

APPLICATION OF CORRELATIONAL RESEARCH DESIGN IN NURSING AND MEDICAL RESEARCH

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Abstract

Correlational design is a study design for examining the relationships between or among two or more variables in a single group, which can occur at several levels. It is a type of non-experimental design that examines the relationship between two or more variables. It should be remembered that the researcher is not testing the cause-and-effect relationship. A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two or more variables. The direction of a correlation can be either positive or negative. Correlational research refers to a non-experimental research method which studies the relationship between two variables with the help of statistical analysis. Correlational research design does not study the effects of extraneous variables on the variables under study. In cases where carrying out experimental research is unethical, correlational research can be used to determine the relationship between 2 variables. Unwanted or extraneous variables can thus be controlled, the variance of specific variables is enhanced and the possibility of error in measurement is minimized. Nursing and medical Researcher need to have an updated knowledge regarding the various sub design under correlational research. This paper will focus on various types of Correlational design available.

Key words: Research Design, Correlational Design, Nursing Research, Medical Research, Research Variables, Relationship In Research

INTRODUCTION

Research is a major force in nursing and the evidence generated from research is changing practice, education and health policy. Nursing research is essential for the development of empirical knowledge that enables nurses to provide evidence-based

nursing care for patients and families. Thus, care provided by nurses must be constantly evaluated and improved on the basis of new and refined research knowledge. Each research has a design for conducting a study. Research design is a blueprint. Just as a blueprint made for a house is individualized to a specific home being built, so must the design be made specific to a study.¹

The research design is the plan, structure and strategy of investigations of answering the research question. It is the overall plan or blue-print the researchers select to carry out their study.

According to Kerlinger, research design has 2 basic purposes:

1. To provide answers to research questions
2. To control variance

Variance is controlled by planning the study in such a way as to rule out other hypothesis or other intervening variables as causes of the study outcome. Control is defined as the measures that the researcher used to hold the conditions of the investigation uniform. The research design consists of the strategy used to find answers to the research questions. This strategy is tailored by the objective of the study, the expertise of the researcher, the constraints placed on time and expenditure, the availability of subjects and means to elicit information from them. The design of a research study logically follows the identification of a research question, a search of the literature and a statement of hypothesis. The hypothesis is defined as a statement of the relations between two or more variables and carries clear implication for testing those stated relations.^{1,2}

Elements of Research Design

A good research design includes several elements which are as follows:

1. Description of subjects (who): Subjects are the individuals who take part in the research study. They are the recipients of the experiment and are observed in a descriptive survey. Subjects in nursing research may be individual human beings, couples, families, groups or communities.
2. Observation of variable (what): Variables are the focus of the study and reflect the empirical aspects of the concept being studied.
3. Measures of time (when): Time is the frequency (how often) and the order (when) in which observations are made.
4. Setting (where): Setting may be natural or laboratory setting depending upon study topic and researcher's choice.
5. Investigator's role: In some studies, the investigator remains unobtrusive, attempting not to influence the variables being studied. In other studies, the

investigator imposes control on many variables, actively manipulates some of the variables being studied.²

TYPES OF DESIGN FOR NURSING STUDIES

A variety of study designs are used in nursing research. The four commonly used are:

- Descriptive
- Quasi-experimental
- Experimental
- Non- experimental

Descriptive design is further divided into correlational, comparative, case study, cross-sectional and longitudinal studies.^{1,2,3}

CORRELATIONAL DESIGN

Correlational design is a study design for examining the relationships between or among two or more variables in a single group, which can occur at several levels. It is a type of non-experimental design that examines the relationship between two or more variables. It should be remembered that the researcher is not testing the cause-and-effect relationship.⁴

A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two or more variables. The direction of a correlation can be either positive or negative.^{4,5}

