Chapter 1

Experimental Design

* Preface
  + Experiment – educated plan for data collection and analysis (emphasize PREPLANNED)
  + You need controls!
  + You need to know who you are testing!
  + You need to know what you are testing!
* Variables in experimental research
  + IVs – people are treated differently, critical difference between groups, behavior is measured and defined for groups
    - Also called: manipulated variable, treatment variable, factor
    - For IVs you have to have at least two conditions or measurements
    - HARD versus EASY, give other examples here
    - You can have many conditions
  + Types of IVs
    - Qualitative / categorical IVs – represents variations on the kind or type (teaching styles, classroom types) – you manipulate them
      * When you have more than two conditions, you are basically doing a lot of small mini-studies (this is where post hoc tests come into play)
    - Quantitative / continuous IVs – a variation in amount of something (like drug testing)
      * Usually the type of test you will run between qualitative and quantitative is different because the research question is different
      * You might want to know the trend, but only use these points to measure
    - Classification variables / subject / organismic / individual differences IVs – studying the differences of something about the subjects (quasi-experimental)
      * Not a true experiment since you didn’t manipulate the variables
      * Allows you to show differences but not why (practically people talk about it this way though)
      * Quasi-experimental / nonrandomized experiments – studies with individual differences variables, must interpret outcome differently
  + The DV
    - The thing you want to measure to see if the groups are different
    - Lots of ways to do this
    - Univariate procedures – one DV at a time
    - Multivariate – multiple DVs at a time
    - Floor effects – all subjects getting scores close to the bottom
    - Ceiling effects – subjects getting scores close to the top
      * These are bad because it limits your ability to detect differences between groups
  + Nuisance variables
    - Things that cause scores to differ but they are not of interest in that study
    - Confounding variables – alter apparent effects of the treatment, that’s what makes quasi experimental designs so hard to understand.
    - Also – even if they aren’t tied to the treatment, they will increase the variance and obscure the treatment anyway
    - Ways to deal
      * Hold the thing constant throughout the experiment
      * Counterbalance – do each nuisance level at the same rate
      * Nuisance factor – control for it statistically
      * Randomization – should take out the nuisance factor (if this is possible).
* Control in Experimentation
  + The ultimate is to keep everything the same EXCEPT for the things you are studying.
    - Can you really do that?
  + Control by design
    - Deal with nuisance variables (and the world) by designing the study carefully
      * See previous list about nuisance variables
    - Subjects
      * They can be their own controls (repeated measures design)
      * Blocking – matching the people in each treatment condition on your nuisance variable
        + Reduces error variance
        + Assures control of nuisance variable
  + Control by randomization
    - Randomization assures that differences are not *systematically* related to treatments
    - Can use randomization tables (or excel!) to help you do this
    - In theory, this controls all environmental features.
    - And puts the same number of weird people into each group (so subject variables as well) – please note you will have to control for gender
    - It’s not perfect – you can never run enough people, experimenters (talk about Eric!)
* Populations and generalization
  + Goal: to be able to extend study to a population (called generalization)
  + Sample – the group of people you tested
  + Population – the group of people you are trying to study in general
  + The statistics vary depending on how those subjects are obtained
    - You really want a random sample (is PSY 121 a random sample?)
    - Random sample – we all have an equal chance of being picked for the study
    - Convenience sampling – samples that are easy to get
  + Generalization
    - Statistical generalization – depends on random sampling
    - Nonstatistical generalization – depends on knowledge of a particular research area
* Basic experimental designs
  + Between subjects designs – subjects only receive ONE of the treatments
    - Smallest assumptions
    - More people
    - “easy to analyze”
  + Within subjects designs (also called repeated measures) – subjects receive all the treatments
    - Tests are more sensitive
    - Less people
    - More assumptions
  + Factorial designs – more than one IV, considers the interactions between IVs
    - Between subjects only
    - Within subjects only
    - Mixed Factorial designs