

COGS 14A: Week 6

Wednesday Bushong

Midterm

- If you have a grading dispute, bring it to the TA who graded that specific question (and do it soon)
- Version 1:
 - Wednesday: 1, 4
 - Calvin: 2, 3, 5
 - Esther: 6, 7
- Version 2:
 - Wednesday: 2, 4
 - Calvin: 1, 3, 7
 - Esther: 5, 6

Recap of Between-Subjects Design

- 2 (or more) groups randomly assigned
- Experimental group(s) compared w/ control group

Within-Subjects Design

- Each participant receives **every level** of the independent variable
- Different designs:
 - Pretest-posttest (2 measurements)
 - Repeated measures (>2 measurements)
 - *Some* longitudinal studies

Pros

- Require fewer subjects!
- Takes less time to complete study
- Subject variables remain constant
- Lower error variance (more statistical power)
 - Have less people, therefore less variability

Confounds

- Demand characteristics
 - Participants adopt strategy, which systematically skews the results
 - How to avoid?
- Carryover effects (order effects)
 - Each participant sees the test more than once
 - Practice effects
 - Fatigue effects

Confounds Cont'd

- History effects
 - Event happens which affects participants' behavior
- Maturation effects
 - E.g., participant hits puberty
- Testing effects

Counterbalancing Order Effects

- Vary the order of presenting the different conditions across participants
- Complete W-S Design
- Incomplete W-S Design

Complete W-S Design

- Every participant sees every possible ordering
- For 2 conditions A and B: AB, BA
- For 3 conditions A, B, and C: ABC, ACB, BAC, BCA, CAB, CBA
- Etc.

Incomplete W-S Design

- Each participant sees a unique order of conditions at least once, but doesn't see all of the possible conditions
 - Random order with rotation
 - Balanced Latin square

A B C D

B D A C

C A D B

D C B A

Quasi-Experimental Design

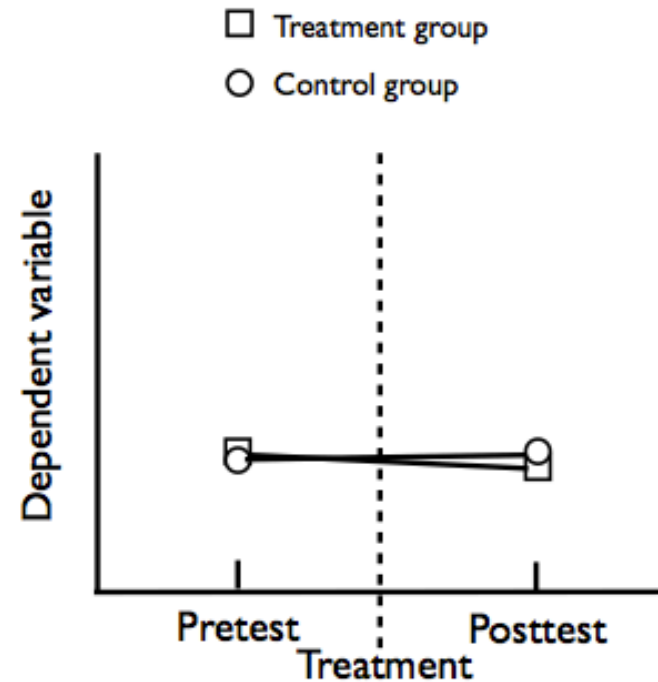
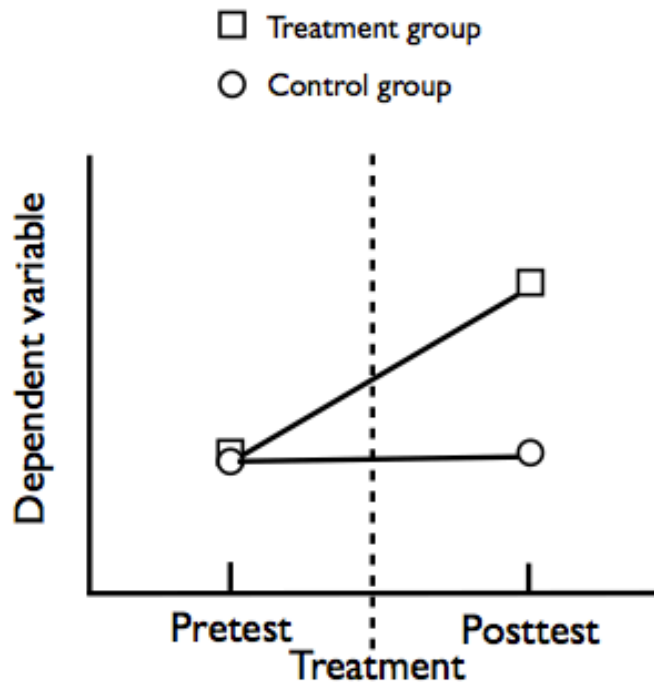
- Manipulate independent variable but for which equivalent groups are not possible
- Quasi-experiment not ideal, but is often the only solution to a true experiment