Correlational research refers to a non-experimental research method which studies the relationship between two variables with the help of statistical analysis. Correlational research design does not study the effects of extraneous variables on the variables under study. In cases where carrying out experimental research is unethical, correlational research can be used to determine the relationship between 2 variables. For example, when studying humans, carrying out an experiment can be seen as unsafe or unethical; hence, choosing correlational research would be the best option.^{4,5,6}

In correlation design, the researchers study the effect of a potential cause that they cannot manipulate. They use designs that examine relationships between variables. Many variables of interest to nursing researchers cannot be manipulated. Attitudes, beliefs, or behaviours are concepts that are often thought of as causal in health, illness, response to treatment and other effects. A correlation is an interrelationship or association between two variables, that is, a tendency for variation in one variable to be related to variation in another (e.g., people's height and weight). Correlations can be detected through statistical analyses. A famous research dictum is: Correlation does not prove causation.

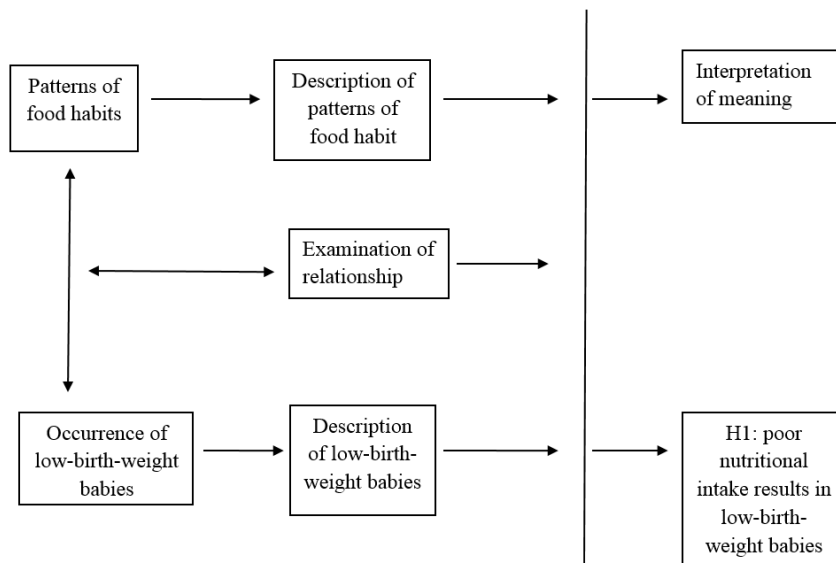
That is, the mere existence of a relationship between variables is not sufficient to warrant the conclusion that one variable caused the other, even if the relationship is strong.⁷

Example: A study of relationship between the pattern of food habits and the occurrence of low-birth-weight babies among middle income family of primi mothers of a selected urban community in West Bengal. In this study, the relationship between how and what the mother's nutritional intake and the occurrence of low-birth-weight babies is examined. The result may reveal that the mothers with poor food habits lead to low-birth-weight babies. Although, the study may reveal a positive correlation, causality cannot be assigned. Both the variables are described and their relationship examined. The meanings are interpreted and hypothesis is developed.^{7,8}

CHARACTERISTICS:

1. It attempts to identify relationship
2. It typically involves two or more variables and one group
3. It involves establishing relationship.

Figure 1: Correlational Design⁶



POSITIVE AND NEGATIVE CORRELATION

Correlation determines relationship between two variables. For example, changes in one variable influence other variable, we can say that there exists correlation between the two variables. For example, we can say that there exists a correlation between the number of

hours spent in reading and preparation and the scores obtained in the examination. One can infer that higher the amount of time spent on preparation may result in better performance in examination leading to higher scores. Hence, it is a case of positive correlation. If an increase in independent variable leads to an increase in dependent variable, it is a case of positive correlation.^{6, 7, 8}

On the other hand, if an increase in independent variable leads to decrease in dependent variable, it is a case of negative correlation.

Example: Relationship between age advancement and resistance to disease. As age advances, resistance due to disease reduces.

