

5.2 Designing Experiments

When we apply a treatment to a group of individuals (**experimental units** or **subjects**) it is called an **experiment**. We do these so that we can measure the change in our **treatment** group against the change in a **control group**. When we control for all possible lurking variables, we can begin to make a case for causation.

more terms:

factor - a categorical explanatory variable (there can be >1)

level - different degrees of each factor

treatment - the specific combination of factor/level

placebo - a dummy treatment

placebo effect - response to a dummy treatment

randomization - using a chance device to divide experimental units into groups to avoid systematic differences in the groups

One factor/ one level:

Y	N
Aspirin (325 mg) 1	Placebo 2

One factor/ two levels:

Y	Y	N
Aspirin (250 mg) 1	Aspirin (325 mg) 2	Placebo 3

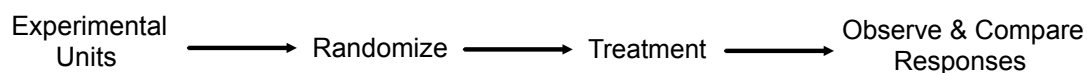
Two Factors/ one level each:

	Y	Factor 2: Beta Carotene	N
Factor 1: Aspirin Y	Aspirin (325 mg) + Beta Carotene (50 mg) 1		Aspirin (325 mg) + Placebo 2
N	Placebo + Beta Carotene (50 mg) 3		Placebo + Placebo 4

Two factors, one w/ 2 levels and one w/ 1 level:

	Y	Factor 2: Beta Carotene	N
Factor 1: Aspirin Y	A (250) + BC 1	A (250) + Placebo 4	
Y	A (325) + BC 2	A (325) + Placebo 5	
N	Placebo + BC 3	Placebo + Placebo 6	

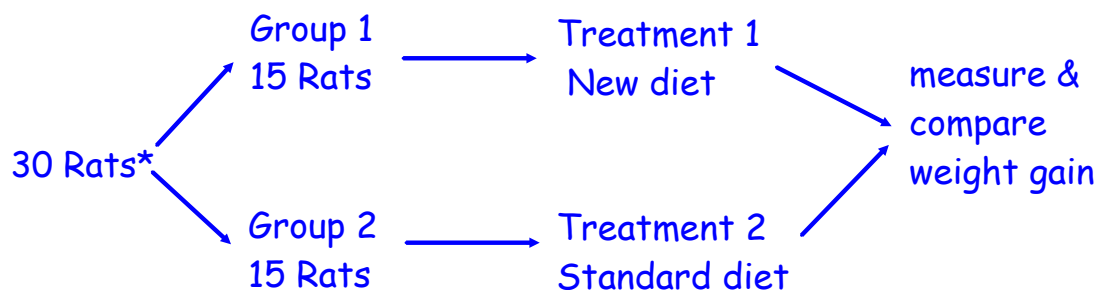
Basic Randomized Experiment Design



Create this type of diagram for an experiment:

Ex. 5.12: testing for nutritional quality of an "instant breakfast" food.

30 rats, one factor (diet) with two levels (test diet and std. diet).



*must use a chance device here to randomly assign the first 15 rats into group 1. The remaining rats fall into group 2.

Blind & Double Blind:

In order to create an environment in which the treatment groups are treated equally, experiments should be

blind - the subjects do not know which treatment they are receiving

OR

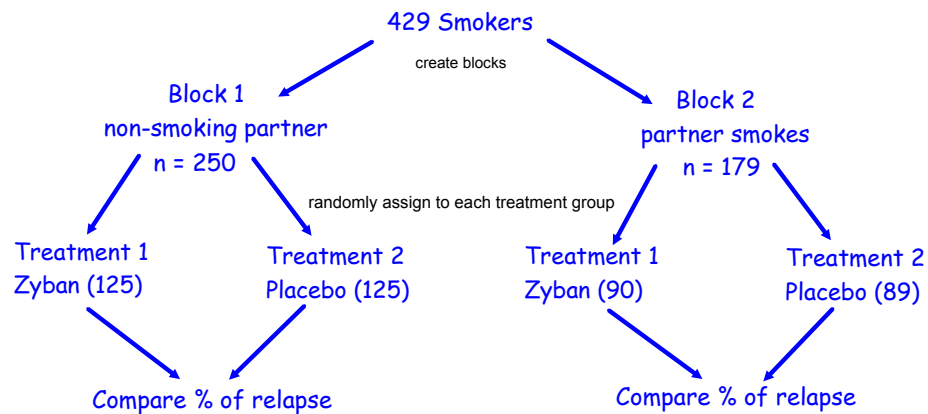
double blind - neither subject nor experimenter knows which treatment is being given to which group. This prevents unconscious bias.

Blocking and Matched Pairs

Block Design:

Not a completely randomized design. Group subjects/units according to potential lurking variables and then randomly select for treatment.

Ex: experiment to measure effects of a partner smoking in a smoking cessation study. 429 smokers trying to quit with Zyban. 250 live with nonsmokers and 179 live with a smoker. Since partner smoking is a potential lurking variable, it can be blocked to remove the effect of that variable.



Matched Pairs:

A special type of blocking design with only two treatments.

blocks of two closely matched units - one treatment to each

OR

one subject receives both treatments one after the other (either in randomly assigned order or before and after)

Ex: A shoe company wants to test wear and tear on a new sole they are developing for athletic shoes. They test 75 individuals by measuring the dimensions of the soles of each pair, logging their daily wear and usage and then measuring the dimensions again at the end of 30 days.

