Causal Comparative Research: Purpose

- Attempts to determine cause and effect
- Not as powerful as experimental designs
- Alleged cause and effect have already occurred and are being examined after the fact (e.g., ex post facto)
- Used when independent variables cannot or should not be examined using controlled experiments
- A common design in educational research studies

Similarities to Correlational Research

- Both lack manipulation
- Both require caution in interpreting results
  - Causation is difficult to infer
- Both can support subsequent experimental research
  - Results can lead to testable experimental hypotheses

Differences with Correlational Research

- Correlational
  - No attempt to understand cause and effect
  - Two or more variables
  - One group
- Causal comparative
  - Attempts to understand cause and effect
  - At least one independent variable
  - Two or more groups
Example Topic
The Relationship between Years of Experience & Job Satisfaction

Correlational Design

- Hypotheses:
  - Alternative - There is a relationship between years of experience and job satisfaction among elementary school teachers.
  - Null - There is no relationship between years of experience and job satisfaction among elementary school teachers.

- Sample
  - One group (teachers) are randomly sampled.

- Variables
  - Years of experience
  - Job satisfaction
  - Both variables measured in all subjects.

Correlational Design (cont.)

- Data Analysis
  - Correlation computed between the two variables (r) within the group to test null hypothesis.
  - Rejection of null hypothesis suggests that years of experience is related to job satisfaction. Direction and magnitude of (r) determine nature of relationship.

Causal Comparative Design

- Hypotheses
  - Alternative - Teachers with a high level of experience will be more satisfied with their jobs than teachers with low levels of experience.
  - Null - Teachers with a high level of experience will be equally satisfied with their jobs when compared to teachers with low levels of experience.

- Variables
  - Dependent - Job satisfaction
  - Independent - Years of experience
    - Two levels (High & low)
  - Exists naturally in the population of teachers at the start of study.
Example Topic
The Relationship between Years of Experience & Job Satisfaction

Causal Comparative Design (cont.)

Sample
- Two groups sampled, one for each level of the independent variable
  - High experience
  - Low experience

Data Analysis
- Mean job satisfaction ratings for High Experience & Low Experience subjects are compared using t-test, ANOVA, or other appropriate statistical test
- Rejection of the null hypothesis supports the alternative hypothesis that years of experience results in increased job satisfaction

Comparison to Experimental Research

- Experimental
  - Causal group comparisons
  - Individuals randomly assigned to treatment groups
  - Independent variable manipulated by the researcher

- Causal comparative
  - Group comparisons
  - Individuals already in groups before research begins
  - Independent variable not manipulated
    - Cannot
    - Should not
    - Is not

Examples of Naturally Occurring Variables

- Non-manipulated variables
  - Age
  - Sex
  - Ethnicity
  - Learning style
  - Socioeconomic status
  - Parental educational level
  - Family environment
  - Preschool attendance
  - Type of school
Design and Procedures
- Select two groups that differ on some independent variable
  - One group possesses some characteristic that the other does not
  - Each group possesses the characteristic but in differing amounts
- The independent variable must be clearly operationally defined

Design and Procedures
- Randomly sample subjects from each of the two groups
- Collect background information on subjects to determine the equality of the groups
- Compare groups on the dependent variable

Control of Extraneous Variables
- Extraneous variables represent alternative explanations for research findings
  - These are variables that have not been ruled-out (controlled for) by a study’s design
- In our previous example, what other variable besides years of experience could explain job satisfaction among teachers?
  - Class Size?
Control of Extraneous Variables

- Lack of randomization, manipulation, and control are all weaknesses of causal comparative designs
- Control procedures
  (let's consider how to control for class size in our previous example)
  - Matching
    - Each subject in the high experience group is matched with a subject in the low experience group along the variable of class size
    - Each high experience teacher who teaches a large class is matched with a low experience teacher who teaches a large class.
    - Each high experience teacher who teaches a small class is matched with a low experience teacher who teaches a small class.

Control of Extraneous Variables

- Control Procedures (cont.)
  - Comparing homogeneous groups
    - Subjects may only participate if they have large class sizes
  - Comparing subgroups
    - Statistically compare subjects with small & large class sizes to determine if the dependent variable is different between these subgroups
  - Analysis of covariance

Data Analysis

- Descriptive statistics
  - Central tendency
    - Mean
    - Median
    - Mode
  - Variation
    - Standard deviation
- Inferential statistics
  - t-test
  - Analysis of variance
  - Analysis of covariance
  - Chi-square