-7

today LN (69) →

hwk 1 due @ canvas tomorrow night;
quiz 2 ——— Sat night

start working on hwk 2 (now) : please
R-(32)
→ R-(54)

(R-41) read now; read at end of class

independent variable
X (supposedly causal factor):
psychological environment

dependent: response
Y (outcome variable):
brain anatomy
cortex weight

X → Y does X cause Y?

subjects : male rats

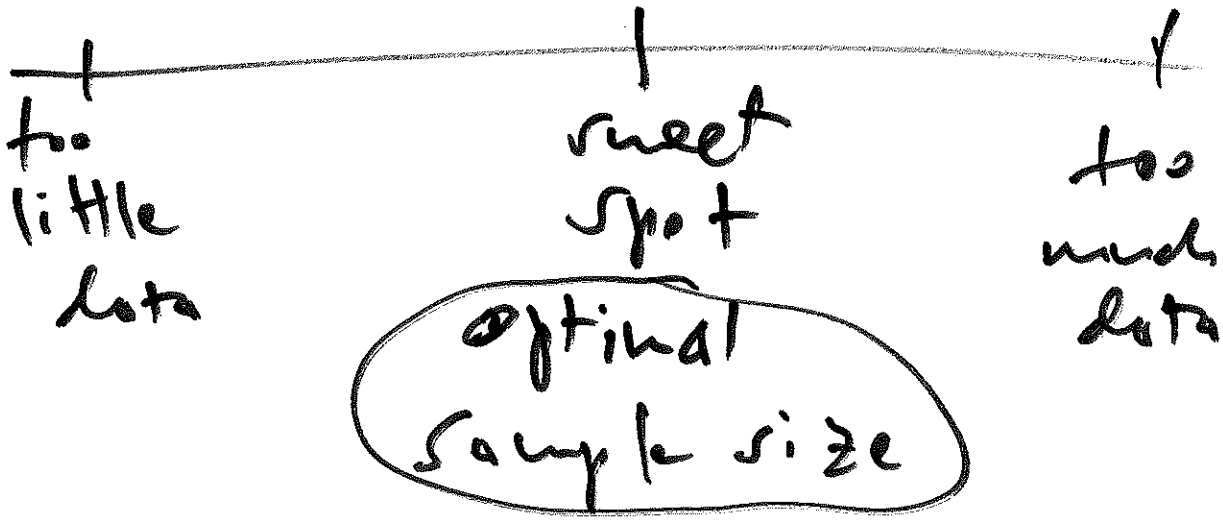
sample size determination (2)

intuition to decrease your uncertainty about something of interest to you, get more information (data) (i.e., make $n \uparrow$)

good

unbiased

$n = 120$



$\bar{y}_T = 683$ mg

$\bar{y}_C = 647$ mg

difference

$(\bar{y}_T - \bar{y}_C) = +36$ mg

Q1 is this difference large in (real-world) practical (biological) terms?

↔ is this dif. practically significant?

practsig

Q2 is this difference large in statistical terms? ↔

is this diff. statistically significant?

statsig

AI work on best expert

A, approx.

$$\frac{\bar{y}_T - \bar{y}_C}{\bar{y}_C} = \frac{683 - 647}{647}$$

$$= \frac{+36}{647} \doteq 5.6\%$$

the enriched rats had extra weight that were 5.6% heavier on average than deprived rats

no universal rule of form

if rel diff > blah %

then precise answer is context-specific

k neurons → $\frac{k(k-1)}{2}$ possible synapses (5)

5.6% weight → $(5.6\%)^2$ increase ≈ 28% in synapses

big in biological terms (∴ practsig) therefore

Q] how assign rats to (T), (C)?

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

simplest method: assign T/C at random

pop'l
all UCSC
dear

sample

disease

1s
2
0s

850

how chosen?

at random

disease?

