



**KING SAUD UNIVERSITY  
COLLAGE OF NURSING  
NURSING ADMINISTRATION & EDUCATION DEPT.**

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**NURSING RESEARCH**

**(NUR 412)**

**MODULE 5**

**Selecting a Research Design**

**Course Coordinator**

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**1437 – 1438 H**

## Learning Outcomes:

By completing this module, the student is expected to:

1. Define Experimental Research
2. Discuss the purposes of research design.
3. Distinguish Among True Experimental, Quasi-Experimental, and non-experimental research designs.
4. Describe Three Quasi-experimental Designs
5. Discuss Four Types Of Non-experimental Research Designs.
6. Understand the characteristics of good research design.

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- **Research design:** Is the researcher's overall plan for answering the research questions or testing the research hypotheses.

### Purpose of research design:

Research design aims at giving decisions regarding the following aspects of the study:

1. **What** to do?
  2. **When** to do it?
  3. **Where** to do it?
  4. **How** to do it?
  5. **Who** will do it?
  6. **The sequence** of doing the steps.
- There are several research designs. Some are appropriate for certain kind of researches, while others are suitable for other kind of researches.
  - Sometimes the nature of the study dedicates the type of research design to be used for other researchers; several types of research design could be used.
  - Before developing the research design, the researcher has to remember that:

- Both of *descriptive and correlational researches* examine the variables *as they exist* in natural environment and do not include any manipulation.
- All *experimental researches* examine *cause and effect*, i.e.; differences in the dependent variable (D.V.) that are thought to be caused by the independent one (I.V.).

## **Types of research design:**

There are three main types (classifications) of research design, these are:

1. The experimental research design.
2. Quasi-experimental design.
3. The non-experimental research design.

### **I. The experimental research designs:**

- These types of research design differ with regard to the amount of control over the independent variable.

#### **1. True experimental research:**

It is a research design in which the researcher manipulates the independent variable and measures the variations in the dependent variable accordingly. So, researcher - here- is an active agent.

#### ***Characteristics of experimental design:***

- a. ***Manipulation:*** in which the researcher intentionally varies the independent variable and observes the effect of that manipulation on the dependent variable.
  - ✓ The manipulation usually involves some type of intervention on the part of the researcher. That is why he/she is an active agent.
  - ✓ Here, the experimenter controls and consciously varies the independent variable and then observes its effect on the dependent variable.

**Example:**

*If the researcher want to investigate the effect of three different drugs (I.V.) on the blood pressure. (D.V.). He has to manipulate the drugs (drug a, b & c), as independent variables, and monitor the effect of each one on the B.P, the variable of interest.*

- b. Control:** It is the process of holding constant possible influences on the dependent variable (D.V.) under investigation. Such control is usually acquired by manipulation, use of control group, careful preparation of the research plan.
- **Control group:** is a group of subjects in the study who **do not** receive the manipulation/experimental treatment or intervention, and whose performance provides a **baseline against which the effects of the treatment or manipulation can be measured through comparison.**
- Thus, a true experimental research design should contain at least two groups:
  - One or more experimental group(s), who is given the treatment/intervention/manipulation.
  - One control group who is not given the treatment/intervention/manipulation.
- Then, the effect of the manipulation on the D.V. among the experimental group is measured by comparing it among the two groups.

**Example: "Effect of X relaxation technique on B.P."**

Experimental Group (G1)	B.P. (yb1)	----- X -----	B.P. (ya1)
Control Group (G2)	B.P. (yb2)	-----	B.P. (ya2)

yb1- ya1= D1    When there is a difference between D1 & D2. Thus,  
yb2- ya2= D2    X was effective, and vice versa.

- c. **Randomization:** It is the choice of study subjects as well as their assignment to groups randomly, i.e., on random basis.
- By random, it is meant that each subject has an equal chance to be chosen and/or assigned to either group.
  - **Methods of randomization include:**
    - Flip a coin.
    - Use of random table.
    - Use of computers.
  - Generally, the true experimental research design is the best (because it gives the most valid results that could be generalized), yet most difficult one.

***Advantages of experimental design:***

1. The most powerful design to test hypotheses of cause-and-effect relationships.
2. Its controlling properties provide for greater corroboration (تأييد) than any other design.

***Disadvantages of experimental design:***

1. A number of interesting variables simply are not suitable to manipulation, (for example, a large number of human characteristics, such as disease or health habits, cannot be randomly conferred on people).
2. There are many variables that could technically (but not ethically) be manipulated.

