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Cozby & Bates:
Methods in Behavioral Research

Chapter 8: Experimental Design

Summer 2014

# **Chapter 7 Review**

- Close-ended questions
- Open-ended questions
- Confidence Interval
- Focus Group
- High Frequency Scale
- Rating Scales
    - Graphic
    - Likert
    - Semantic Differential
    - nonverbal
    - Guttman
- Group Administration (survey)
- Interview
    - Computer-Assisted Telephone Interview (CATI)
    - Face-to-Face
    - Telephone
- Interviewer Bias
- Normative
- Panel study
- Population

- Response Rate
- Response Set
- Sampling
    - Cluster
    - Convenience (haphazard)
    - Nonprobability sampling
    - Probability sampling
    - Purposive sampling
    - Quota sampling
    - Random sampling
        - Simple
        - stratified
- Sampling Error
- Sampling Frame
- Survey research
    - Internet
    - Mail
- Telephone interview
- Yea-saying bias
- Nay-saying bias

Confounding Variables

- *A variable that varies along with the IV such that the effect of the IV and an uncontrolled variable are intertwined so that it is impossible to determine which variable is responsible for the experimental effect*

- Good design eliminates confounds

- When confounds are present, the experiment lacks INTERNAL VALIDITY.

Basic Designs

Posttest Only

treatment → DV

sample
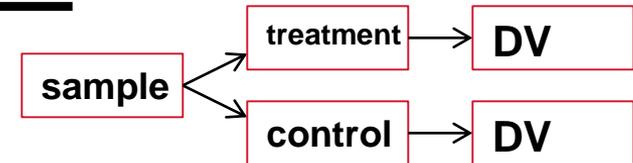
control → DV

- Two equivalent groups of participants
- IV (control, experimental group treated differently)
- DV measured after the IV manipulation

Difficulties:

- equating the groups
- eliminating potential confounds with the IV

Basic Designs

Pretest-Posttest Design

- Two equivalent groups of participants

  - Pretest to establish equivalence

- IV (control, experimental group treated differently)

- DV measured after the IV manipulation

Difficulties:

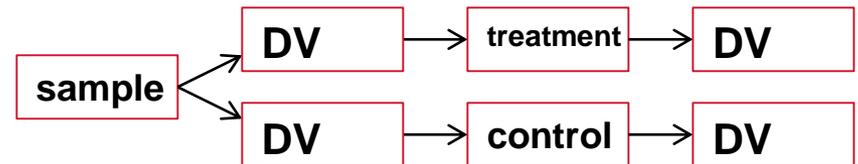- equating the groups

- eliminating potential confounds with the IV

- Time required for pretest; retesting effects

Advantages:

- Allows to control for mortality (drop out)

Solomon Four-Group Design

	Control Group	Experimental Group
No Pretest (Posttest only)		
Pretest and Posttest		

- This design allows the experimenter to directly assess the impact of the pretest – answers the question of whether the pretest impacted the experimental results

Between versus Within-Subject Designs

Independent Groups (between subject)

- Avoids "contrast effect" and disclosure of the experimental hypothesis

Repeated Measures (within subject)

- Cannot be used with lasting change effects
- Greater control over individual differences
- Fewer participants needed

Order Effects

Practice Effect (improvement with practice) a.k.a., Learning Effect

Fatigue Effect (decrement in performance)

Carryover effect (hold over of prior condition)

Counterbalancing

Complete (all possible orders)

Latin Square (A, B, *L*, C, *L-1*, …)
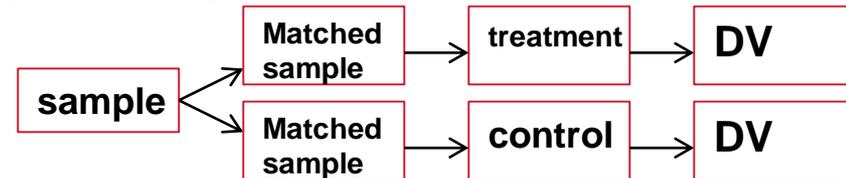
Time Spacing (reduce carryover)

Drug tests (e.g., Alcohol, Caffeine, etc.) require time for the treatment to wear off

Rest Periods can reduce fatigue

Delays in retesting can reduce retesting effects

Matched-Pairs Design

Matching participants with others in the other group(s) such that one participant acts as the control for a specific other participant.

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                    ┌──────────┐      ┌───────────┐      ┌──────┐
                    │ Matched  │ ───→ │ treatment │ ───→ │  DV  │
                    │ sample   │      └───────────┘      └──────┘
┌──────────┐   ↗    └──────────┘
│  sample  │ ──
└──────────┘   ↘    ┌──────────┐      ┌───────────┐      ┌──────┐
                    │ Matched  │ ───→ │  control  │ ───→ │  DV  │
                    │ sample   │      └───────────┘      └──────┘
                    └──────────┘
```

Matched-pairs designs ensure that the groups are equivalent on the matching variable (normally related to the DV)

Members of each pairing are randomly assigned to conditions

Usable with any between-subject design

Random Selection

- Randomly choosing a participant from a larger sample

Random Assignment

- Randomly assigning specific pre-selected participants across experimental groups

In-class (from the text, p172) Activity

- Design an experiment to test the hypothesis that single-gender math classes are beneficial to adolescent females. Construct operational definitions of the the IV and DV.

- The experiment should have two groups and use a matching-pairs design.

- Make a good case for your "matching" variable.

- Defend your choice of design.

Chapter 8 Terminology

- Confound
- Contrast Effect
- Counterbalancing
  - Latin square
  - Full
- Internal Validity
- Independent Groups (Between-subject) design
- Repeated Measures (Within-subject) design
- Matched Pairs Design

- Mortality (Attrition)
- Posttest-only design
- Pretest-posttest design
  - Solomon 4-group design
- Random Selection
- Random Assignment
- Selection Effects
- Order Effects
  - Fatigue
  - Practice (Learning)
  - Carryover

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