Factorial Designs Part 2

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Pretest-Posttest Control Group Designs

- comparison between treatment and control group
  - between-subjects factor
- treatment and control groups are measured before any treatment
  - the treatment group gets the treatment, the control group gets nothing
- then they are both tested again on the same measure
  - Ex: Pretest - Exam –> Study Guide/No Study Guide –> Exam
  - Would it make more sense to have the exam be the same for pre and posttest?
  - example of a two-factor mixed design (2 x 2 mixed factorial design)

Pretest-Posttest Control Group Designs

- this design can be used for both quasi-experimental and experimental designs
  - you can decide who gets the study guide and who doesn't
    - maybe off past grades in statistics
  - you can randomizly select participants to be put in the two groups to make this an experimental design

Higher-Order Factorial Designs

- **higher-order factorial designs** are when there are three or more factors
  - this would resemble the A x B x C designs
  - Ex: Depression, Sex, Age Group (Adolescent vs Young Adult) on Exercise Levels
    - instead of only having an interaction between A and B
    - we would have one three-way interaction (A x B x C), three two-way interactions (A x B, A x C, B x C), and the three main effects (A –> outcome, B –> outcome, C –> outcome)

Statistical Analysis of Factorial Designs

- statistics for factorial designs depend on whether or not there is a within-subjects factor
  - if all factors are between-subjects factors = ANOVA/regression
  - if you have one within-subjects factor = repeated measures ANOVA
    - even if you have a mixed design factorial design, you'll still use this method
- A two-factor ANOVA (2 x 2 as an example) would provide three potential hypotheses
  - H1: Interaction
  - H2: Main Effect 1
  - H3: Main Effect 2

Statistical Analysis of Factorial Designs

- Ex: Depression Treatment (Therapy vs no therapy), Age Group (Adolescent vs Young Adult) on Exercise Levels
  - H1: The relationship between depression treatment and exercise levels will depend on the age group of participants
    - Alternative H1: The age group of participants will moderate the relationship between depression treatment and exercise levels.
  - H2: The group that receives therapy will exercise more or less than the no therapy group.
    - H2: The group that receives therapy will exercise more than the no therapy group.
  - H3: Differences will be seen in exercise levels between adolescents and young adults.
- JP: we'll mostly cover these tests for your studies toward the end of the semester

Applications of Factorial Designs

- factorial designs tend to come from past literature/studies
  - Similar to correlational designs
  - if you know there was a difference between two groups (depression treatment), now you wonder if that would change by the age of the participants (age groups) to see if it would have a different effect on exercise
- JP: nowadays if you have an interaction/moderator variable, you have a good chance of getting a study published; just looking at linear relationships may not be enough sadly

Reducing Variance in Between-Subjects Designs

- the amount of variation in groups can be problematic to seeing a true effect
  - Ex: age groups are adolescents and adults, instead of young adults
- there is an easy way to handle this variation that makes ANOVA more appropriate to handle variation in a continuous variable
  - What do you think you can do?
- This is another reason why I am not worried about you including other constructs, that may be measured as continuous, into your survey

Reducing Variance in Between-Subjects Designs

- separating your continuous variables can be helpful, but there are some considerations that need to be considered before splitting them into groups
  - If you split your continuous variable into two groups, right down the middle
    - referred to as the median split
    - are your groups really all that different?
  - you'll have to get creative for how to separate continuous variables into groups
    - only a real problem if your data looks normally distributed
  - if bimodal distribution, split into groups somewhere in the middle of the two distributions

Using Treatment Order as Second Factor

- sometimes researchers want to examine the cause that order effects have on the outcome
- **counterbalancing** is a technique that allows researchers to control for confounds like order effects in within-subjects designs
  - by making some participants begin with one treatment while the other group starts with the other treatment
- useful for showing a true effect between the treatments/conditions
  - you can have the main effect of the treatments not be statistically significant, because the order of the treatments
  - you can also have issues with having actual differences in the treatments but when averaged together, you no longer see the difference
  - you could also just not see as strong of a difference between the groups because of order effects