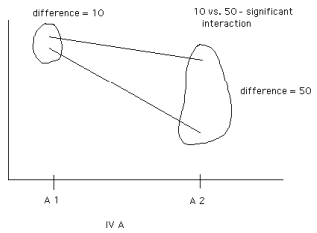
Simple Effects Analysis

Review of Factorial ANOVA

- **Main effects** - comparison of marginal (level) means
- **Interaction** - comparison of condition means to determine if differences between means for one level of an IV are the same as differences at the other level(s) of the IV

Simple Effects

- Breakdown the interaction to understand what's driving it



Simple Effects

- Will characterize the interaction – to determine which differences are significant
- Comparison of condition means for one level of the IV

Example - Room Color x Room Size

Mean comfort ratings for room color by room size

	Blue	Orange	Yellow
10 sq. ft.	2.2	2.4	2.0
25 sq. ft.	0.6	2.0	2.8

Example - Room Color x Room Size

To conduct simple effects we will compare means for each column separately.

	Blue
10 sq. ft.	2.2
25 sq. ft.	0.6

Calculations

- What we want to do is compare means for IV-B (e.g., room size) at one level at IV A (e.g, A1, room color = blue)
- Conduct a full set of comparisons (do this for all levels of IV-A)
- For our example, we can start by comparing means at blue, but then continue with orange and yellow to do a full set of simple effects

Calculations

- Compute SS for this comparison only to use in an F ratio
- $SS_{B \text{ at } A1} = n\Sigma(Y_{A1B} - Y_{A1})^2$
- $df_{B \text{ at } A1} = b - 1$
- For our example with means, 2.2 and 0.6 and $n = 5$:
  - $= 5[(2.2 - 1.4)^2 + (0.6 - 1.4)^2]$
  - $= 5[(.64 + .64)]$
  - $= 6.4 = SS_{B \text{ at } A1}$
  - $df_{B \text{ at } A1} = 2 - 1 = 1$

Calculations

- $MS_{B \text{ at } A1} = 6.4 / 1 = 6.4$
- $F = \frac{MS_{B \text{ at } A1}}{MS_{S/AB}} = \frac{6.4}{.583} = 10.98$ *vs.* $F_{crit}(1,24) = 4.26$
- Significant simple effect: blue/10 > blue/25
- This is one simple effect - need to complete the set by comparing 10 and 25 for orange and yellow too
- Can also do opposite set - compare blue vs. orange vs. yellow for 10 sq. ft. room
- **But DO NOT do both sets - they are NOT orthogonal**

Calculations

- Simple effect test for IV-B at A2 (orange)
- For our example with means, 2.4 and 2.0 and $n = 5$:
  - $= 5[(2.4 - 2.2)^2 + (2.0 - 2.2)^2]$
  - $= 5[(.04 + .04)]$
  - $= 0.4 = SS_{B \text{ at } A2}$
  - $df_{B \text{ at } A2} = 2 - 1 = 1$
- $MS_{B \text{ at } A2} = 0.4 / 1 = 0.4$
- $F = \frac{MS_{B \text{ at } A2}}{MS_{S/AB}} = \frac{.4}{.583} = .686$ *vs.* $F_{crit}(1,24) = 4.26$
- Non-significant simple effect: orange/10 = orange/25
- **Try one on your own: conduct the simple effect test for IV-B at A3 (yellow)**

Notes

- It is up to the researcher to choose which set of simple effects to conduct (see p. 248 for heuristics)
- If you are comparing more than two means per simple effect (e.g., blue vs. orange vs. yellow for 10 sq. ft. room) and effect was significant - you would need to conduct pairwise comparisons to determine where the effect was
- Simple effects are not "pure interaction" - main effect variance is not subtracted out - but they help us understand what is driving the interaction (Formulae 12.9 on p. 253)

SPSS

- How do we conduct simple effects on SPSS?
- Alter the syntax code!
- Start with an ANOVA on the full design
- Pull up syntax by clicking on paste where you define the variables
- Alter the syntax by including commands for simple effects
- Run the syntax by clicking the arrow key at the top of the window (beside binoculars)