## II. Quasi-Experimental research:

- It is a research design that searches for knowledge and examination of causality in situations in which complete control is not possible.
- It lacks at least one of two characteristics of the true experiment research design, mainly *randomization*, and/or *control group*, but never manipulation.

### Types of quasi-experimental research:

There are several quasi-experimental designs, but the following are the most commonly used by nurse researcher.

#### 1. *One-group post test design:*

In this type, the researcher, for example wants to introduce a new teaching approach to his students. He goes on and uses this approach, then evaluates the effect of this (X) new approach on students' achievement (y) at the end of the course.

D.V. ----- students' achievement (y).

I.V. ----- new approach (X).

Sample: ----- one group only, an experimental group.

#### *Disadvantages:*

1. It is a weak research as it has no measure of change as a result of manipulation (X), because there was no pretest before the introduction of (X).
2. There is no comparison with another group to avoid the doubt of having a change (if present) due to either: *maturation or time*, and not as a result of exposure to (X).

## 2. *One-group pre & post-test design:*

- It is the same as the one-group post-test design, except that a pretest is performed before the manipulation, i.e. the introduction of the (X) new teaching approach.
- This is better than the previous one as it measures changes after manipulation through the comparison between the pre-test and the post-test.
- Yet, it still lacks comparison with another group who is not manipulated (i.e., control group) because the change may be due to maturation, time factor, or other extraneous variable.

## 3. *Time-Series design:*

- This is also one-group design, i.e., without a control group. But, it is better than the two previously mentioned designs, as it includes a method of overcoming the lack of the control group.
- The collection of data, in this design, is done 2 to 3 times before and after manipulation. That is, data is collected over an extended time period, and (X) is introduced during the course of data collection.
- The repeated data collection of the dependent variable (y) controls most of the extraneous variables which may be maturation and/or time factor. Therefore, the effect of the independent variable is more *justifiable* now.

### ***Example of a time-series design:***

Study the effect of a low-impact aerobic exercise program on fatigue and aerobic fitness among people with rheumatoid arthritis.

Here, the researchers obtained measures of their outcome variables before the intervention, at mid-treatment (after 6 weeks of exercise), at the end of treatment (12 weeks of exercise), and at a 15-week follow-up.

***Advantages of quasi-experimental research design:***

1. It is a practical design. In nursing, it is sometimes not feasible to conduct true experiments (because we deal mainly with human beings).

***Disadvantages:***

1. It is difficult to make a cause-and-effect inference as easily as the researcher can do with experiments.
2. There are alternative explanations for the observed results.

**III. The Non-experimental research designs**

Many research problems cannot be addressed with an experimental or quasi-experimental design. For example, suppose we are interested in studying the effect of widowhood on physical and psychological functioning. Here, independent variable is widowhood versus non-widowhood. Widowhood cannot be manipulated; people lose their spouses by a process that is neither random nor subject to research control. Thus, we would have to proceed by taking the two groups (widows and non-widows) as they naturally occur and comparing their psychological and physical well-being.

**Definition:**

Non-experimental research design is a design in which the researcher is a *passive agent*, who observes, measures, and describes a phenomenon as it occurs or exists.

**Characteristics of non-experimental design:**

1. No manipulation can be done for the variables.
2. Dependent and independent variables should not be used with such studies because there is *no attempt to establish causality*. It only delineates the phenomenon.
3. The study proposition here will be a *question* or *hypothesis*.
4. Some designs may contain one or two variables, while others may contain several variables. So, they vary in their levels of complexity.





### **3. Practical constraints on manipulation:**

Such as inconvenience, lack of cooperation, and lack of money (budget).

## **Types of Non-Experimental Research Designs:**

1. Pure descriptive design.
2. Correlational descriptive design.
3. Other types.

### **1. Pure descriptive design:**

This is a design that aims to obtain information about a current existing phenomenon of interest. That is to describe what exists in terms of frequency of occurrence (i.e., presence or absence) rather than to describe a relationship between variables. Therefore, the research proposition here is always a **question**.

1. For example: "Saudi women's experience of menopause"

For this study, a pure descriptive research design is used to describe the experience of menopause among Saudi women.

2. The researcher finds out, and describes several variables such as:

- Age.
- Physical symptoms.
- Emotional symptoms.
- Medications.
- Health care.
- Stage of family life....etc.

3. All these variables are included in the study, and the researcher has to describe each one independently without relating them to each other ..... **Here, this is a pure descriptive design.**

### **2. Correlational descriptive research design:**

It is a research design that explores the interrelationship between variables of interest without any active intervention or manipulation of the independent variable by the researcher.