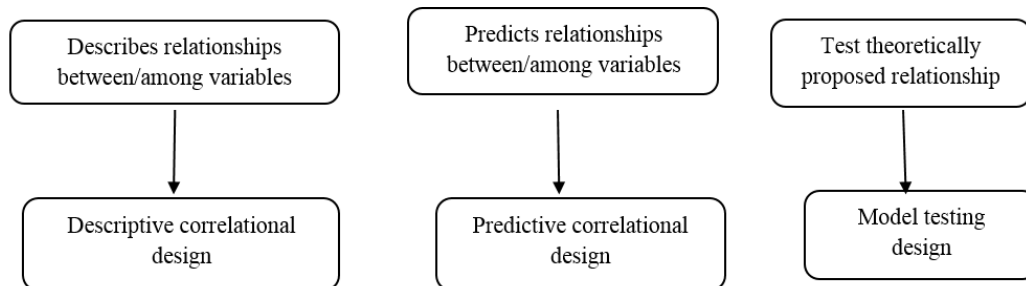
TYPES OF CORRELATIONAL DESIGN

There are three types of correlational design which are as follows:

1. Descriptive correlational design
2. Predictive correlational design
3. Model testing design

To determine the type of correlational design, the following algorithm may be considered:

Figure 2: Algorithm for determining type of correlational design⁶



1. DESCRIPTIVE CORRELATIONAL DESIGN:

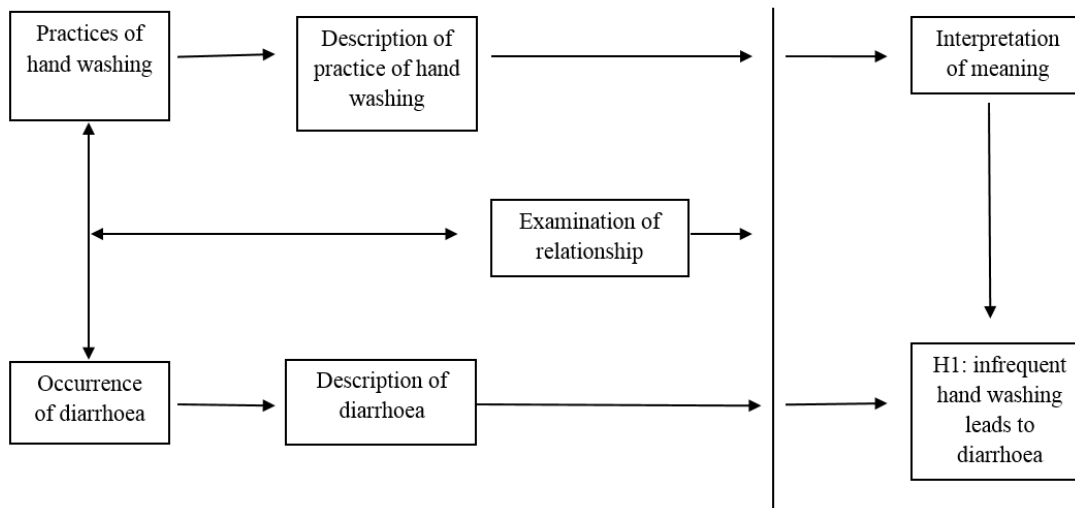
Definition:

A descriptive correlational design is a research study where the researcher seeks to describe a relationship among variables, without attempting to infer causal relationship.

Example: A study of practice of proper hand washing in handling of food and occurrence of diarrhoea among selected rural household of West Bengal. The two variables, viz. the practice of hand washing and occurrence of diarrhoea are described and then relationship is examined. After that interpretation of the meaning of the relationship is carried out,

developing a hypothesis. Here, only the variables i.e., the practice of hand washing and occurrence of diarrhoea are described. Causal relationship cannot be established.⁷

Figure 3: Descriptive Correlational Design⁶



Purpose:

- To describe a relationship or determine existence between or among two or more variables in a single group.⁵

Characteristics:

- It facilitates the identification of many interrelationships in a situation.
- The study may examine variables in a situation that has already occurred or is currently occurring.
- Researcher makes no attempt to control or manipulate the situation.
- Variables must be clearly identified and defined.^{5,6}

2. PREDICTIVE CORRELATIONAL DESIGN:

Definition:

Prediction is one approach of research study to examining causal relationships between the variables. In Prediction studies, degree of relationship that exists between 2 variables to predict one variable from the other is focused.

