Factorial ANOVA (2-factor)

1. Sum of squares
   1. Before we talked about SSa – between groups or treatment variance that was considered the “good” variance
   2. Now we are going to break down SSa into three parts:
      1. Main effect 1: SSa – the overall effect of just one IV (remember we talked about averaging down or across)
      2. Main effect 2: SSb – the overall effect of just one IV
      3. Interaction: SSaxb – the effect of the interaction
2. Important Terminology without talking about the math
   1. Marginal means – the average across one IV to get the means for each level of the other IV (i.e. just one level IV = hot weather versus cold weather)
   2. Cell/condition/group/treatment means – the averages for conditions (or the paired combinations of IVs).
3. Assumptions:
   1. Homogeneity
   2. Normality
   3. Linearity
   4. Sphericity (repeated measures only)
4. Effect size
   1. n2 = useful for each component of the design (you will get one for each main effect and interaction)
   2. d = still best for individual comparisons
5. Power – will depend on which version of factorial ANOVA you are doing (we will work one for each type).

Chapter 12!

1. Understanding a two-way design:
   1. Totally graph the means. You have to do it for the paper/homework/etc. anyway.
   2. Line graphs are easier to read, but that doesn’t necessarily mean they are appropriate for the data.
      1. You can always start with a line graph, then switch it to bars for your final draft.
   3. You can get the graphs from SPSS by using the plots options.
   4. The main challenge is to figure out the best way to present the data – it’s got to be readable, understandable, and compelling.
2. Outcomes in an experiment
   1. No interaction – examine only the main effects – basically two sets of one way (1 iv) ANOVAs to interpret
   2. Interaction but strong main effects – helps to understand the main effects and see what has made the interaction pattern different
   3. Interaction dominates main effects – when the pattern for the main effects does not match the actual story behind the interaction
3. Skip section 12.2
4. Interpreting the interaction:
   1. Since you cannot just look at the means for each level, you want to consider the conditional means – but first you have to figure out which way is meaningful to compare them (across, down, specific combinations?)
   2. If there are two conditional means (i.e. the ANOVA is a 2 x 2(+)) – you can compare the cells with t-tests (matching to the design type).
   3. If there are 3 or more conditional means, you can still use t-tests, but as the number of means increase, so does the number of post hoc tests AND type 1 error. You should consider correcting for large number of tests (bonferroni, sidak, tukey, fisher-hayter, etc.).
   4. How to decide? (first does it make sense?)
      1. Choose the factor with the greatest number of levels – that will help minimize the number of post hoc tests you need to do.
      2. Choose the slightly continuous factor – if it’s available – i.e. it’s easier to explain that 1 dose is better than 2 doses which is better than 3 rather than the other way around
      3. Choose the factor with the greater main effect SS – or the greater effect size – it’s the bigger effect on the data anyway
      4. Choose a manipulated factor over a classification factor (like gender)
5. Skip section 12.4-6 – we’ll talk about the specific applications with each factorial type
6. Controlling Type 1 error
   1. Before we never considered the omnibus test (F value) when talking about familywise error
      1. Here we do the same – however it’s three omnibus tests – two main effects and an interaction
   2. People tend to treat each of these components (main effect 1, main effect 2, interaction) as separate families of tests
      1. So correct *within* each one for large numbers of comparisons
      2. Remember bonferroni/sidak is good for smaller number of comparions
      3. Tukey/Fisher-Hayter better for larger number of comparisons