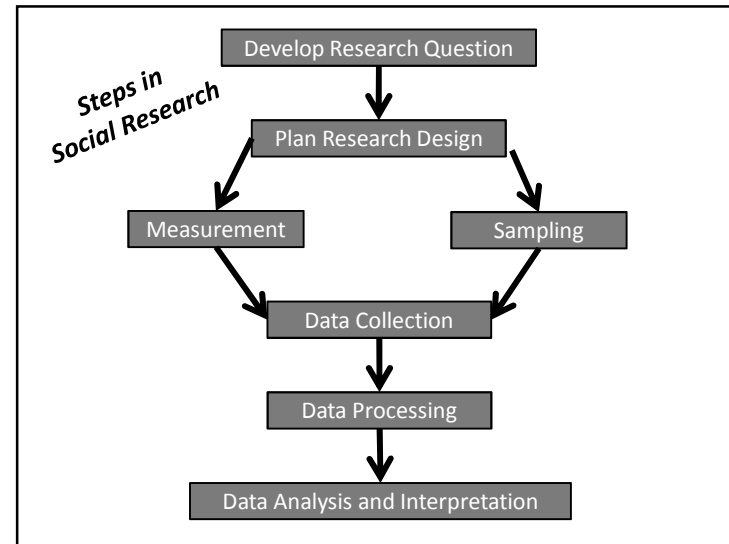


## Research Designs

Dr. K. A. Korb  
University of Jos



## Outline of Research Designs

- Survey/Descriptive
- Causal-comparative (ex-post facto)
- Correlational
- Experimental

## Overview

- **Research design:** Overall plan in a scientific study
  - Guidelines on how the major parts of the research study (Participants, Instruments, Procedures, Data Analysis) work together to address the research question

## Survey Design

- **Survey Design:** Quantitative research that identifies trends in attitudes, opinions, behaviors, or characteristics of a large group of people
- Key Characteristics of Survey Designs
  1. Large number of respondents chosen through probability sampling to represent the population of interest
  2. Systematic questionnaires or interviews used to gather information from respondents
  3. Answers on the questionnaire/interview are numerically coded and analysed

## Descriptive Design

- **Descriptive design:** Describe the current state of specific variables of interest
- Key Characteristics of Descriptive Design
  - Includes one group of participants
  - Variables are precisely assessed and reported
  - Data is analysed according to Research Questions using descriptive statistics

## Descriptive Design

- Steps in Descriptive Designs:
  1. Identify key variables of interest and develop Research Questions
  2. Operationally define key variables
  3. Develop an instrument to measure each of the specific variables
  4. Collect data following standardized procedures exactly
  5. Analyse the data based off of the research questions, primarily using descriptive statistics