1. It only describes the existing relationship without fully understanding or explaining the complex causal pathway that exists. Therefore, it is a relationship that is not causal in nature. It is an **associative relationship**.
2. For example: "are men more likely than women to become smokers?"
3. The answer from such a research would be either **YES** or **NO**. It describes the present situation in this time and place with no generalizations because the research results do not depend on a causal relationship between a genetic factor in men/women and smoking.

### **Types of correlational descriptive research design:**

There are two types of correlational descriptive research design: retrospective and prospective research designs.

#### **a. Retrospective correlational descriptive research:**

- This is a study that begins with *manifestation* of the *dependent variable in the present*, and then link it to some *presumed cause* in the *past*. That is observing the dependent variable now, and then goes to the independent variable in the past. (i.e., searching back).
- For example: the researcher starts with the infants born with malformations (D.V.) then looks for/links it with some retrospective presumed (I.V.) such as Rubella in pregnancy.
- The researcher can conclude from this study that the percent of malformations among mothers who got rubella during pregnancy was higher than that among mothers who did not get rubella during pregnancy. But, he cannot conclude or generalize that rubella had caused the malformation.
- Here, the study proposition could be either a *question* or a *hypothesis* (associative and non-directional in nature).
  - *Question*..... Is there a relationship between rubella during pregnancy and incidence of congenital malformation?

- *Hypothesis*..... will be:
  - H1: The incidence of newborn's malformations among mothers, who had rubella in pregnancy, is different than that among mothers who had not get rubella during pregnancy.
  - H0: The incidence of newborns malformation does not differ among mothers who had rubella during pregnancy and others who did not have rubella during pregnancy.
  
- The researcher will study 500 cases of newborns' malformation and look through their mothers antenatal records to find out how many of these 500 mothers had rubella and how many did not have it:
  1. If the percentages of both groups are equal: i.e., 250 got rubella and 250 did not ..... there is no relationship nor association between rubella and malformation.
  2. If the percentage was 150 got rubella and 350 did not ..... there is no relationship nor association between rubella and malformation.
  3. If the percentage was 350 got rubella and 150 did not ..... Thus, rubella is associated with malformation. But, one cannot conclude nor generalize that rubella had caused malformation.

**b. Prospective correlational descriptive research:**

- It is a design that begins with the *examination of a presumed cause in the present* (I.V.), then *goes forward* in time to link it with a presumed effect (D.V.) in the future.(i.e., search forward).

- For example: If a researcher wants to test the hypothesis "The incidence of rubella during pregnancy is associated with or related to malformations in newborns".
  - To do this research prospectively, the researcher begins with a sample of pregnant women, one group who got rubella, and another group who did not.
  - Then he waits till they deliver and observes/measures the incidence of malformation among the two groups.
  - The results of the study would be an identification of the malformation among both groups. Then, comparing them with each other to find out in which group it is higher.
  
- Again, in this example, one cannot conclude nor generalize that rubella had caused the malformation. Only, presence of an association.

### **Difference between retrospective and prospective designs:**

<b>Retrospective design</b>	<b>Prospective design</b>
<ul style="list-style-type: none"> <li>• Researcher <i>starts with a presumed effect</i> (D.V.) in the present and goes <i>back</i> in time to link it with a presumed cause in the <i>past</i> (I.V.).</li> </ul>	<ul style="list-style-type: none"> <li>• Researcher <i>starts with a presumed cause</i> (I.V.) in the present and goes <i>forward</i> in time to link it with a presumed effect (D.V.) in the <i>future</i>.</li> </ul>
<ul style="list-style-type: none"> <li>• Research direction is <i>backward, in time</i>.</li> </ul>	<ul style="list-style-type: none"> <li>• Research direction is <i>forward, in time</i>.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Easier</i> because data are collected in a limited time by investigation of records or asking subjects about some previous information, behavior, or instances.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Difficult</i> because data collection; takes time and energy, needs larger sample, especially if D.V. is rare such as malformation.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Weaker</i>.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Stronger</i>.</li> </ul>

### 3. *Other non-experimental research designs:*

#### a. **Surveys:**

- *Surveys* refer to “Studies in which information is obtained from a population or sample of individuals by means of *self-report*”. *Self reporting* means that the subjects responses to a series of questions posed by the researcher.
- The content of survey researches is limited by the extent to which respondents are willing to report on a topic.
- It usually focuses on examining people's characteristics, opinions, behaviors, attitudes...etc.
- For example:
  - "The sleeping patterns among X population".
  - "The compliance in taking medication among ....".
  - "Saudi's knowledge about X".
  - "Saudi's attitudes about X".
- Most surveys secure data about demographic characteristics such as: age, sex, education, occupation, marital status, income....etc.

