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Learning Outcomes:

After studying this module, you shall be able to:

- Understand the meaning of Variable
- Understand the concept of different types of Variables.
- Learn validity of a research and its types

2. Introduction

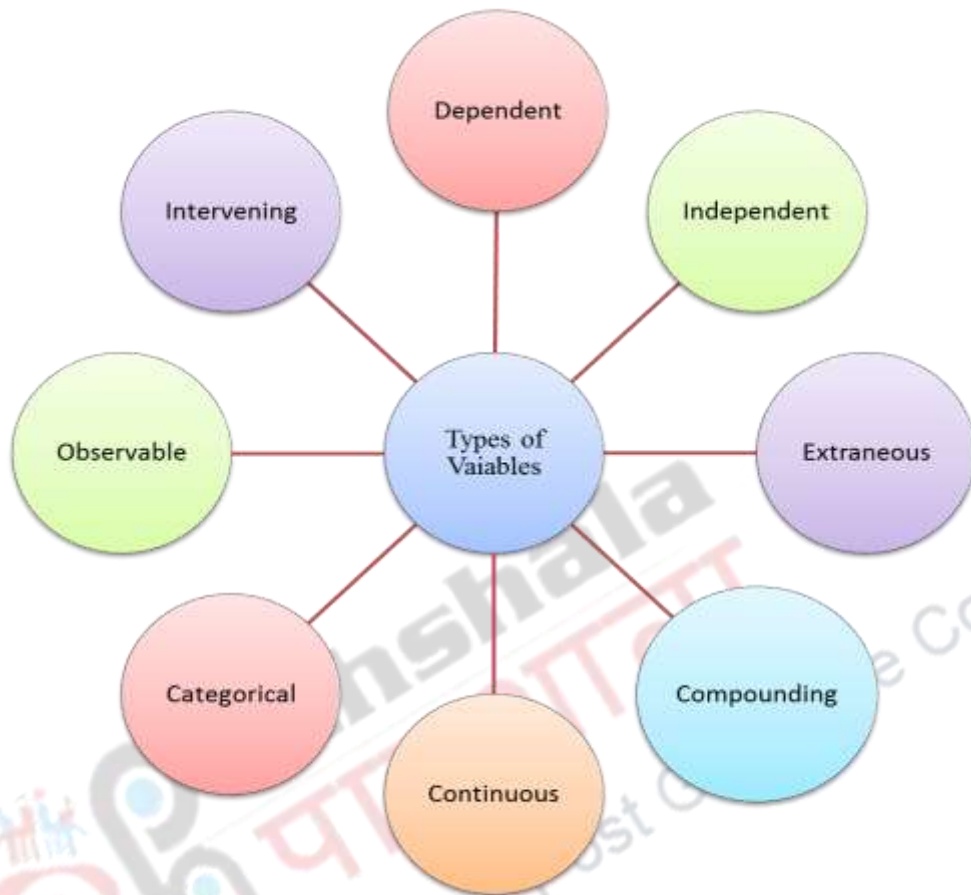
In its most common definition, anything that varies is known as a variable. However in a scientific manner it is defined with more precision and accuracy like variables are the conditions or characteristics that can be controlled, manipulated and observed by the researcher during the process of research. In other words, variables are those dimensions of objects, things, etc. that can be measured for the research gains. Intelligence, anxiety, attitude, aptitude etc. are the examples of variables used in psychological research. A variable is often represented as a *symbol*.

For example: X is a variable that is to be quantified. Variables can be categorized in many ways to enhance the validity of the research we, shall explore all these as we progress through the module.

Two qualities for which a researcher endeavors for are reliability and validity of his results.

Validity is the confidence that our research has in fulfilling its purpose. The research that serves the aim of applying its results to solution of the problems is a valid research. If the research does not fulfill its purpose, it is said to be invalid. There is a subtle difference in reliability and validity of a research.

Let us take up the example of a watch without its cell, it will never work as it does not show time, such a watch is reliable, but it is not valid because it is not fulfilling its purpose (i.e. the time).



3. Types of variables

3.1 Dependent Variable

Dependent variable (DV) is the variable or factor that researcher expect to change as a function of change in the independent variable. It is also known as response variable. For example: If the experimenter wants to study the effect of sex (male and female) upon attitude towards interpersonal relationships. So the DV is the attitude towards interpersonal relationship. Dependent variable must be reliable so as it must act systematically with respect to the independent variable, it should also be delicate as it must change in accordance with the independent variable and to be valid, the dependent variable must measure what it means to measure.