## Operational Definition

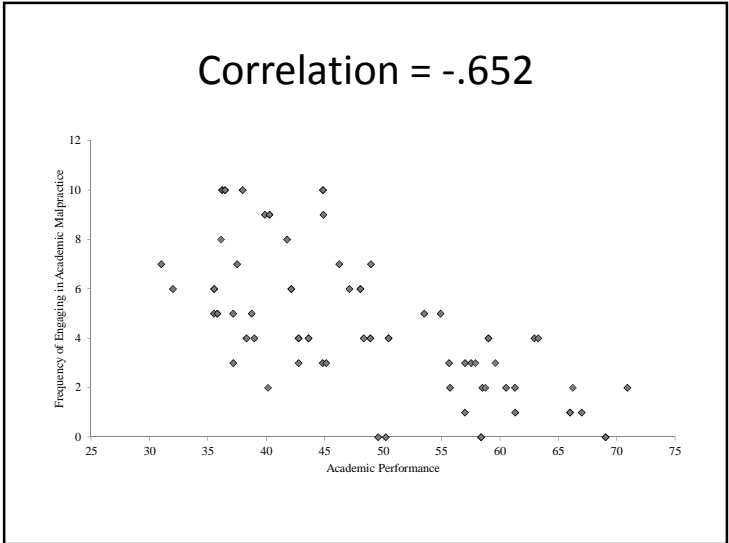
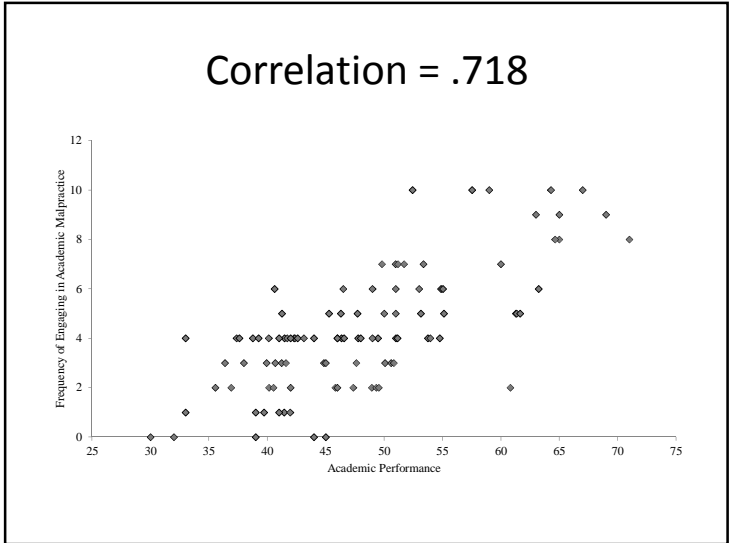
- **Operational Definition:** Specification of how a variable will be defined and *measured* in the research study
- Examples:
  - *Socioeconomic Status:* A person's economic standing based on lifestyle, prestige, power, and control of resources. SES was measured by participants' living conditions (either with friends/relatives, rented house, own land, or own house).
  - *Plagiarism:* Stealing or passing off the ideas or words of another as one's own. Plagiarism was measured by six Likert-scale items where participants indicated the degree to which they had done each of the plagiarizing behaviors in the past year.

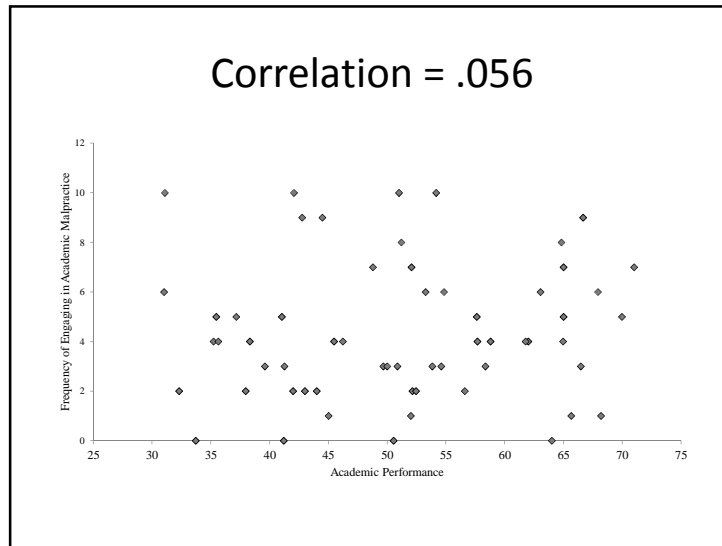
### Correlational Design

- **Correlational Design:** Quantitative research that measures the degree of relationship between two or more variables using the correlation statistic
- Key Characteristics of Correlational Design:
  - Includes only one group of participants
  - Two (or more) variables of interest are precisely measured
  - Generally, both variables are continuous variables
  - Two (or more) scores are obtained for each participant in the study
  - Correlation statistic is used

### Correlational Design

- **Explanatory Design:** All data is collected at one point in time to explain the relationship between variables
- **Prediction Design:** Identify predictor variables that are thought to predict other variables (criterion variables)
  - Predictor variables are measured at Time A, and Criterion Variables are measured at Time B