#### **Data collection methods for surveys:**

##### a. *Personal interviews:*

- It is the most powerful method of gathering information.
- Here, the researcher meets the individuals in a face-to-face communication in order to get information.
- He will use a specially designed set of questions referred to as the interview schedule.
- It is time consuming because each individual will need time (minutes up to hours).
- It ensures the depth and quality of obtained information.

*b. Telephone interviews:*

- These are less costly, but often less effective method of gathering survey information.
- Whenever detailed information is needed from respondents, a telephone interview is usually preferable, because when the interviewer is unknown, respondents may be less cooperative or responsive.
- It lacks the ability to build rapport, which is a feature of face-to-face interview.
- It may be more convenient, time saving, and easy to collect concise, specific, and not personal data.

*c. Questionnaires:*

- It is a self-administered tool and method of data collection.
- In this tool/method, the respondents read questions and answer them.

**Advantages of surveys:**

1. It can be applied to a population or a real big sample.
2. It can focus on a wide range of topics, i.e., too many variables.
3. Data collected by surveys can be used for many purposes.
4. In most cases, a lot of information is gathered with a relatively short period of time.

**Disadvantages of surveys:**

1. Collected data are relatively superficial.
2. No control over independent variables.
3. It reveals no causal relationships.
4. It needs a lot of time for analysis of data.
5. Sometimes needs a lot of time and energy.

**b. Needs assessment:**

- Needs assessment is a study in which a researcher collects data for estimating the needs of a group, organization, or community.
- It provides an information input in a planning process.
- It is usually done by agencies or groups that have service components.
- For example: "Nursing educators may wish to assess the needs of their students".

**c. Historical research:**

- It refers to the systematic collection and critical evaluation of data related to past occurrences.
- It is done to answer questions or hypothesis regarding trends, causes, or effects related to past events that may shed light on present behaviors, practices or phenomenon.
- Data for such researches are found in written materials whether books, periodicals, journals, reports, newspapers, letters, meetings minutes, photos, films, tapes...etc.

**d. Case studies:**

- This is an in-depth investigation of an individual, family, group, or any small social unit.
- It investigates a current phenomenon within its real life context, especially when the boundaries between the phenomena and its context are not clear.
- Case studies address multiple variables that are measured at several points in time.



- The *purpose* of case study may include:
  1. *Explanation* of relationships between phenomena.
  2. *Description* of relationships between phenomena.
  3. *Exploration* of relationships between phenomena.
  
- All *data collection methods* could be used in a case study. The researcher may select one or more of the following techniques to collect data:
  - Questionnaire.
  - Interview.
  - Reporting.
  - Statistical records.
  - Rating devices.
  - Observation.
  - Physical measurement.
  - Psychological measurement.
  
- *Advantages:*
  1. It is very useful for the production of hypothesis to be tested in future.
  
- *Disadvantages:*
  1. Its results can never be generalized.
  2. It does not have a specific research design. It could be performed in several ways according to the phenomena under investigation.

## **Characteristics of a good research design:**

The purpose of a research design is to guide the collection and analysis of data in such a way that the results it yields are both interpretable and generalizable.

Generally, a good research design is characterized by:

### ***1. Appropriateness to the research problem:***

- Generally, a given research problem can be handled adequately with a number of different research designs. Therefore, researchers usually have some flexibility in selecting a design.
- Yet, some research designs are inappropriate for some research questions. So, the selection of proper research design is very important.

### ***2. Lack of bias:***

- A good research design results in data that are not biased.
- Bias can result from many sources such as:
  - a. Sampling techniques.
  - b. Data collection method.
  - c. Data collection tool.
  - d. Data analysis techniques.
  - e. Data interpretation.
- Randomization minimizes bias because of the sample or sampling techniques.

### ***3. Control:***

- The researcher must design a study that controls extraneous variables through; manipulation, randomization, and use of a control or comparison group (especially in experimental research design).

**4. Precision:**

- It refers to the appropriateness of the statistical procedures used to analyze data. Such a proper statistical analysis can detect any effect on the dependent variable by the external variables.

**5. Internal validity:**

- It is concerned with the question of whether or not the results of a research are attributed to the independent variables or other external variables.

**6. External validity:**

- It is concerned with the generalizability of the research findings to other population/sample and other setting.

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