# Types of Variables

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# Agenda

- Dependent Variable
- Independent Variable
- Intervening/Mediating Variable
- Organismic Variable
- Control/Constant Variable
- Interval variable
- Ratio variable
- Nominal/Categorical variable
- Ordinal variable
- Dummy variables
- Preference variable
- Multiple response variable
- Extraneous Variable

# Variable

Any characteristic which is subject to change and can have more than one value such as age, intelligence, motivation, gender, etc.

# Dependent Variable

- Variable affected by the independent variable

- It responds to the independent variable.

# Independent Variable

- Variable that is presumed to influence other variable

- It is the presumed cause, whereas the dependent variable is the presumed effect.

# Example 1

You are interested in **"How stress affects mental state of human beings?"**

Independent variable ----- Stress

Dependent variable ---- mental state of human beings

You can directly manipulate stress levels in your human subjects and measure how those stress levels change mental state.

# Example 2

**Promotion affects employees' motivation**

Independent variable ----- Promotion

Dependent variable ----Employees motivation

# Other Names for Dependent and Independent Variables

| Dependent Variable | Independent Variable |
| --- | --- |
| Explained | Explanatory |
| Predictand | Predictor |
| Regressand | Regressor |
| Response | Stimulus |
| Outcome | Covariate |
| Controlled | Control |

# Intervening/Mediating Variable

It is a variable whose existence is inferred but it cannot be measured.

# Example 1

**Determining the effect of video clips on learning ability of students of M.Phil.**

The association between video clips and learning ability needs to be explained.

**Other variables intervene**

Such as anxiety, fatigue, motivation, improper diet, etc.

# Intervening/Mediating Variable (Contd.)

It is caused by the independent variable and is itself a cause of the dependent variable.

# Example 2

## Higher education typically leads to higher income

- Higher education----(independent variable)

- Higher income----(dependent variable)

- Better occupation---- intervening variable

It is causally affected by education and itself affects income.

# Organismic Variable

Any characteristic of the research participant/individual under study that can be used for classification

Such as personal characteristics of gender, height, weight, age, etc. in behavioral sciences.

# Control/Constant variable

- It is variable that is NOT allowed to be changed unpredictably during an experiment.

- As they are ideally expected to remain the same, they are also called *constant variables*.

# Example

An example of a constant variable is the **voltage from a power supply.**

If you are examining "**How electricity affects experimental subjects**" you should keep the voltage constant, otherwise the energy supplied will change as the voltage will be changed.

# Interval Variable

- Interval variables have a numerical value

- These have order and equal intervals.

- They allow not only to rank order the items that are measured but also to quantify and compare the magnitudes of differences between them.

# Example

Suppose you have a variable such as monthly income that is measured in rupees, and we have three people who make

- Rs. 10,000
- Rs. 15,000 and
- Rs. 20,000

# Ratio Variable

A **ratio variable** is similar to an interval variable with one difference: **the ratio makes sense.**

# Example

- Let's say respondents were being surveyed about their stress levels on a scale of 0-10.

- A respondent with a stress level of 10 should have twice the stress experienced as a respondent who selected a stress level of 5.

Age, height, and weight are also good examples of ratio variables. Someone who is 6'.0" tall is twice as tall as someone who is 3'.0" tall.

# Nominal/Categorical Variable

- They can be measured only in terms of whether the individual items belong to certain distinct categories

- We cannot quantify or even rank/order the categories:

- Nominal data has no order

- One cannot perform arithmetic (+, -, /, *) or logical operations (>, <, =) on the nominal data.

# Example

Gender:    1. Male
(Dichotomous Variable) 2. Female

Marital Status:   1. Unmarried
       2. Married
       3. Divorcee
       4. Widower

# Ordinal Variable

- An ordinal variable is a nominal variable, but its different states are ordered in a meaningful sequence.

- Ordinal data has order but the intervals between scale points may be uneven.

- Because of lack of equal distances, arithmetic operations are impossible, but logical operations can be performed on the ordinal data.

- A typical example of an ordinal variable is the socio-economic status of families.

*We know 'upper middle' is higher than 'middle' but we cannot say 'how much higher'.*

# Example

A questionnaire on the time involvement of scientists in the 'perception and identification of research problems'.

The respondents were asked to indicate their involvement by selecting one of the following codes:

1 = Very low or nil
2 = Low
3 = Medium
4 = Great
5 = Very great

Here, the variable 'Time Involvement' is an ordinal variable with 5 states.

# Dummy Variable

A qualitative variable can be transformed into quantitative variable(s), called dummy variable.

# Example

| Description | Variable | Code |
|---|---|---|
| Gender | gender | f- female m-male |
| **Dummy Variable** | | **D-Gender** Female---1 otherwise 0 |
| Job Category | JOBCAT | 1-Clerical 2-Coustodian 3-Manager |
| **Dummy Variable** | **D1-Job Category** Clerical---1 otherwise 0 | **D2-Job Category** Custodian---1 otherwise 0 |

# Preference Variable

Preference variables are specific discrete variables whose values are either in a **decreasing or increasing order**.

For example,

In a survey, a respondent may be asked to indicate the importance of the following **FIVE** sources of information in his research and development work, by using the code [1] for the most important source and [5] for the least important source:

# Multiple Response Variable

Multiple response variables are those which can assume more than one value

# Example

**A typical example is a survey questionnaire about the use of computers in research.**

The respondents were asked to indicate the purpose(s) for which they use computers in their research work. The respondents could score more than one category.

1. Statistical analysis

2. Lab automation/ process control

3. Data base management, storage and retrieval

4. Modeling and simulation

5. Scientific and engineering calculations

6. Computer aided design (CAD)

# Extraneous Variable

Extraneous variables are **undesirable variables** that influence the relationship between the variables an experimenter is examining.

# Example

**An educational psychologist has developed a new learning strategy and is interested in examining the effectiveness of this strategy.**

The experimenter randomly assigns students into two groups. All of the students study text materials on a biology topic for thirty minutes. One group uses the new strategy and the other uses a strategy of their choice.

Then all students complete a test over the materials.

Extraneous variable ------ pre-knowledge of the biology topic

Thank You….