- ### Steps in Correlational Research
1. Identify the key variables
  2. Develop null hypotheses
    - There is no significant relationship between engaging in plagiarism and academic performance.
  3. Operationally define key variables
  4. Develop the instrument to measure each of the key variables *separately*
  5. Collect data following standardized procedures exactly
  6. Analyse data using correlational statistics based on the research hypotheses

- ### *Correlation, NOT Causation*
- A significant relationship means there is a **relationship between the variables only**
  - Correlation does ***NOT*** mean that one variable causes another variable
    - Issue of directionality: which variable caused which variable?
    - Issue of a potential third variable in the causal chain
  - Correlational designs generally do not have independent and dependent variables

- ### Causal Comparative Design
- **Causal Comparative Design:** Examine effect of one variable that cannot be manipulated on other variables
    - Also called *ex post facto* design (“after the fact” in Latin)
  - Key Characteristic of a Causal Comparative Design
    - Compare two or more groups (independent variable) on one or more dependent variable(s).

## Causal Comparative Design

1. Identify and define the key variables
  - Clearly articulate how participants were divided into groups
2. Develop null hypotheses
  - There is no significant difference between males and females on the frequency of engaging in academic malpractice.
3. Develop the instrument to measure the key variables separately
4. Collect data following standardized procedures
5. Analyse data using inferential statistics based on the research hypotheses
  - Generally *t*-test or ANOVA

## Experimental Design

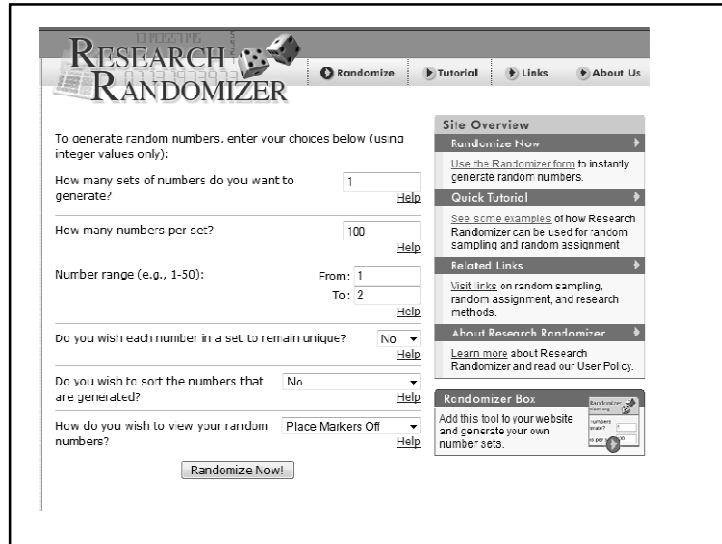
- **Experimental Design:** Determine if one variable affects another variable
- Key Characteristics of an Experimental Design
  - Independent Variable (IV) is manipulated by the researcher
  - Measurement of the Dependent Variable (DV) after the manipulation of the Independent Variable
  - Presence of a **Treatment Group**
  - A **Control Group** is treated *exactly like* the treatment group except they do not receive the treatment, in order to control for extraneous variables
  - Participants are randomly assigned to the treatment and control groups
    - Designs without random assignment are generally called quasi-experimental designs

## Random Assignment

- **Random:** Technical term that means that every case has an equal and independent chance of being assigned or selected
  - **Selection:** How participants were selected from the population to participate as the sample of the study.
  - **Assignment:** How participants are assigned to the treatment and control groups
- The rationale for random assignment is to control for extraneous variables
  - “By virtue of random assignment, individual characteristics or experiences that might confound the results will be about evenly distributed between the groups” (Singleton & Straits, 2010, p. 197).