3.1.1 Measuring the Dependent Variable

To measure the dependent variable, following approaches are undertaken:

- The first approach can be the direct observation of the targeted behavior where the experimenter observes directly and, measure the intended behavior. For example: In a

- study by Schachter (1968) measuring the eating behavior measured the amount of food eaten by the subject as a function of different eating cues present.
- Second approach is a mirror reflection of the direct approach where the dependent variable works with the observable response which is *unseen*. Sometimes the experimenter tends to measure the blood-pressure, heart rate etc. are the examples.
 - Self-report is another kind of measure where the dependent variable is obtained by self-reports of the subject. In these kinds of report, the subjects are asked to express their feelings, attitudes, interests about the stimulus.
 - The last measure tends to be the judgment about a stimulus where the subject is asked to make judgment about a stimulus.

3.2 Independent Variable

The independent variable (IV) refers to the variable or factor that the researcher deliberately manipulates in a formal experiment or selected and categorized in non-experimental research for producing the change in dependent variable. It is also known as *controlled variable*. For example: If the experimenter wants to study the effect of sex (male and female) upon attitude towards interpersonal relationships. So the independent variable is the sex. Independent variable is manipulated by the experimenter and is classified on the basis of the nature of the variables. Thus, changes in the dependent variable depend on changes in the independent variable.

3.2.1 Classification of Independent variable:

Independent variable is classified into three categories:

- **Environmental variables** are those characteristics of the environment which are not included in the undertaking process but may produce change in the behavior. Temperature, noise, day or night etc. are the examples of environmental variable. For example in an examination, noise of the traffic may distort the examiner's point of view of giving an examination.
- **Task variables** refer to the characteristics which are linked with behavioral task presented to the subject. The physical characteristics of setup and many features of the task are included in the task variables.
- **Subject variables** are those characteristics of the subject that produce change in the behavioral patterns. Mood, intelligence, sex, weight, age etc. are considered as subject variables.

3.3 Extraneous Variable

Extraneous variables those variables that are not part of the manipulation, i.e. they are factors we haven't controlled. Extraneous variables may affect our results, but usually they affect all our conditions equally and so they do not create any biases in our results. They may affect the dependent variable. But the main idea should be that how do we control the Extraneous variable. There are three important ways by which we can control extraneous variable:

3.3.1 Controlling Extraneous Variable:

- **Technique of elimination:** By eliminating the extraneous variable completely from the experimental setup. For example if noise of traffic is an extraneous variable then the simple way to control it is by making the setup sound proof. But sometimes this technique is very difficult to manage variables like age, sex etc.
- **Constant condition:** When extraneous variable cannot be controlled by the elimination technique, this technique comes to the rescue by making it constant. For example, by making the conditions like temperature, lightening, instructions constant for all the participants. Sometimes extraneous variables like age, sex etc. become important, to control these variables this technique is used like selecting a homogeneous data like equal number of males and females.
- **Randomization:** It is the most favorite and popular technique of controlling extraneous variable. Under this technique, each member of the population or universe has independent and equal chance of getting selected without any biases.

3.4 Confounding Variables

In statistics, a confounding variable (also confounding factor, hidden variable, a confound) is an extraneous variable in a statistical model that correlates (directly or inversely) with both the dependent variable and the independent variable. For example: there is a statistical relationship between frozen yogurt consumption and number of drowning deaths for a given period. These two variables have a positive correlation with each other. An experimenter explains this correlation by inferring a causal relationship between the two variables (either that frozen yogurt consumption causes drowning, or that drowning causes frozen yogurt consumption). However, a more likely explanation is that the relationship between ice-cream consumption and drowning is false and that a third confounding variable i.e. the season influence both variables: during the summer, warmer temperatures lead to increased frozen yogurt consumption as well as more people swim and thus more drowning deaths occur.

3.4.1 Types of Confounding Variables:

Confounding Variables can be categorized into three types:

- An **operational confounding** can occur in both experimental and non-experimental research designs. This type of confounding occurs when a measure designed to assess a particular construct inadvertently measures something else as well.
- A **procedural confounding** can occur in a laboratory experiment. This type of confound occurs when the researcher unconsciously allows another variable to change along with the manipulated independent variable.
- A **person confounding** occurs when two or more groups of units are analyzed together (e.g., workers from different occupations), despite varying according to one or more other (observed or unobserved) characteristics (e.g., gender).

3.5 Continuous Variables:

Kerlinger (1973) defined “a continuous variable is capable of taking on an ordered set of values within a certain range. This definition means, first that the values of a continuous variable reflect at least a rank order, a large value of the variable meaning more of the property in question than a smaller value. The values yielded by a scale to measure dogmatism, for instance, express differing amounts of dogmatism from high through medium to low. Second, continuous measures in actual use are contained in a range and each individual obtains a score within the range. A scale to measure dogmatism may have the range 1 through 7.”

