More on Data Collection
& Group Comparison

Today's Agenda

Article 2 presentations
Review
New information
  More on group comparisons
  More on data collection
Planning/upcoming activities

Review
**Research Process**

Examine association between variables

- Develop *hypothesis* or question
- State specific, testable prediction
- Collect data

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**Variables**

Basis for research

- Individual elements of hypotheses/predictions
- Must vary

A *variable* has **levels**

- Is a category
- Can change

- Is a member of category
- Cannot change

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**Variable Definitions**

- Concept → Operation → Valid
- Valid
  - Face
  - Predictive
  - Concurrent
  - Convergent
  - Discriminant

- Reliable
  - Internal
  - Test-retest
  - Inter-rater

- Scale
  - Ratio
  - Interval
  - Ordinal
  - Nominal
Variables & Causality

Types of variables
- Subject
- Situation
- Response

Created vs. pre-existing variables
- Subject always pre-existing
- Situation & response may be
  - Pre-existing
  - Created

Goals of Research

<table>
<thead>
<tr>
<th>Description</th>
<th>Prediction</th>
<th>Causation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Description Statistics</td>
<td>Inferential Statistics</td>
</tr>
</tbody>
</table>

Describing a Group

Norms (Central Tendencies)
- Mean
- Median
- Mode

Individual Differences (Variability)
- Range
- Standard Deviation
### Kinds of Inferences

<table>
<thead>
<tr>
<th>Linear Relations</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Comparisons</td>
<td>Experiments</td>
</tr>
</tbody>
</table>

### Comparison Between 2 Groups

Based on
- Difference between group norms (means)
- Differences within groups (standard deviation)
- Odds that sample represents population (degrees of freedom)

Produce probability of Type 1 Error

### Example

Is the number of fights in classrooms with 20 children significantly greater than the number of fights in classrooms with 10 children?

**Steps**
- Sample classrooms in each group
- Count the fights in each room
- Compare groups to see if norm for 20 children classes is "typical" of 10 children classes
Comparing Groups

10 Children  20 Children

95%

Comparing Groups

\[ t(18) = 3.75, \ p < .05 \]

\( t \)-statistic

Numerical representation of difference between groups

Degrees of Freedom
Probability of Type 1 Error

Difference between means divided by standard deviation

Degrees of freedom

Related to sample size
Possible variability in sample
How much freedom is there to get a different score?
### Probability Errors

<table>
<thead>
<tr>
<th>Research Decision</th>
<th>Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Null is True</td>
</tr>
<tr>
<td>Accept Null</td>
<td>☹</td>
</tr>
<tr>
<td>Accept Hypothesis</td>
<td>Type I Error</td>
</tr>
</tbody>
</table>

### More on Group Comparisons

### Scales of Measurement

- **Ratio/Interval**: Mean, Median, Mode
- **Ordinal**: Median, Mode
- **Nominal**: Mode
Variables in Between Group Comparisons

- Grouping Variable
  - Called *independent* or *predictor*
  - Used as nominal measure
- Outcome Variable
  - Called *dependent* or *criterion*
  - Must be interval/ratio or Likert
  - Accommodate math

Defining Groups

- Created groups
  - Independent variables
    - Defined by experimenter
    - Create *experimental design*
  - Group creation strategies:
    - Random assignment
    - Matched pairs
- Existing groups
  - Predictor variables
    - Defined by
      - Subject variables
      - Pre-existing situation variables
    - Create *quasi-experimental design*

Developmental Designs
Developmental Designs

- Quasi-experimental
  - Examine change associated with age
  - Attempt to differentiate development and experience
- 3 different designs
  - Cross-sectional
  - Longitudinal
  - Sequential

Cross-Sectional

Cohort Effects

Longitudinal

Cross-Sectional
### Intervention Designs

### Principle of Intervention Studies

<table>
<thead>
<tr>
<th>Frequency/Score</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td></td>
<td></td>
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</tbody>
</table>
Types of Comparisons

Two different groups of people
Scores are independent of each other
One measurement does not influence the other
*Independent group design*

One group of people before and after
(pretest vs. post-test)
Scores are related to each other
One measurement does influence the next
*Repeated measures design*

Relations among Design Elements

Existing vs. created grouping variables
Predictor vs. independent variables
Independent groups created by
– Random assignment
– Matched-pairs
Quasi-experimental vs. experimental

Independent vs. Repeated measures
2+ different groups vs.
one group measured 2+ times
Longitudinal design = repeated

Sampling & Assignment
**Sampling**

Identification of participants

Strategies

- Random
  - Entirely random
  - Stratified random
- Cluster
- Haphazard
  - Truly haphazard
  - Quota

<table>
<thead>
<tr>
<th>Random</th>
<th>Easy</th>
</tr>
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<tbody>
<tr>
<td>Random</td>
<td>Haphazard</td>
</tr>
<tr>
<td>Stratified</td>
<td>Quota</td>
</tr>
</tbody>
</table>

**Assignment**

Creation of experimental groups

Must be determined by experimenter

Only applies to Independent Variables

Strategies

- Random
- Haphazard

**Methods of Data Collection**
**Data Collection Techniques**

- Testing
- Observation
- Survey (questionnaire)
- Interview
- Content analysis
- Pre-existing source (archival data)

**Observation Strategies**

- Naturalistic vs. Systematic
- Participant vs. Concealed

**Issues**

- Reactivity
- Reliability (coding/recording)
- Sampling vs. comprehensive

**Questionnaire Issues**

- Measure ideas rather than behavior
- Ease data collection
- Evaluate sample characteristics
- Distribution
  - Find target population
  - Ensure adequate response rate
- Format
  - Close vs. open-ended questions
  - Influence of wording
  - Reactivity
  - Social desirability
  - Order effects
Content Analysis

- Analysis of thing rather than person
- Requires coding/counting

Interviews

- Same risks as Observations
- Surveys
- Advantages:
  - Detailed qualitative information
  - “Clinical interview” flexibility

What’s Next?
Upcoming events

Week 10 = workday
  Identification of remaining articles
    4 total for individuals
    8 total for groups
  Begin analysis and interpretation
Week 11 = examine more complicated research designs (multiple variables)
Week 12 = workday & review
Week 13 = exam 2