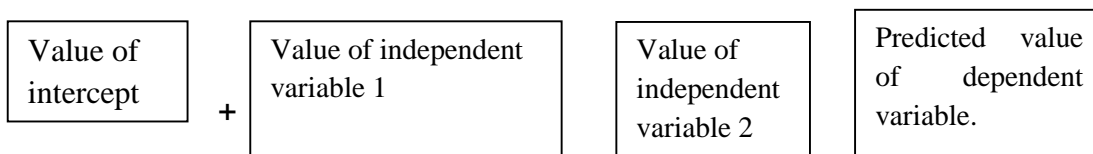
Purpose:

- To predict the value of one variable based on values obtained for another variable(s).

Characteristics:

- Because causal phenomenon is being examined, the terms dependent and independent are used to describe the variables.
- A predictive study attempts to predict the level of the dependent variable from the independent variables.
- The independent variables that are most effective in prediction are highly correlated with other independent variables used in the study.
- Predictive correlational designs require the development of a theory-based mathematical hypothesis proposing variables expected to effectively predict the dependent variable.
- Predictive research seeks to forecast the likelihood of particular phenomena occurring in a given circumstance.
- It is always quantitative because it involves identifying and/or defining measurable (quantifiable) effects.⁸

Figure 3: Predictive design⁶



Example: If reading and spelling are correlated, then we can use the information to predict a student's score on the spelling test if the student has only taken the reading test. Conversely, we could predict the student's score on the reading test given the student's score on the spelling test.

3. MODEL TESTING DESIGN:

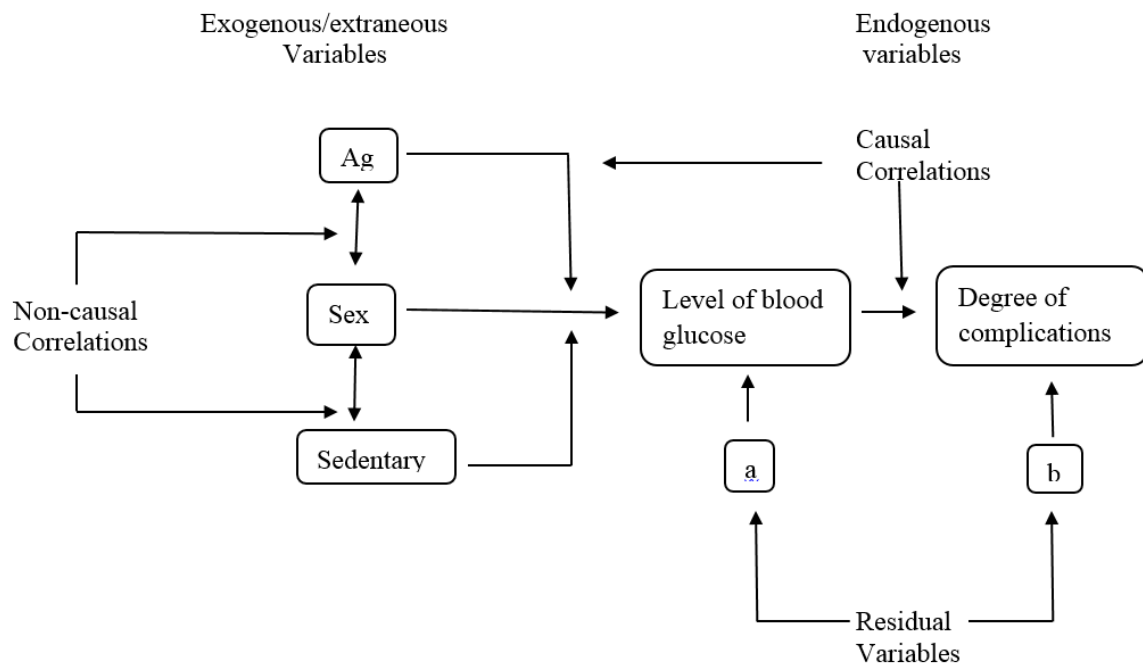
This design is similar to predictive correlational design but is testing a hypothesized causal model. In model testing design, all the relationships proposed by a theory are tested simultaneously. Model testing design is designed specifically to test the accuracy of a hypothesized causal model. This model requires that all variables relevant to the

