Subject Sampling and Design
General Control Procedures

• Control through the selection and assignment of participants
• Control through specific experimental design
• Control over subject and experimenter effects
Selecting a Subject Sample

- **Sample**
  - Small group of people who actually participate in the study

- **Population**
  - The full set of every potential subject who falls into our category of interest
Representative vs. Biased Sample

• Usually difficult to test the whole population
  – Select a sample of the population to test

• Want to generalize to the whole population
  – Sample must be representative of the population
    • Representative sample

• Biased sample
  – Not representative of the population
Statements about a Specific Population

• Must be based on a sample that represents the population
• Must select the sample directly
  – Do not rely on self-selection
Simple Random Sampling

• Most fundamental type of probability sampling
• Each member of the population has an equal chance of being selected as a member of the sample
Simple Random Sampling

• Effective, practical way to create a representative sample

• Sometimes chosen for ethical reasons
  – Military service
Random Sampling and Assignment

• Random sampling
  – How you draw the sample of people for your study from a population

• Random Assignment
  – How you assign the sample to different study treatments
Problems

• Might want systematic features of the population in sample
  – Stratified sampling

• Impractical if population is very large
  – Cluster sampling
Stratified Random Sampling

- 5,000 students (4,000 F, 1,000 M)
- Random sample
  - More F than M but NOT the same proportion as in the population
- Want a sample representative of the population
  - Make sure 80% of the sample is F
Considerations

• Deciding how many layers/strata to use
  – Some population characteristics are more critical than others

• What has occurred in prior research?

• What are the goals of the study?
Cluster Sampling

• Randomly select a cluster of people
  – Share a common feature

• Example
  – Campus survey
  – Identify core classes (40)
    • Randomly select 10
  – Administer survey to every person in each class
Types of Sampling

• Probability sampling
  – Describe certain features of a defined population
  – Investigates a segment of the defined population

• Non-probability sampling
  – Study the relationship between variables
  – Replication process determines generalizability to population
Convenience Sampling

• Most frequently used
• Most convenient to use
• Involves requesting volunteers from a group of available people
  – Subject pool
    • Students enrolled in general psychology classes
College Sophomore Problem

• Demographic characteristics of psychological research are not representative of the population
• Most often use college sophomores
  – Most likely population to be enrolled in General Psychology courses
Not a Problem

• Assume certain aspects of the study will not influence the results
• Example
  – Biology
  – Basic cognitive processes
• Focus on possibilities more likely to affect results
Replication

• Generality assessed by performing research on other groups
  – Replication
    • Differences indicate a need to identify variables that change the behavior

• Sophomores today
  – Diverse mixture
  – Very different from sophomores 50 years ago
Conducting an Experiment

Comparison
Control
Manipulation
Experimental Research

• Focuses on identifying causes of behavior
• Based on the ideas of
  – Comparison
  – Control
  – Manipulation
Comparison

• Compare data patterns under different conditions
  – Hypothesis testing
    • Rule out explanations
    • Confirm explanations

• Control experimental situation
  – Manipulate hypothesized causal variable
Systematic Research Study

• Variables of interest are manipulated
  – Independent variables
    • Must have at least two levels

• All other variables held constant
  – Extraneous variables

• Effects of manipulation are observed
  – Dependent variables
Systematic Research Study

• Independent variable
  – Exposure to violent videogames
    • Violent versus nonviolent

• Dependent variable
  – School shooting

• Extraneous variables
  – Age, personalities, access to guns, social skills, home life…..
Prying Variables Apart

- Occurrence of an event correlated with many factors
  - Difficult to determine cause
- Create special situations
  - Isolate the influence of a single variable
  - Determine causation
Confound

• Extraneous variables held constant
  – Changes in DV result from changes in IV

• Extraneous variables allowed to covary with IV
  – Can influence behavior systematically
  – Effects of extraneous variable can not be separated from effects of IV
Spot the Confound (1)

- Coaching technique that will lead to better teams
  - Team 1 receives special coaching technique
  - Team 2 receives standard coaching
- Teams play each other
  - Team receiving special coaching (team 1) should perform better
**Spot the Confound (2)**

<table>
<thead>
<tr>
<th>Club 1</th>
<th>Club 2</th>
<th>Club 3</th>
<th>Club 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image of Club 1" /></td>
<td><img src="image2.png" alt="Image of Club 2" /></td>
<td><img src="image3.png" alt="Image of Club 3" /></td>
<td><img src="image4.png" alt="Image of Club 4" /></td>
</tr>
</tbody>
</table>

- Does new type of driver (club 1) drive a golf ball greater distances than competing brands?
  - 20 male golf pros recruited
  - Starting with club 1, hit 50 balls with each club.

