UNIT 3 QUASI EXPERIMENTAL DESIGN

Structure

3.0 INTRODUCTION

For most of the history of scientific psychology, it has been accepted that experimental research, with its twin assets of random assignment and manipulation of the independent variable by the researcher, is the ideal method for psychological research. Some researchers believe this so strongly that they avoid studying important questions about human personality, sex differences in behaviour, and other subjects that do not lend themselves to experimental research.

A few decades ago researchers in psychology were interested in applied psychology issues conducting research on how students learnt in school, how social factors influenced the behaviour of an individual, how to motivate factory workers to perform at a higher level etc. These research questions cannot be answered by lab experiments as one has to go to the field and the real life situation like the classroom etc., to find answers to the research issues mentioned above. Thus the quasi experimental research came into existence. Quasi-experimental research design can be more easily implemented in natural settings and one can make direct assessment of subjects, find out the effects of a specific treatment introduced by the researcher, and while doing so the researcher can also minimise the influence of extraneous variables. In this unit we will discuss the quasi experimental design.

3.1 OBJECTIVES

After reading this unit, you will be able to:

- Define quasi experimental design;
- Differentiate between quasi experimental and true experimental design;
- Elucidate the different types of quasi experimental design; and
- Enumerate the advantages and disadvantages of quasi experimental design.

3.2 MEANING OF QUASI EXPERIMENTAL DESIGN

The word quasi means 'as if' or 'to a degree'. Thus quasi experimental design is one that resembles an experiment but lacks at least one of its defining characteristics.

According to Mcburney & White (2007) 'quasi experiment is a research procedure in which the scientist must select subjects for different conditions from preexisting groups'.

According to Broota (1989) "All such experimental situations in which the experimenter does not have full control over the assignment of experimental units randomly to the treatment conditions or the treatment cannot be manipulated are called quasi experimental design."

According to Singh (1998) "A quasi experimental design is one that applies an experimental interpretation to results that do not meet all the requirement of a true experiment."

According to Wikipedia, The quasi experimental design are related to the setting up a particular type of an experiment or other study in which one has little or no control over the allocation of the treatment or other factors being studied.

According to Shadish, Cook & Cambell (2002), "The term quasi experimental design refer to a type of research design that lacks the element of random assignment."

Quasi experimental designs are sometimes called ex-post facto design or after the fact experiment, because the experiment is conducted after the groups have been formed. The independent variable has already occurred and hence, the experimenter studies the effect after the occurrence of the variable. For example if we are interested in gender differences in verbal learning figures we would have to conduct a quasi experiment because we cannot assign participant to the two conditions male and female. We cannot create groups of males and females but instead select members from preexisting groups. In other words, we can say that in quasi experiments we do not manipulate variables but we observe categories of subjects. Matching instead of randomisation is used.

3.3 DIFFERENCE BETWEEN QUASI EXPERIMENTAL DESIGN AND TRUE EXPERIMENTAL DESIGN

In true experimental situation experimenter has complete control over the experiment. In quasi experimental situation, the experimenter does not have control over the assignment of subject to condition.

In true experimental design we manipulate variables but in quasi experimental design manipulation of variable is not possible, we observe categories of subjects. For example, If we want to study the effect of gender then we cannot manipulate gender we simply label groups according to what we think is the important difference between them.

In quasi experimental design we present some independent variables to two preexisting groups. We may not know whether the difference in behaviour was caused by difference between the groups or by the independent variable. A quasi experiment leaves open the possibility that other differences exist between the experimental and control conditions and thus permit other potential differences to remain.

Self Assessment Questions

1) Given below are statement, state whether statement are true or false :
   - i) Trait anxiety is a quasi experimental variable.
   - ii) Quasi experimental design have high internal validity.
   - iii) Quasi experiment may be performed when a true experiment would be impossible.
   - iv) In quasi experiment there is lack of random assignment of subjects in groups.
   - v) These design are not useful in psychological research.

2) Fill in the blanks :
   - i) It is possible to ..... subjects to conditions in a true experiment, in a quasi experiment it is necessary to ..... subject from preexisting groups.
   - ii) The ..... validity of a quasi experiment is higher than true experiment.
   - iii) The research design that allows the same group to be compared over time to known .....
   - iv) In multiple time series design we have ..... groups.
   - v) Manipulation of independent variable is made by ..... in quasi experimental design.

3) Descriptive question :

Answers:

1) (i) T (ii) F (iii) T (iv) T (v) F

2) (i) assign, select (ii) external (iii) time series design (iv) two (v) selection

3.4 TYPES OF QUASI EXPERIMENTAL DESIGN

There are many different types of quasi experimental designs that have a variety of applications in specific context. Here we will study some important quasi experimental designs.

3.4.1 Non-Equivalent Group, Posttest only Design

The non-equivalent, posttest only design consists of administering an outcome measure to two groups or to a program/treatment group and a comparison. For example, one group of students might receive reading instruction using a whole language program while the other group of students receives a phonetics based program. After twelve weeks, a reading comprehension test can be administered to see which program was more effective.

A major problem with this design is that the two groups might not be necessarily the same before any instruction takes place and may differ in important ways that influence what reading progress they are able to make. For instance, if it is found that the students in the phonetics groups perform better, there is no way of determining if they are better prepared or better readers even before the program and/or whether other factors are influential to their better performance.