Pre-experimental Designs

- Not a true experiment!
 - No control of potential confounds by random assignment of participants to groups
 - No control group

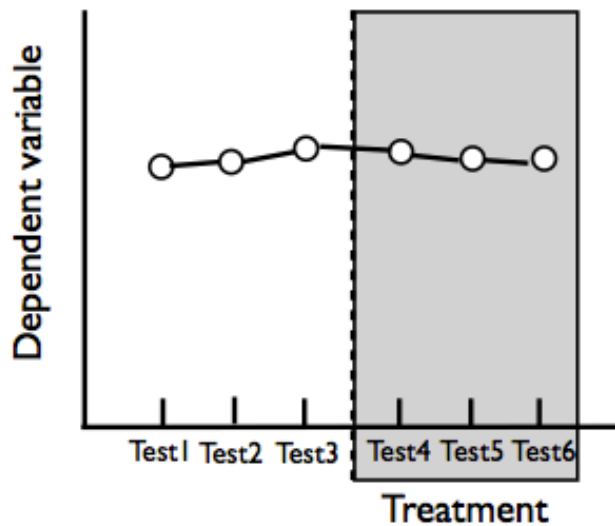
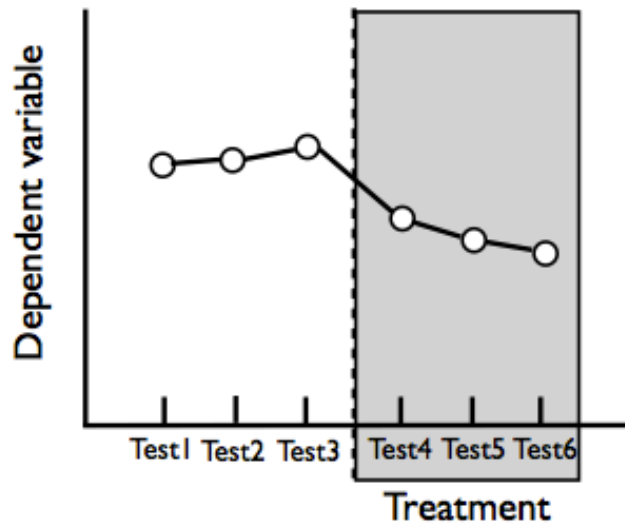
Nonequivalent Control Group Design