- Average the distance driven with each club across the 50 trials
Spot the Confound (3)

• Students who cram for a test don’t do as well as students who study over several days.
• 3 equivalent groups of students are selected
• Learn 5 chapters in a general psychology text
## Spot the Confound (3)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Group1</td>
<td>3</td>
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<td></td>
<td>Exam</td>
</tr>
<tr>
<td>Group2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>Exam</td>
</tr>
<tr>
<td>Group3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td>Exam</td>
</tr>
</tbody>
</table>

- Group 1 studies 3 hours on Monday
- Group 2 studies 3 hours on Monday & Tuesday
- Group 2 studies 3 hours on Monday, Tuesday & Wednesday
- All tested on Friday
Control

• Subject variables
  – Characteristics of the subjects in the study
  – Subject related artifacts

• Experimental variables
  – Experiment design
  – Experimenter expectancy
Subject Variables

- Evenly distributed across treatment conditions
- Accomplished through random assignment
- Every Ss has an equal chance of being placed in each of the groups
Random Number Table

- Select column and a row
- Find number at intersection
  - Odd number
    - Assign to experimental condition
  - Even number
    - Assign to control condition
- Repeat for each subject

<table>
<thead>
<tr>
<th>Row number</th>
<th>Column number</th>
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<tbody>
<tr>
<td>1</td>
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<td>40</td>
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</table>

Select a row from 1 to 40 and a column from 1 to 12. Use the number at the intersection of the selected row and column.
## Between-Subjects Design

<table>
<thead>
<tr>
<th>Loud Noises</th>
<th>No Noises (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 3</td>
<td>Subject 1</td>
</tr>
<tr>
<td>Subject 5</td>
<td>Subject 2</td>
</tr>
<tr>
<td>Subject 6</td>
<td>Subject 4</td>
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<td>Subject 10</td>
<td>Subject 7</td>
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<td>Subject 11</td>
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<td>Subject 12</td>
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<td>Subject 13</td>
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<td>Subject 14</td>
<td>Subject 18</td>
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<tr>
<td>Subject 15</td>
<td>Subject 19</td>
</tr>
<tr>
<td>Subject 17</td>
<td>Subject 20</td>
</tr>
</tbody>
</table>
Within-subjects Design

- Experience one or more levels of IV
- Subject variables equivalent across conditions
- Need half as many subjects for study

<table>
<thead>
<tr>
<th>Subject</th>
<th>Loud Noises</th>
<th>No Noises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 1</td>
<td>Subject 1</td>
<td></td>
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<tr>
<td>Subject 2</td>
<td>Subject 2</td>
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<td>Subject 3</td>
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<td>Subject 9</td>
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<tr>
<td>Subject 10</td>
<td>Subject 10</td>
<td></td>
</tr>
</tbody>
</table>
Order Effects

- Gradual improvement over trials
- Gradual decline over trials
- Certain sequences produce effects different from other sequences
## Latin Square Design

<table>
<thead>
<tr>
<th>Order of Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>---</td>
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<tr>
<td>Sequence 1</td>
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<tr>
<td>Sequence 2</td>
</tr>
<tr>
<td>Sequence 3</td>
</tr>
<tr>
<td>Sequence 4</td>
</tr>
</tbody>
</table>
Between-subjects or Within-subjects?

1. A neuroscientist hypothesizes that damage to the primary visual cortex is permanent in older animals.
2. A sensory psychologist predicts that it is easier to distinguish slightly different shades of gray under daylight than under fluorescent light.
3. A social psychologist believes people will solve problems more creatively in groups than when alone.
5. A clinical psychologist thinks that phobias are best cured by repeatedly exposing the person to the feared object and not allowing the person to escape until they realize the object is really harmless.
Order Effects

• Practice effects
  – Performance improves across conditions

• Fatigue effects
  – Performance declines across conditions

• Carryover effects
  – Treatment in one condition “carries over” or affects performance in next condition
Design and Control

• Order effects
  – Use counterbalancing
  – Use between-subjects design

• Subject variables
  – Use random assignment to conditions
  – Use within-subjects design
Deciding on Design

• Depends upon the study

• Within-subjects
  – If counterbalancing is an option
    • Economical
    • No subject effects

• Between-subjects
  – If counterbalancing is not an option
    • “A neuroscientist hypothesizes that damage to the primary visual cortex is permanent in older animals”