

FRES 1010 — Mythbusting, Skepticism, and Statistics
Homework 6 – Due Thursday, March 9

Homework Guidelines:

- The written portion of your homework assignment (if there is one) is due at the beginning of class on the due date specified above. **No late homeworks will be accepted.**

Data Collection Assignment:

This week we are going to investigate whether audio stimulation helps plants grow. There are lots of myths about this; the most common one is that it is helpful to talk to your plants. However, people have also claimed that singing to your plants, playing music for them, etc., can all have beneficial effects. Rather than have you spend hours and hours in conversation (one-sided, presumably) with a plant, I think it would be easier for you to play the radio for your plants. Therefore, our audio stimulation intervention here is going to be exposure to music and talk from the radio.

There are many ways we could design an experiment to investigate this issue, but we are going to use a *crossover design*. A crossover design is one in which each subject (in this case the plants are the subjects) gets each treatment. For example, if there are two treatments labelled A and B, then a subject might first receive treatment A then treatment B with a measurement of the response taken after each treatment has been experienced. The name of the design comes from the fact that here, each subject starts out in a certain treatment group and then *crosses over* to the other treatment. Obviously, it is not such a good idea for all subjects to receive the treatments in the same order (e.g., for all subjects to get the treatments in the order A,B). Therefore, we typically balance the treatment orders so that approximately equal numbers of subjects receive each ordering of the treatments (e.g., in the two-treatment case, half the subjects get the treatments in the order A,B, and half get them in the order B,A).

A crossover design has some nice features. Most notably, it requires fewer subjects than some alternative designs and it controls for differences between subjects when assessing treatment effects. However, it is a bit trickier to analyze because a proper analysis must account for possible subject effects and order effects when assessing the treatment effect.

Here's what I want you to do:

Materials: A plant (supplied), a window sill, a radio, and a ruler.

Treatments: There are two treatments in this experiment: treatment A involves playing the radio for your plant, treatment B will be a control treatment in which no (extra) radio playing will be done. In treatment A, I want you to play the radio for your plant a minimum of 3 hours per day during daylight hours. In treatment B, I want you to treat the plant exactly the same as in treatment A (placed in the same location, watered

as regularly, etc.) but with no extra radio playing. A complication here is that you all probably listen to the radio or music anyway. So, in the control condition (treatment B), I don't really expect you to keep 100% quiet. The important point is that treatment A must involve substantially more auditory stimulation than treatment B. So, if you normally listen to music/radio x hours a day, make sure that treatment A involves $x + 3$ hours of auditory stimulation. Ideally, I would like you to keep the plant in a location where it has sunlight, but where you can keep its auditory stimulation near 0 in treatment B and near 3 hours in treatment A (e.g., in a bathroom or other room where you normally don't listen to music but can place a radio for treatment A). Each treatment will be administered for 7 days.

Response Variable: Plant growth as measured by the one-week change in height. Please measure this as accurately as you can from the soil to the top of the highest point on the plant. You should stretch the plant to its maximal height when taking this measurement. I would prefer that you take the measurement in centimeters, but I can convert from inches if need be.

Procedure:

1. Today in class I will give you each a plant. These plants will be the "subjects" in our crossover design. In addition, I will assign you an order – either A,B or B,A. Here treatment A corresponds to playing the radio for your plant (as described above) and treatment B corresponds to no extra radio playing.
2. Place your plant on a window sill or in some other location where it can receive light. I would prefer that it be located somewhere where you can control its exposure to the radio, music and other auditory stimulation as much as possible, but do the best you can. Remember to water and care for your plant adequately and uniformly over the two-week period of this experiment. I'm not sure exactly how best to care for these plants, but I suggest watering them enough to saturate the soil every other day.
3. If you are assigned the order A,B, then you should give your plant extra auditory stimulation (treatment A) every day starting on Feb. 23 (Thursday) and continuing through March 1 (next Wednesday). This will be followed by no extra auditory stimulation (treatment B) on March 2 (next Thursday) through March 8 (a Wednesday). If you are assigned the order B,A, then administer these treatments in the opposite order.
4. Measure and record the height of your plant today (Wednesday, Feb. 22), next Wednesday (March 1), and on March 8, the final day of the experiment. It would be best to take these measurements in the evening of each of these days.
5. I will send everyone an Excel spreadsheet in which to record your data. Record your data in this spreadsheet and send it back to me on March 9, following the last height measurement taken on March 8.

That's it. Have fun. See you next week.