1 = disease
0 = not

1s
0s

n = 100

mean $\bar{y} = 1\%$

use $\bar{y}$ as a good estimate of μ

mean $\mu = ?$

greek "mew"

pop

unsample
u
(C)

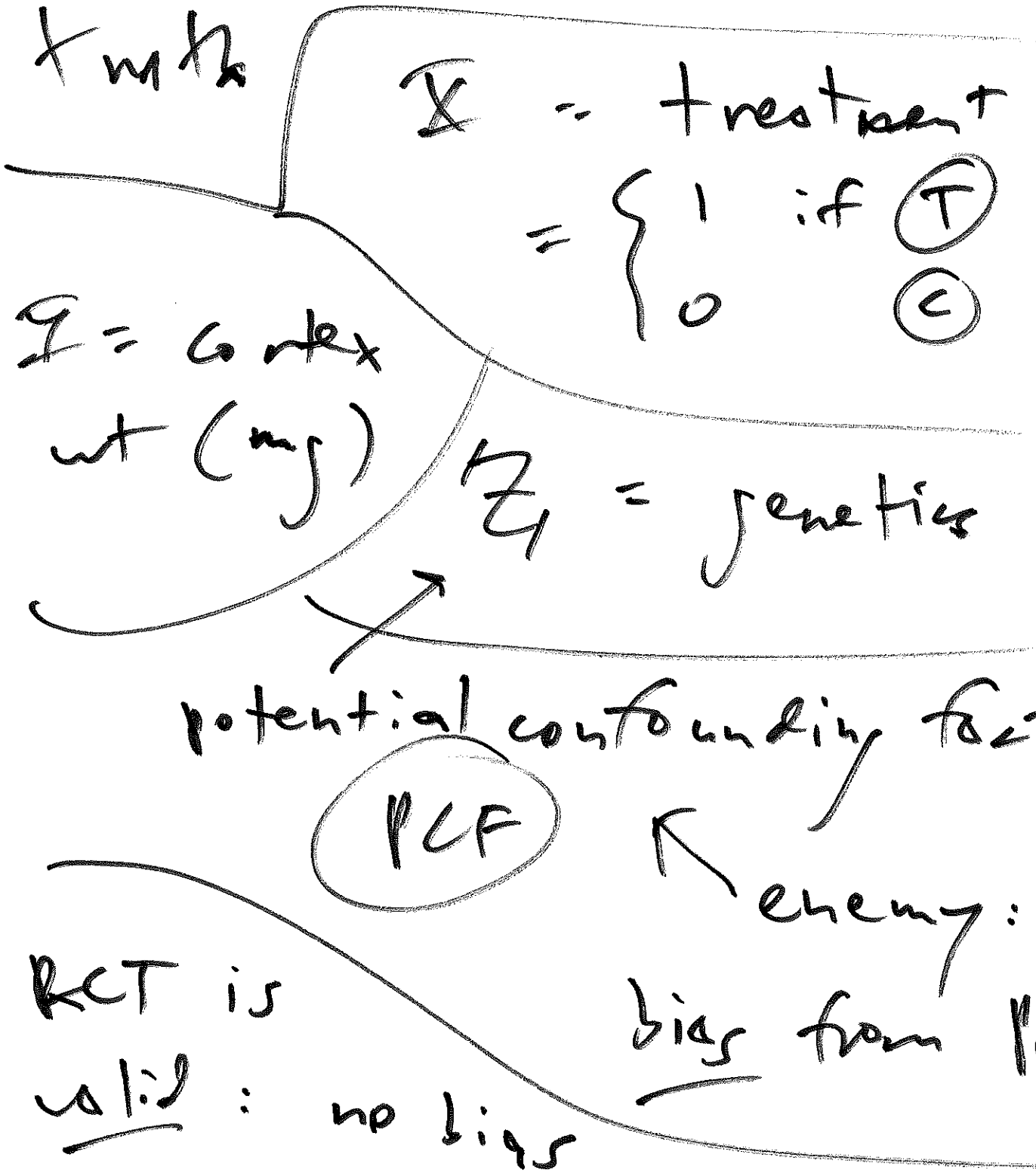
sample
S
(T)

controlled experiment + randomization to (T), (C) →

RCT

randomized controlled experiment trial

bias : systematic tendency to over- or under-estimate truth



placebo : same as (T) but without active ingredient

double blind RCT (Rolls Royce) | placebo effect