WEEK 3

Outline

I. What to study?
II. Variable
III. Relationship among variables
IV. Hypothesis and theory

What to work on?

- Identify the “problem”
- It may be generated from many resources depending upon many factors
- Like many other things in life, if one wants to play the “game”, one must know the “rules”
- Part of the rules is understanding the language of research.
I. Variable

- "A variable is anything that can take on different values" (Marczyk, DeMatteo, & Festinger, p. 3 & 42).
- Williams (1986) defines a variable as "an observable characteristic of an object or event that can be described according to some well-defined classification or measurement scheme" (p. 4).
- Bolton and Parker (1992) defined a variable as "characteristics of persons or things that can take on two or more values" (p. 341).
- A variable is an object, event, idea, feeling, time period, or any other type of category you are trying to measure.
- A key element is that variables refer to characteristics that are not fixed but are able to vary, that is, to take on more than one value.
- For example, the word "green" would not be a variable but "shades of green" could be a variable.
- "One inch" is not a variable, however, "length", which could be operationally defined as the number of inches as measured by a ruler would be a variable.
• Variable is simply, something that varies.
• Specifically, variables represent persons or objects that can be manipulated, controlled, or merely measured for the sake of research.

Variation: How much a variable varies. Those with little variation are called constants.

• A variable is a measured concept.
• There can be more than one variable for a single concept.
• Variables that have same name can
  ◦ have different values (i.e. height in meter or as ranked high/tall)
  ◦ Be defined differently (i.e. intelligence can be IQ test result of Stanford Binnet Intelligence Test or Scores on another scale performance in various other fields for multiple intelligence)

Types of variables

• Quantitative Variables
  ◦ Discrete Variables
  ◦ Continuous Variables

• Qualitative or Categorical Variables
• A variable that can be measured numerically is called a **quantitative variable**.

• The data collected on a quantitative variable are called **quantitative data**.

• A variable whose values are countable is called a **discrete variable**. In other words, a discrete variable can assume only certain values with no intermediate values.
  • Example: A household could have:
    ◦ three children or six children, but not 4.53 children.
    ◦ two or three cars, but not 2.5 cars.

• A variable that can assume any numerical value over a certain interval or intervals is called a **continuous variable**.

  • Example: A person can be:
    ◦ 5.7 inches tall, & 75.1 kg in weight
A variable that cannot assume a numerical value but can be classified into two or more nonnumeric categories is called a **qualitative** or **categorical variable**. The data collected on such a variable are called **qualitative data**.

Examples: Gender; Type of house; hair colours

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**Dependent & Independent Variables**

- **Independent variable**: “Variable that is believed to cause or influence the dependent variable”.

- **Dependent variable**: “Variable that is influenced by the independent variable”.
Independent variable

- These variables are ones that are more or less controlled.
- Scientists manipulate these variables as they see fit.
- They still vary, but the variation is relatively known or taken into account.
- Often there are many in a given study.

Dependent variable

- Dependent variables are not controlled or manipulated in any way, but instead are simply measured or registered.
- These vary in relation to the independent variables, and while results can be predicted, the data are always measured.
- There can be any number of dependent variables, but usually there is one to isolate reason for variation.

What’s the difference?

<table>
<thead>
<tr>
<th>IV</th>
<th>DV</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Intentionally manipulated</td>
<td>• Intentionally left alone</td>
</tr>
<tr>
<td>• Controlled</td>
<td>• Measured</td>
</tr>
<tr>
<td>• Vary at known rate</td>
<td>• Vary at unknown rate</td>
</tr>
<tr>
<td>• Cause</td>
<td>• Effect</td>
</tr>
</tbody>
</table>
• The dependent variable is placed on the y-axis

• The independent variable is placed on the x-axis.

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**Antecedent variable**

• An antecedent variable is a variable that occurs before the independent variable and the dependent variable.

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**Control variable**

• Variable held constant in order to assess or clarify the relationship between two other variables. In the example below, gender is a control variable.

• e.g. to check the influence of hours studying on students’ grade; we need to control for differences in gender since gender is related to the DV. Therefore, gender must be held constant (controlled)

  ![Diagram](image)
Types of Variables

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>Synonym</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable (DV)</td>
<td>A variable that indicates whether the treatment or manipulation of the IV had an effect</td>
<td>Outcome/results/effect/criterion variable</td>
</tr>
<tr>
<td>Independent variable (IV)</td>
<td>A variable that is manipulated to examine its impact on a DV</td>
<td>Treatment/factor/predictor variable</td>
</tr>
<tr>
<td>Control</td>
<td>An variable that a researcher does not wish to examine in the study; thus it must be controlled. Variable that is held constant in order to clarify the relationship between IV and DV</td>
<td>Covariate (It relates with DV)</td>
</tr>
<tr>
<td>Confounding variable</td>
<td>A variable that obscures the effects of another variable</td>
<td>i.e. Teachers effectiveness and type of teaching materials are confounding variables in explaining reading comprehension</td>
</tr>
<tr>
<td>Mediating variable</td>
<td>A variable that explains a relation / provides a causal link between other variables</td>
<td>Intervening (mediating variables can explain DV)</td>
</tr>
<tr>
<td>Moderating variable</td>
<td>A variable that influences/moderates the relation between 2 other variables; produces interaction effect</td>
<td></td>
</tr>
</tbody>
</table>

Interactive Quiz: IV and DV

1. Time spent studying causes a change in test score.
2. Stress causes increase heart rate.
3. Independent happens no matter what, dependent can only happen based on another condition.

Interactive Quiz: Find the IV and DV

A researcher wanted to study the effects of sleep deprivation on physical coordination. The researcher selected 25-year-old male college students and deprived some of the subjects to either 24, 36, or 45 hours of sleep.

In the present study the independent variable was:
   a) the length of time the subjects were deprived of sleep.
   b) the age of the subjects.
   c) the gender of the subjects.
   d) the physical coordination skills of the subjects.

In the present study the dependent variable was:
   a) the length of time the subjects were deprived of sleep.
   b) the age of the subjects.
   c) the gender of the subjects.
   d) the physical coordination skills of the subjects.
Interactive Quiz: Quantitative or Qualitative?

1. Hair color
2. Height
3. Eye color
4. Religion
5. Shoe size
6. Favorite movie
7. Sex
8. Weight
9. Money
10. Time
11. Age
12. Self-esteem score
13. CGPA