

Lecture 15: Confounding Variables

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Confounding Variables

- **Extraneous variables that vary systematically**
 - ↳ Importance of keeping other variables equal
 - ↳ Rule out alternative explanations
- **Two prime sources**
 - ↳ Irrelevant effects of procedures
 - ↳ Artifacts: biasing effects of investigators and participants

Participant Variables

- Demographic and personal characteristics
- Critical issues: groups need to be comparable
- Methods of control:
 - ↳ **Random assignment**
 - Easiest and surest way of scrambling all possible variables across all groups
 - Promotes but does not guarantee equivalence
 - ✓ Particularly on small samples
 - ↳ **Homogeneous sample**
 - Restrict variance by narrowing sample
 - Have to control potential confounds
 - Price: generalizability can be challenged

Participant Variables

↳ Matched participants

- Virtual twins in each group
- Desired size and diversity
- Rule out group differences
- Difficult to find enough people who match on more than a few variables
 - ✓ Often narrow match - but have to be careful
- Referred to as *matched group design*

↳ Equated groups

- Means, medians and percentages are important participant variables of the groups
- Groups should not be significantly different - should be significantly alike
- Assess by nonparametric tests: chi-square, Z test
- Possible strategy: drop, add or exchange members
 - ✓ Could change mean of other variables
 - ✓ Dropping after measurement should raise skepticism

Participant Variables

↪ Statistical control

- Balance secondary variables
- Treat as covariant in covariance analysis
 - ✓ Adjust scores for secondary effects

↪ Creation of blocking variables

- Study effect and see whether it interacts with treatment variable
- Must increase the number of cells

↪ Own control

- Sampling error is the largest error built into a design that has different people in each group
- Especially useful in SWE for accounting for differences in abilities/productivity
- Some studies do not lend themselves to this kind of control
 - ✓ Long term studies, eg
- Possible problems:
 - ✓ First treatment effects response on second
 - ✓ Learning effects from first test

Participant Variables

- **Extra-experimental changes in participants**
- **Critical issues:**
 - ↳ Especially in cases where considerable time elapses
 - ↳ Maturity and history
- **Methods of control**
 - ↳ Cannot be prevented over the long course
 - ↳ But if truly random, odds are greater against systematic problems

Participant Variables

→ **Motivation and role perception**

→ **Critical issues**

- ↪ Are some more motivated than others?
- ↪ Are egos more involved in some than others?
- ↪ Is it important to be a part of a study
- ↪ Unequal benefits may result in unequal performance
- ↪ Perception of the role might differ systematically
- ↪ Second guessing, scoping out, expectations

→ **Methods of control**

- ↪ Judge whether same benefits and rewards
- ↪ Constant motivation over time and between groups
- ↪ Unobtrusive and non-reactive measures

Participant Variables

→ **Communication among participants**

→ **Critical issues:**

- ↪ Communicating experiences with those waiting for treatment
- ↪ Possible where participants drawn from a co-located population
- ↪ Not a problem in some cases: eg, auditory acuity
- ↪ Where there are right/wrong answers, judgments

→ **Methods of control**

- ↪ Physical separation or simultaneous treatment
- ↪ With adults, explain problem and ask for cooperation
- ↪ Pretreatment screening for possible contamination
- ↪ Participants from different places
- ↪ Work quickly and finish before communication can take place
- ↪ Monitor for communication

Participant Variables

→ Placebo effects

→ Critical issues

↳ Can be quite powerful effects

↳ Important where there are change expectancies

↳ Especially where benefit expected

→ Methods of control

↳ Placebo to random half of sample

↳ Not always appropriate - eg, psychotherapy

↳ What about SWE?

Experimental Variables

→ Critical issues

↪ Interactional effects

➤ Biosocial effects:

- ✓ Demographic: men reacting to women

➤ Psychosocial effects

- ✓ Personal characteristics: don't like pushy people

➤ Situational effects

➤ Modeling effects

- ✓ Self-fulfilling prophecies
- ✓ Demand characteristics

↪ Noninteractional effects:

➤ Observer effects

➤ Interpreter effects

↪ Personal equation

➤ Eg, astronomer's observations differed

↪ Selective - effects that are different in one group

↪ Secondary variance - affect both groups

↪ Experimentor bias

Experimental Variables

→ Methods of control

- ↪ Institutionalized critical review process
- ↪ Experience and self-discipline
- ↪ Control bio-social effects
 - Anticipate them
 - Rule them out, minimize by design
 - Analyze them
 - Report them
- ↪ Psychosocial effects
 - Same ways as biosocial
 - Trial experiment and monitor experimenter

Procedural Variables

→ Critical issues:

- ↪ Nature, amount and duration of treatment
- ↪ Instructions, unplanned events, order of treatment, timing
- ↪ Magnitude, setting
- ↪ Manipulation check: post session interview or questionnaire to assure integrity

→ Methods of control

- ↪ Hold everything constant and invariant as possible
- ↪ Same thing in the same way

Instrumentation

→ Apparatus

- ↳ Change may confound
- ↳ Readers should be informed
- ↳ Quality, reliability and frequency of calibration

→ Judges, raters and scorers

- ↳ Can differ in observations, interpretations, recording
- ↳ Take care to prevent bias, inattention, drift, incompetence, etc

Nuisance Variables

- Eg, during a task of concentration, an airplane flies over
- Eg, crucial time, pencil breaks
- Best can do: anticipate and be prepared
- But can never guarantee a trouble free experiment

Other Factors

→ Error variance

↳ Between subject variability (sampling error)

➤ Difference between people, groups

➤ Separate them from differences in independent variables

↳ Within subject variability

➤ Different conditions

➤ People are just not consistent

→ Covariates

↳ Correlate with independent variable

↳ Need to be controlled lest effects are confounded

↳ Can deal with them statistically

↳ Must be identified first