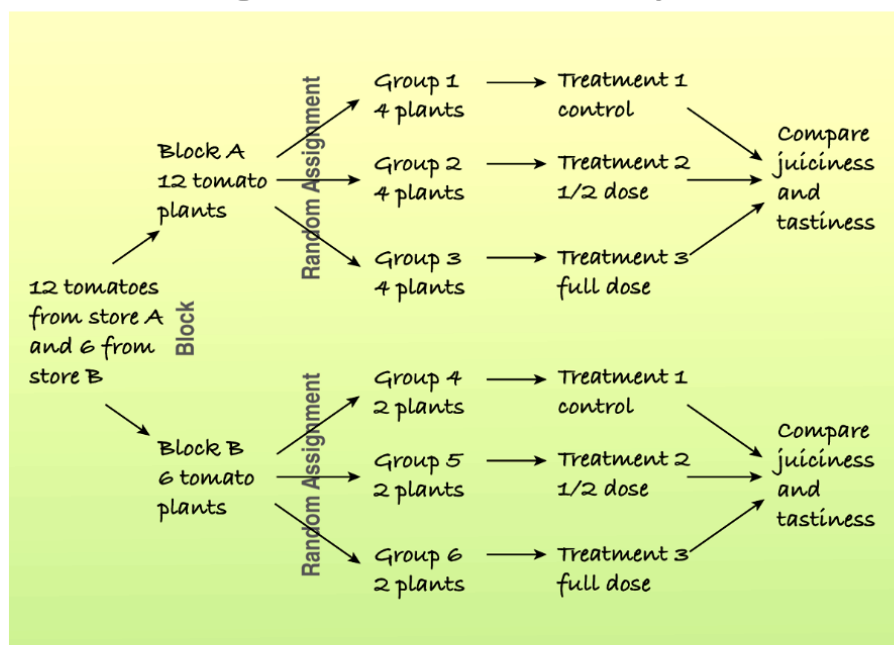


Blocking

- When there are pre-existing differences between groups of experimental units, it's often a good idea to gather them together into **blocks**.
- Blocking isolates the variability due to the differences between the blocks so that we can see the differences due to the treatments more clearly.
- When randomization occurs only within the blocks, we call the design a **randomized block design**.

Blocking (cont.)

- Here is a diagram of a blocked experiment:



Blocks and treatments

- Be careful reading the previous diagram. We have only *three* treatment groups (not six).
- Our goal is to ensure that each treatment group will have 4 store A tomatoes and 2 store B tomatoes.
- This way we can isolate the effect of the fertilizer and eliminate any store A vs. store B differences.

Blocking (cont.)

- In a retrospective or prospective study, subjects are sometimes paired because they are similar in ways *not* under study.
 - **Matching** subjects in this way can reduce variability in much the same way as blocking.

Blocking (cont.)


- Blocking is the same idea for experiments as stratifying is for sampling.
 - Both methods group together subjects that are similar and randomize within those groups as a way to remove unwanted variation.
 - We use blocks to reduce variability so we can see the effects of the factors; we're not usually interested in studying the effects of the blocks themselves.

Confounding

- When the levels of one factor are entangled with the levels of another factor, we say that these two factors are **confounded**.
- When we have confounded factors, we cannot separate out the effects of one factor from the effects of the other factor.
- It's worth noting that the role of blinding in an experiment is to combat a possible source of confounding.

Confounding (cont.)

- Confounding can arise in experiments when some other variables associated with a factor has an effect on the response variable.
- A confounding variable is a third variable that is unfortunately intertwined in our experiment.

 Our goal is to measure how the factor affects the response variable. But when another variable is intertwined with the factor and we can't tell how much each of these variables is effecting the response variable, we describe this problem as confounding.

Confounding example

- We wish to see if detergent A cleans better than detergent B.
- Detergent A is used in one washing machine and detergent B is used in a different machine.
- At the end of this experiment, we have confounding. That is, we cannot tell if a difference in the cleanliness of the clothes is caused by the detergent or by the quality of the machine that was used.

Lurking Variables

- A variety of variables may be influencing a given situation.
- Sometimes isolating the effect of one variable may be difficult.
- There may be “lurking” variables that we need to think about. We sometimes discuss the potential effects of these other variables.

Homework:

Pg. 261 # 15, 16, 21, 22

Add answers to the chart on
worksheet pg. 10-13

↑ packet
pg. 27

15. Researchers have linked an increase in the incidence of breast cancer in Italy to dioxin released by an industrial accident in 1976. The study identified 981 women who lived near the site of the accident and were under age 40 at the time. Fifteen of the women had developed breast cancer at an unusually young average age of 45. Medical records showed that they had heightened concentrations of dioxin in their blood and that each tenfold increase in dioxin level was associated with a doubling of the risk of breast cancer. (*Science News*, Aug. 3, 2002)
16. In 2002 the journal *Science* reported that a study of women in Finland indicated that having sons shortened the lifespans of mothers by about 34 weeks per son, but that daughters helped to lengthen the mothers' lives. The data came from church records from the period 1640 to 1870.

21. A dog food company wants to compare a new lower-calorie food with their standard dog food to see if it's effective in helping inactive dogs maintain a healthy weight. They have found several dog owners willing to participate in the trial. The dogs have been classified as small, medium, or large breeds, and the company will supply some owners of each size of dog with one of the two foods. The owners have agreed not to feed their dogs anything else for a period of 6 months, after which the dogs' weights will be checked.
22. Athletes who had suffered hamstring injuries were randomly assigned to one of two exercise programs. Those who engaged in static stretching returned to sports activity in a mean of 15.2 days faster than those assigned to a program of agility and trunk stabilization exercises. (*Journal of Orthopaedic & Sports Physical Therapy* 34 [March 2004]: 3)