Variables in research

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INRODUCTION

"Variable" is a term frequently used in research projects. It is pertinent to define and identify the variables while designing quantitative research projects. A variable incites excitement in any research than constants. It is therefore critical for beginners in research to have clarity about this term and the related concepts.

Variable, to put in layman statement is something that can change and or can have more than one value. ''A variable, as the name implies, is something that varies".[1″] It may be weight, height, anxiety levels, income, body temperature and so on. Each of these properties varies from one person to another and also has different values along a continuum. It could be demographic, physical or social and include religion, income, occupation, temperature, humidity, language, food, fashion, etc. Some variables can be quite concrete and clear, such as gender, birth order, types of blood group etc while others can be considerably more abstract and vague.

 "Variable is a property that takes on different values".[2] It is also a logical grouping of attributes.[3] Attributes are characteristics or qualities that describe an object. For example if gender is a variable then male and female are the attributes. If residence is the variable then urban, semi urban, rural become the attributes. So attributes here describe the residence of an individual.

It is pertinent for a researcher to know as how certain variables within a study are related to each other. It is thus important to define the variables to facilitate accurate explanation of the relationship between the variables. There is no limit to the number of variables that can be measured, although the more variables, the more complex the study and the more complex the statistical analysis. Moreover the longer the list of variables, the longer the time required for data collection.

Variables can be defined in terms of measurable factors through a process of operationalization. It will convert difficult concepts into easily understandable concepts which then can be measured, empirically. "It is essential to define the term as variables so that they can be quantified and measured. That is, the variable have to be able to work for you to operate, or becomes operational".[4]

There are different types of variables and having their influence differently in a study viz. Independent & dependent variables, Active and attribute variables, Continuous, discrete and categorical variable, Extraneous variables and Demographic variables.

INDEPENDENT & DEPENDENT VARIABLE

The independent variable is the antecedent while the dependent variable is the consequent. If the independent variable is an active variable then we manipulate the values of the variable to study its affect on another variable. In the above example, we alter anxiety level to see if responsiveness to pain reduction medication is enhanced. Anxiety level is the active independent variable.

Dependent variable is the variable that is affected by the independent variable. Responsiveness to pain reduction medication is the dependent variable in the above example. The dependent variable is dependent on the independent variable

ACTIVE AND ATTRIBUTE VARIABLES

Variables are often characteristics of research subjects, such as their age, health beliefs, or weight etc. ''Variables which cannot be manipulated are attribute variables and the variables that the researcher creates are the active variables".[2] Active variables can also be independent variables. E.g. effectiveness of

communication board in meeting the needs of the intubated patients. Communication board is an 'active independent variable' as it can be modified according to the needs of the patients or according to the requirement in the study and it is researcher's concept. It is also the cause i.e. independent variable. .

Attribute variable is a variable where we do not alter the variable during the study. It can also be the independent variable, but it has limitations. Some attribute variables are age, gender, blood group, color of eyes, etc. We might want to study the effect of age on weight. We cannot change a person's age, but we can study people of different ages and weights. "An active variable in one study could be an attribute variable in another study''.

CONTINOUS, DISCRETE AND CATEGORIAL VARIABLES

Sometimes variables take on a wide range of values on a continuum. ''A continuous variable can assume an infinite number of values between two points''.[1] If we consider the continuous variable weight: between 1 and 2 Kg, the number of values is limitless: 1.005, 1.7, 1.33333, and so on. Continuous measures in actual use are contained in a range each individual obtains a score within the range.[1] On the other hand, a discrete variable is one that has a finite number of values between any two points, representing discrete quantities.

Categorial variables, belongs to a kind of measurement called nominal. In nominal measurements there are two or more subsets of the set objects being measured. "They have a simple requirement that all the members of the subset are considered the same and all are assigned the same name (nominal) and the same numeral".[2] That is, they can be measured only in terms of whether the individual items belong to certain distinct categories, but we cannot quantify or even rank order the categories. The variable gender, for example, has only two values (male and female). Variables that take on only a handful of discrete non quantitative values are categorical variables.

"When categorical variables takes on only two values, they are sometimes referred to as dichotomous variables".[1] Some examples of dichotomous variables and multiple variables are:

EXTRANEOUS VARIABLES

It happens sometimes that after completion of the study we wonder that the actual result is not what we expected. In spite of taking all the possible measures the outcome is unexpected. It is because of extraneous variables. Variables that may affect research outcomes but have not been adequately considered in the study are termed as extraneous variables. Extraneous variables exist in all studies and can affect the measurement of study variables and the relationship among these variables. "Extraneous variables that are not recognized until the study is in process, or are recognized before the study is initiated but cannot be controlled, are referred to as *confounding variables*".[5] Certain external variables may influence the relationship between the research variables, even though researcher cannot see it. These variables are called *intervening variables*. For example, girl's knowledge and practices helps in maintaining menstrual hygiene. Here, motivation, mother and friends, mass media, are some intervening variables which may also help in maintaining menstrual hygiene. Thus, if these two factors are not controlled it would be impossible to know what the underlying cause really is.

DEMOGRAPHIC VARIABLES:

"Demographic variables are characteristics or attributes of subjects that are collected to describe the sample".[5] They are also called sample characteristics. It means these variables describe study sample and determine if samples are representative of the population of interest. Although demographic variables cannot be manipulated, researchers can explain relationships between demographic variables and dependent variables. Some common demographic variables are age, gender, occupation, marital status, income etc.

VARIABLES	EXAMPLES
Dichotomous Variables	Gender: Male and female Type of property: Commercial and residential Pregnant and non pregnant Alive and dead HIV positive and HIV negative Education: Literate and illiterate
Trichotomous Variables	Residence: Urban, semi urban and rural Religion: Hindu, muslim, and Christianity.
Multiple Variables	Blood groups: A,B,AB and O

MEASURING VARIABLES

In order to do an analysis, the variables have to be quantified; this means measuring giving values and scale. Sometimes identification of variables and determining how to measure them looks quite simple, but due to vaguely defined variables measuring can be difficult too. There are four levels of measurements on a continuum of discrete and continuous: nominal-scale, ordinal-scale, interval-scale and ratio-scale. Nominal scale is used when the variables can be categorized but cannot be ranked. E.g. gender, marital status, race, diagnosis, blood group etc. Ordinal scale is one were the variables are categorized that can be ranked. Eg. Levels of pain mild, moderate or severe. Interval scale measures equal numerical distances between the intervals. It can be categorized, as well as ranked. Eg. difference between 70 degree and 80 degree will be same as the difference between 30 degree and 40 degree. So the interval is of 10 degree in both the categories. Ratio scale measures variables which can be categorized, ranked, have equal intervals and can represent a continuum of values.

Thus, the most difficult part of planning a research study is identifying the research variables and research design. Considerable time and thought needs to be given to this step. Once the key variables have been identified, then the research study can be developed.

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