- Compare two groups that are close, but **not**, equivalent



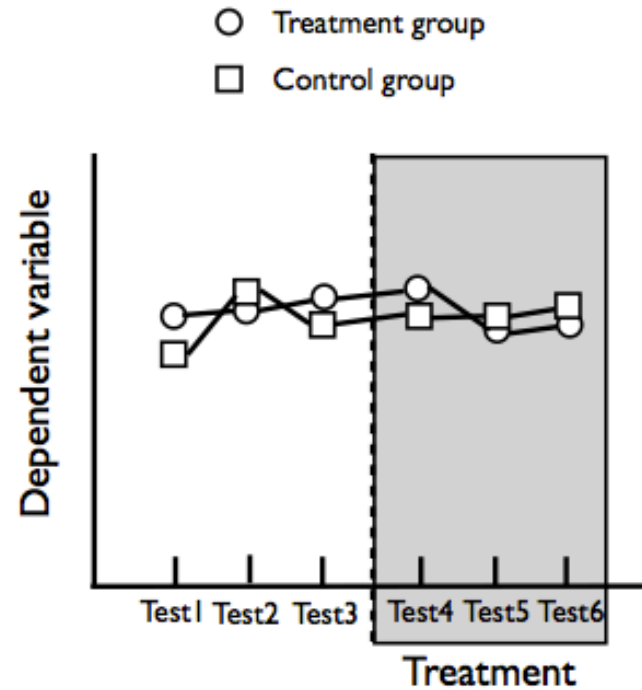
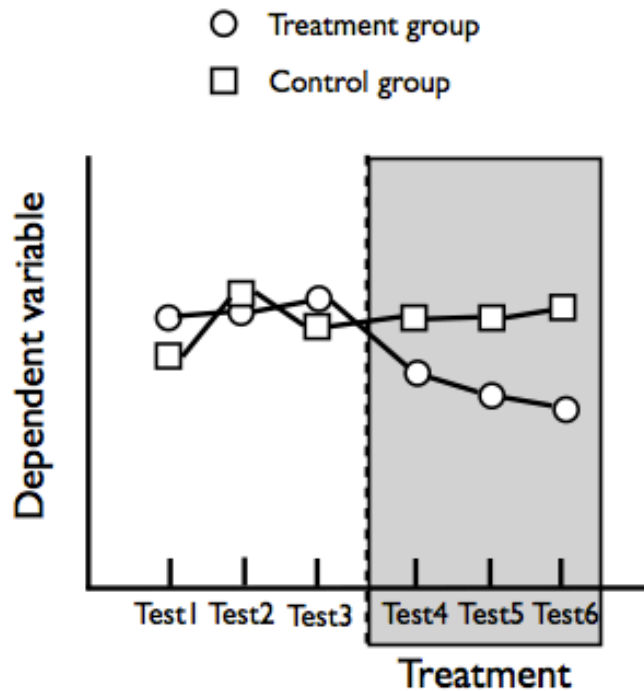
Time-Series Design

- Multiple observations of a single group



Multiple Time-Series Design

- Get control group and time series!



Factorial Designs

- Assess the effect of more than one independent variable on a single dependent variable
 - Each variable has two or more levels
- Several hypotheses tested simultaneously
 - Main effects
 - Interaction effects

Types of Two-Factor Designs

- Both between-groups factors
- Both within-subjects factors
- One between-group, one within-subjects (mixed design or split-plot design)
- Differences: error variance, number of participants, potential confounds, etc.
 - 2-way ANOVAs, but computed differently

Both Between-Groups

2 hours

4 hours

8 hours

Morning

Group 1

Group 2

Group 3

Night

Group 4

Group 5

Group 6

Both Within Subjects

2 hours

4 hours

8 hours

Morning

Group 1

Night

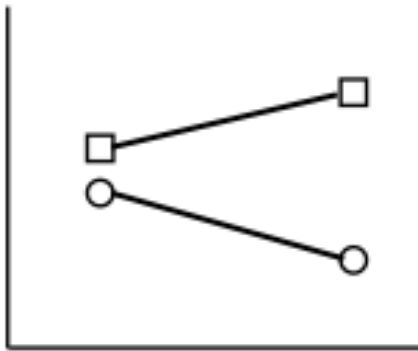
One B/w Groups, One W/in Subjects

	2 hours	4 hours	8 hours
Morning	Group 1	Group 2	Group 3
Night			
	2 hours	4 hours	8 hours
Morning	Group 1		
Night	Group 2		