## Procedures for Random Assignment

- **Hat and Draw Method:** Names of all participants are placed in a hat and drawn out at random. The first name is assigned to the treatment group, the second name is assigned to the control group, the third name is assigned to the treatment group, and so on.
- **Random Number Table**
  - <http://www.randomizer.org/form.htm>



## Random Assignment: Random Number Table

- 2, 2, 1, 1, 1, 1, 1, 2, 2, 2, 1, 1, 1, 2, 1, 2, 1, 2, 2, 2, 1, 2, 1, 2, 1, 2, 2, 2, 1, 2, 1, 2, 2, 2, 2, 1, 2, 1, 2, 2, 2, 1, 2, 1, 2, 1, 1, 2, 2, 1, 2, 1, 1, 1, 1, 2, 1, 2, 2, 1, 2, 1, 1, 2, 2, 1, 2, 2, 2, 2, 1, 2, 2, 1, 1, 1, 1, 2, 1, 1, 2, 1, 1, 2, 2, 1, 1, 2, 1, 2

## Controlling Extraneous Variables

- Experimental research requires careful thought on how to control for extraneous variables
  - This is to ensure that at the end of the study, any changes in the DV can be clearly attributed to the treatment
  - This requires ensuring that the control group is exactly identical to the treatment group in every manner except for the fact that they do not receive the treatment.

## Internal Validity

- **Internal Validity:** Approximate truth about the conclusion drawn about the cause-effect relationship between the independent and dependent variables.
- **Threats to Validity:** Specific factors that can lead to an erroneous conclusion about the cause-effect relationship

### Threats to Internal Validity

- **History:** Other events in the participants' environment that may effect the DV besides the treatment
- **Maturation:** Psychological or physical changes that take place within the participant by the passage of time
- **Testing:** Participants improve their responses completing the instrument a second time
- **Instrumentation:** Unwanted changes in the variable due to a different instrument being used to measure the variable

### Threats to Internal Validity

- **Statistical Regression:** Tendency for extreme scorers on a test to move (regress) closer to the mean on a second administration of a test
- **Selection:** Differences in the composition between the treatment and control groups
- **Attrition:** Loss of subjects from the experimental group between the start and finish of the study

### Experimental Designs: One-Shot Case Study



- X = Treatment
- O = Observation (Test)

- **Problem:** There is no basis for determining whether it was the treatment that affected the DV

### Experimental Designs: One Group Pretest-Posttest



- O<sub>1</sub> = Pre-Test
- O<sub>2</sub> = Post-Test

- **Problems:** Maturation and History

### Experimental Designs: Static Group Comparison

X	O
	O

- There are two groups, but the groups were in existence before the study began
- **Problems:** Selection

### Experimental Designs: Pretest-Posttest Control Group Design

R	O <sub>1</sub>	X	O <sub>2</sub>
	O <sub>1</sub>		O <sub>2</sub>

- R = Random Assignment to Treatment/Control Groups
- **Problems:** Instrumentation or Testing

### Experimental Designs: Posttest Only Control Group Design

R	X	O <sub>2</sub>
		O <sub>2</sub>

- **Problems:** Attrition in long studies

### Experimental Designs: Solomon Four-Group Design

	O <sub>1</sub>	X	O <sub>2</sub>
R	O <sub>1</sub>		O <sub>2</sub>
		X	O <sub>2</sub>
			O <sub>2</sub>

- **Problems:** Cost



### Steps in an Experimental Design

1. Identify and develop a treatment (IV)
2. Identify the DVs that the treatment is hypothesized to affect
3. Develop null hypotheses
  - There is no significant effect of peer mediation on the number of fights a student gets into.
4. Develop the instrument to measure the DV
5. Thoughtfully plan procedures to control for extraneous variables and threats to internal validity
6. Collect data following standardized procedures
7. Analyse data using inferential statistics based on the research hypotheses
  - t-test, ANOVA, or ANCOVA