3.6 Categorical Variable:

Kerlinger (1973) defined “categorical variables as they belong to a kind of measurement called nominal. In nominal measurement there are two or more subsets of the set of objects being measured. Individuals are categorized by their possession of the characteristics that defines any subset. To categorize means to assign an object to a subclass or subset of a class or set on the basis of the objects having or not having the characteristics that define the subset. The simplest examples are dichotomous categorical variables: sex, Republican – Democrats.”

3.7 Observable and Intervening Variables:

Intervening variables are also known as constructs, it is a term invented to account for internal and directly unobservable psychological process that in turn account for behavior.(Kerlinger 1973). It is different from observable variables in the simple sense that observable behavior are observable.

4. Validity of Research

Validity is a very important phenomenon in scientific research. In its most common sense, Validity means “truth” and it is concerned with legitimacy. Thus it refers to degree of which a test measures what it intends to measure. It is the extent to which a measurement is well founded and to which the measurement corresponds accurate to the real world. Students often get confused and think that a valid study is one where the researcher found support for his (or her) hypothesis. This is not the case. A valid result is a correct result in terms of what is really true as opposed to what the researcher thought would be true.

All research strives to be high in validity. Any flaws must be minimized in order to draw valid conclusions from a study. There are two main types of validity: **Internal validity** concerns what goes on inside a study—whether the researcher tested what he or she intended to test. It is the validity of the measurement and test itself. **External validity** concerns things outside a study—the extent to which the results of the study can be generalized to other situations and people. The term ecological validity is often used as another term for external validity. Both are very important in analyzing the appropriateness and usefulness of a research study.

Let us take up an example, a researcher wishes to study “if absence makes heart grow fonder”. The study can be conducted by perhaps sending a person away from the relationship and see if this makes that person think more favorably of his or her partner or not. So, physical separation is the only criterion of separation. If only on this basis the researcher concludes that the study is

producing results that can be generalized to the population, it may not be valid. As there may be many more reasons for the resulting fondness such as, holidays, social networking, work stress etc.. in such circumstances one may find that the research does produce results but they are not applicable to the entire range of population from which the sample has been chosen.

Let us take another example, laboratory experiments are conducted in extremely controlled conditions and therefore can be repeated a number of times. Such research that involves laboratory experimentation can be reproduced with almost similar results time and again. This shows that the research has high internal validity.

5. Summary

- Variables are those dimensions of objects, things, etc. that can be measured. Intelligence, anxiety, attitude, aptitude etc. are the examples of variable used in psychology, sociology etc.
- Variables are likely described into four types i.e. Dependent, Independent, Extraneous and compounding variables.
- Dependent variable (DV) is that types of variables in which an experimenter makes *prediction*. It is also known as response variable.
- The first approach can be the direct observation of the targeted behavior where the experimenter observes directly and, measure the intended behavior.
- Self-report is another kind of measure where the dependent variable is obtained by self-reports of the subject. In these kinds of report, the subjects are asked to express their feelings, attitudes, interests about the stimulus
- The independent variable (IV) refers to the variable which is manipulated, selected and calculated by the experimenter for producing the change in Dependent variable. Independent variable also makes predictions about DV.
- It is also known as *controlled variable*.
- Environmental variables are those characteristics of the environment which are not included in the undertaking process but may produce change in the behavior. Temperature, noise, day or night etc. are the examples of environmental variable. For example in an examination, noise of the traffic may distort the examiner's point of view of giving an examination.
- Extraneous variables those variables that are not part of the manipulation, i.e. they are factors we haven't controlled. Extraneous variables may affect our results, but usually they affect all our conditions equally and so they do not create any biases in our results.
- By eliminating the extraneous variable completely from the experimental setup. For example if noise of traffic is an extraneous variable then the simple way to control it is by

making the setup sound proof. But sometimes this technique is very difficult to manage variables like age, sex etc.

- Intervening variables are also known as constructs, it is a term invented to account for internal and directly unobservable psychological process that in turn account for behavior.(Kerlinger 1973). It is different from observable variables in the simple sense that observable behavior are observable.
- In statistics, a confounding variable (also confounding factor, hidden variable, a confound) is an extraneous variable in a statistical model that correlates (directly or inversely) with both the dependent variable and the independent variable.
- Validity is a very important phenomenon in scientific studies. In its most common sense, validity means “truth”. Thus it refers to degree of which a test measures what it intends to measure. There are two main types of validity namely **internal and external** validity.
- Validity of a test is highly influenced by its uniform length of a test. Longer the test, more would be its validity, thus it is very important to have a uniform length for a test.

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