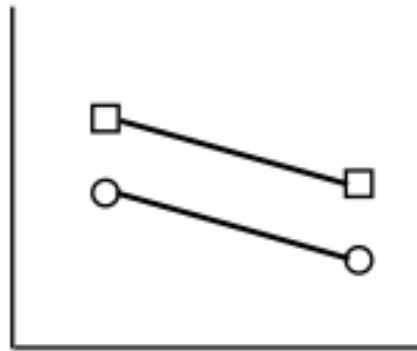
Pros and Cons

- If you need 10 people per group for statistical power, total # of subjects for each scenario:
 - Both Between-Groups: 60
 - Both Within Subjects: 10
 - One of each: 20 or 30
- On the other hand, all within subjects is very sensitive to confounds such as subject attrition

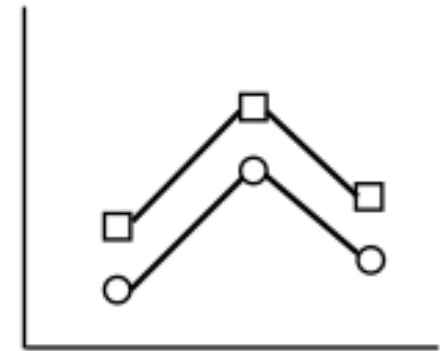
Possible Interactions



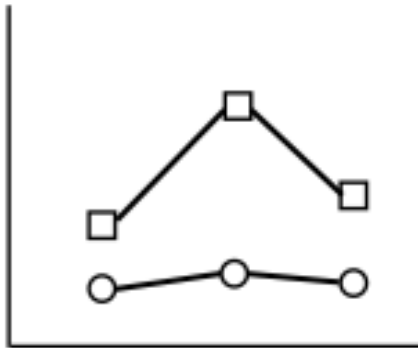
An interaction



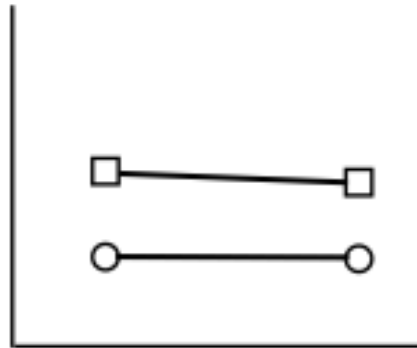
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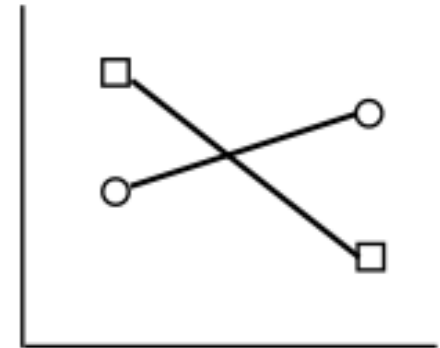
No interaction



An interaction



No interaction



An interaction

Higher-Order Designs

- Three-factor design (IVs A, B, and C)
 - A: 3 levels
 - B: 3 levels
 - C: 2 levels
 - 2 x 3 x 3 design
 - 3 main effects (A, B, and C)
 - 3 two-way interactions (AB, BC, AC)
 - 1 three-way interaction (ABC)
 - 7 effects total!

Interpretation Problems in Higher-Order Designs

- 4-way interaction A, B, C, D
 - Main: A, B, C, D
 - 2-way interactions: AB, AC, AD, BC, BD, CD
 - 3-way interactions: ABC, BCD, ABD,
 - 4-way interaction: ABCD
 - 14 total effects!
 - What happens when you only find effects in, say, AB, BCD, and B? What does that even mean?