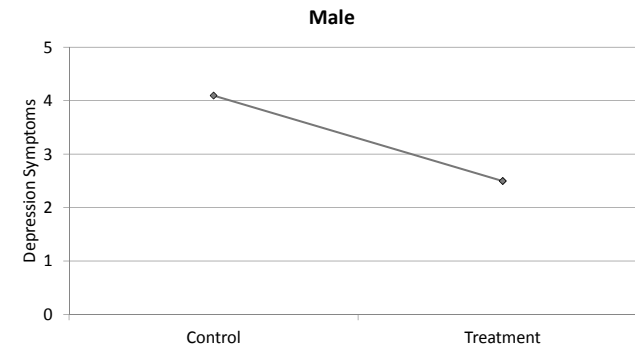
### Factorial Designs

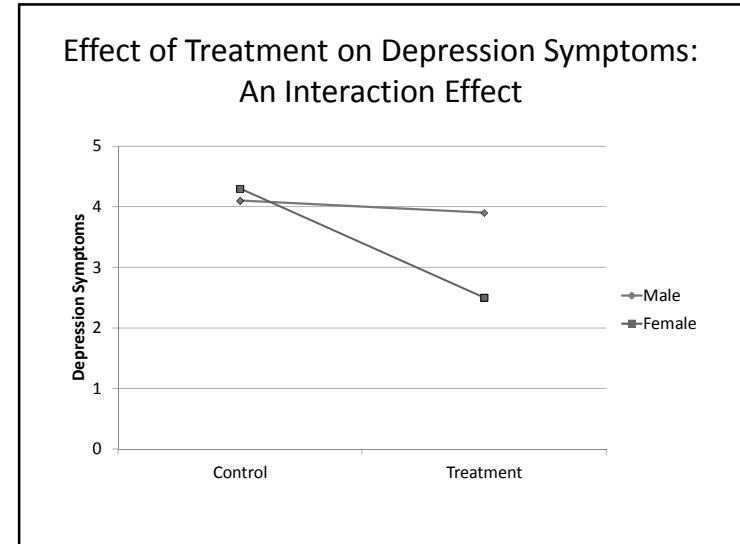
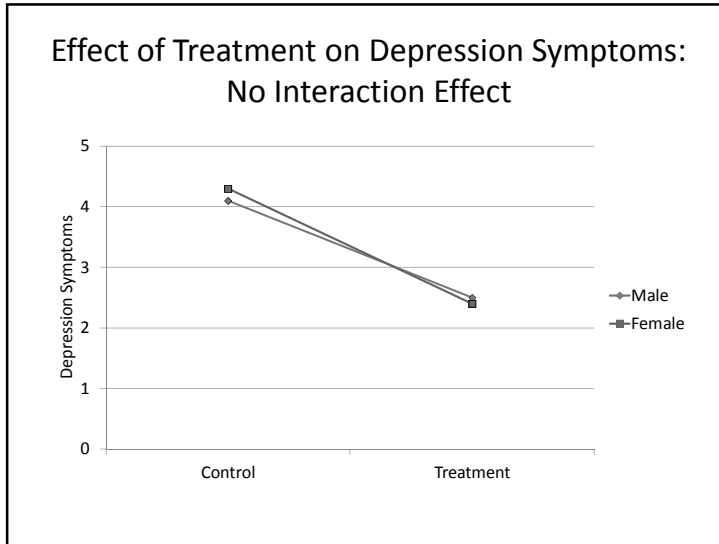
- **Factorial Design:** Study the effects of several independent variables at the same time
- **2x2 Factorial Design:** Two IVs with two levels
  - Treatment/Control and Male/Female
- **3x2 Factorial Design:** Two IVs, one with three levels and another with two
  - Treatment 1/Treatment 2/Control and Male/Female
- **2x3x4 Factorial Design:** Three IVs with two, three, and four levels respectively
  - Treatment/Control; Christian/Muslim/ATR; JS3/SS1/SS2/SS3

### Factorial Designs

- **Main Effect:** Overall effect of each factor by itself
- **Interaction Effect:** The effect of one IV depends on the other IV

Effect of Treatment on Depression Symptoms: Main Effect





### Mini-Assignment

- Pick one variable. Develop a null hypotheses for that variable for the following research designs:
  - a) Survey/Descriptive (Research Question)
  - b) Correlational
  - c) Causal-Comparative
  - d) Experimental
  - e) Factorial