model be measured. A large, heterogeneous sample is required and a very tight measurement of variable. Investigators identify all of the paths expressing relationships between concepts and develop a conceptual map. The analysis determines whether the data are consistent with the model.^{1,2,6}

Example: Study of level of blood glucose and degree of complications among sedentary male workers of age group 45-55 years who has been diabetic for the past 4 years in a selected urban community of West Bengal.

Here, the endogenous variables are level of blood glucose and degree of complications. The exogenous or extraneous variables are the age, sex and sedentary worker. There is a causal relationship between the endogenous variables and a non-causal relationship among the exogenous variables. The residual variables can be the treatment received. There may or may not be residual variables. The model can be depicted as follows⁶:

Figure 4: Model- testing design⁶



All correlational designs demand a conceptual framework or an explanation of why the researcher thinks these variables are related to one another and how. The basic assumptions of the designs are that the variables exist in the population, the sample represents the population (probability sampling), the variables can be measured accurately and there is no manipulation of variables. Researchers generally use correlational designs when they are not sure if the variables are related to each other;

when they think the variables are related to each other but are not sure how they are related; or when they think variables are related to each other, but do not know how strong that relationship really is.⁴

ADVANTAGES OF CORRELATIONAL STUDY

Following are the advantages of correlational study:

1. Fairly easy to conduct
2. An increased flexibility when investigating complex relationships among variables.
3. An increased and effective method of collecting a larger amount of data about a problem area
4. A potential for practical application in clinical settings
5. A potential foundation for future, more rigorous study
6. A possible framework for investigating relationship between variables that are inherently not manipulated.^{7,8,9}

DISADVANTAGES OF CORRELATIONAL STUDY

Following are the disadvantages of correlational study:

1. Actual reason for associations found is quite unclear.
2. The variables of interest are beyond the researcher's control
3. The researcher is unable to manipulate the variables of interest
4. The researcher does not employ randomisation in sampling procedures because of dealing with pre-existing groups, and therefore generalisation is decreased.
5. The researcher is unable to determine a causal relationship between the variables because of lack of manipulation, control and randomisation.
6. It is unethical to use correlational designs when the instrumentation is neither valid nor reliable and when there is no possibility of producing usable results.
7. It is impossible to use correlational designs when there has been no previous research on the variables; when variables cannot be measured numerically and when the sample is too small.
8. Correlational studies are susceptible to faulty interpretations because the researcher works with pre-existing groups that were not found at random but rather by a self-selecting process.^{7,8,9}

CONCLUSION

The purpose of research design is to maximize the possibility of obtaining valid answers to research questions or hypotheses. A good design provides the subjects, the settings and the protocols within which these comparisons can be clearly examined. The design is a set of instructions to the researcher to gather and analyse data in certain ways that will control who and what are to be studied. Unwanted or extraneous variables can thus be controlled, the variance of specific variables is enhanced and the possibility of error in measurement is minimized. Correlational and comparative study are also important method of research design but if we have to weigh the advantage, comparative design is more advantageous than correlational study.

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