## Week of February 9

1. The two-way mixed factorial design
2. Omnibus analysis of the two-way mixed factorial: ANOVA approach

## The Two-Way Mixed Factorial

- A mixed design is one that includes at least one between-subjects factor and at least one within-subjects factor
  - A two-way mixed factorial includes one of each kind of factor
- The key difference between the two-way mixed factorial and previous designs is that different effects are tested using different error terms

## Sources of Variability: Between-Subjects

- Between-subjects effects…
  - *A*: Variability due to the between-subjects factor, collapsing across levels of the within-subjects factor
- …are tested with a between-subjects error term
  - The between-subjects error term (*S/A*) is an average of the variability among subjects within each level of the between-subjects factor, collapsing across levels of the within-subjects factor

## Sources of Variability: Within-Subjects

- Within-subjects effects…
  - *B*: Variability due to the within-subjects factor, averaged across levels of the between-subjects factor
  - *A x B*: Variability due to the interaction of the between-subjects factor and the within-subjects factor
- Are tested with a within-subjects error term
  - The within-subjects error term (*B x S/A*) is an average of the *B x S* component interaction terms, averaged across the levels of the between-subjects factor

## Summary Table

| Source | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| *A* | $SS_A$ | $a - 1$ | $SS_A/df_A$ | $MS_A/MS_{S/A}$ |
| *S/A* | $SS_{S/A}$ | $a(s - 1)$ | $SS_{S/A}/df_{S/A}$ | |
| *B* | $SS_B$ | $b - 1$ | $SS_B/df_B$ | $MS_B/MS_{BxS/A}$ |
| *A x B* | $SS_{AxB}$ | $(a - 1)(b - 1)$ | $SS_{AxB}/df_{AxB}$ | $MS_{AxB}/MS_{BxS/A}$ |
| *B x S/A* | $SS_{BxS/A}$ | $a(b - 1)(s - 1)$ | $SS_{BxS/A}/df_{BxS/A}$ | |
| Total | $SS_T$ | $abs - 1$ | | |

## Omnibus Analysis of a Mixed Factorial: ANOVA Data File

- Need one row for each participant
- Need one column for the between-subjects factor
- Need one column for each level of the between-subjects factor
  - Scores on the DV are entered in these columns

## Omnibus Analysis of a Mixed Factorial: Conducting the ANOVA

1. Use GLM—Repeated Measures
2. Enter the name and number of levels for the within-subjects factor, click Add, then click Define
3. Define the levels of the within-subjects factor
4. Define the between-subjects factor
5. Select any desired Options and Plots
6. Click OK to run the analysis

## Omnibus Analysis of a Mixed Factorial: Reading GLM—RM Output

| Source | Table | Row |
|---|---|---|
| *A* | B-S Effects | fac_a |
| *S/A* | B-S Effects | Error |
| *B* | W-S Effects | fac_b / Sphericity Assumed |
| *A x B* | W-S Effects | fac_a*fac_b / Sphericity Assumed |
| *B x S/A* | W-S Effects | Error(fac_b) / Sphericity Assumed |
| Total | Compute by hand | |

## Numerical Example

http://psych205.50webs.com/presentations/data_060209.sav

- Just before the start of each Super Bowl quarter, four Seattle fans and four Pittsburgh fans are asked to estimate the probability that Seattle will win the game
- This is a two-way mixed factorial design, with team affiliation as a two-level between-subjects factor and quarter as a four-level within-subjects factor
- The DV is the rated probability that Seattle will win the Super Bowl

## Exercise

- Working with a partner…
  1. Use GLM—Repeated Measures to conduct the omnibus analysis. Be sure to ask for a graph of the cell means.
  2. Using information from the SPSS output, write out a summary table for this analysis
  3. A *USA Today* reporter asks you to summarize the findings of your study in a few sentences. Do so, and dream of fame.