3.4.2 Non-Equivalent Control Group Design

In this design both a control group and an experimental group is compared. However the groups are chosen and assigned out of convenience rather than through randomisation. The problem with this design is in determining how to compare results between the experimental and control group. For example, we are interested to study the effect of special training programmes, on the grade point average of 10^{th} grade students. The experimenter could not draw random sample as the school will not permit the experimenter to regroup the classes. Therefore researcher selected two sections of X grade from the same school. Because the subjects were not randomly allocated to the two groups we cannot say that groups are equivalent before the experimental manipulation was performed. We find out the grade point at the start of the programme and then again after the program. The group who does not receive treatment (training) is our control group.

This design may be diagrammed as shown below :

G_1	O_1	O_2
G_2	O_3	O_4

O = Observation

X = Treatment or experimental variable

Here we cannot say whatever difference we find in the grade point of two groups is because of training programme or because of some other confounding variable. It is possible that the student of one section who participate in training programme were inherently different in terms of motivation abilities, intelligence from those who did not participate.

3.4.3 The Separate Pretest -Posttest Sample Design

The basic idea in this design is that the people we use for the pretest are not the same as the people we use for posttest. The design may be diagrammed as shown below :

G_1	0	
G_1	X	0
G_2	0	
G_2		0

There are four groups but two of these one groups come from a single non equivalent group and the other two also come from other single non equivalent group. For example let us say, you have two organisations that you think are similar. You want to implement your study in one organisation and use other as a control. You design a program to improve customer satisfaction. Because customers routinely cycle through your organisation, you cannot measure the same customer pre-post. Instead you measure customer satisfaction in each organisation at one point in time, then implement your program and then once again measure customer satisfaction in the organisation at another point in time after the program. Here the customers will be different within each organisation for the pre-test and post-test. Here we cannot match the individual participant responses from pre to post. We can only look at the change in average customer satisfaction. Here non equivalence exists not only between the organisations but that is within organisation the pre and post groups are non-equivalent.

3.4.4 The Double Pre-Test Design

This is a very strong quasi experimental design with respect to internal validity. Because in pre-post non-equivalent group design the non-equivalent groups may be different in some way before the program is given and we may incorrectly attribute post-test differences to the program. Although the pre-test helps to assess the degree of pre-program similarity, it does not tell us if the groups are changing at similar rates prior to the program.

The double pre-test design includes two measures prior to the program. Consequently if the program and comparison group are maturing at different rates we can detect this as a change from pretest 1 to pretest 2. Therefore this design explicitly controls for selection maturation threats.

3.4.5 The Switching Replications Design

The Switching Replications quasi-experimental design is also very strong with respect to internal validity. And, because it allows for two independent implementations of the program, it may enhance external validity or generalisability. The design has two groups and three phases of measurement.

In the first phase of the design, both groups are pretested, one is given the program and both are post-tested.

In the second phase of the design, the original comparison group is given the program while the original program group serves as the “control”. This design is identical in structure to its randomised experimental version, but lacks the random assignment to group. It is certainly superior to the simple pre-post non-equivalent groups design.

3.4.6 Mixed Factorial Design with one Non-Manipulated Variable

This design can be explained by an experiment. In an experiment Edmund Keogh and Gerke Witt (2001) hypothesise that caffeine intake might influence the perception of pain and that the effect may be different in men and women. 25 men and 25 women took part in two sessions separated by a week. In one session the participants drank a cup of coffee that contained caffeine and in the other session, they drank decaffeinated coffee. In both the sessions the participants put their non dominant hand in ice water bath and to indicate the point of just noticeable pair.

Design of the Study		
	Coffee Beverage	
Gender	Decaffeinated	Caffeinated
Women	S_1	S_1
	S_2	S_2
	S_{25}	S_{25}
Men	S_{26}	S_{26}
	S_{27}	S_{27}
	S_{50}	S_{50}

The above is a mixed factorial design because it has one between subject variable (gender) and one within subject variable (caffeine).

3.4.7 Interrupted Time-Series Designs

These are the research designs that allow the same group to be compared over time by considering the trend of the data before and after experimental manipulation. (Mcburney & White, 2007).

In this design pre-testing and post-testing of one group of subject is done at different intervals. In the time series design, the purpose might be to determine the long term effect of treatment and therefore the number of pre-test and post-test can vary from one each to many. Sometimes there is an interruption between tests in order to assess the strength of treatment over an extended time period. This design can be diagrammed as below :

$$0_1 \ 0_2 \ 0_3 \ 0_4 \ X \ 0_5 \ 0_6 \ 0_7 \ 0_8$$

The above diagram shows that a series of pre-tests are given to a group. Then treatment (X) is given and a series of post-tests are given to the same subject. This design is different from single group pretest posttest design. In this we give the series of pretests and posttests to a subject, where as in the pre test post test design we give only single pretest and posttest.

3.4.8 Multiple Time Series Design

In this design we have two groups, one group receives treatment and the other group does not receive the treatment and this group acts as the control group.

This design can be presented as given in the diagram below :

Pre response measure	Treatment	Post response measure
G_1 0_1 0_2 0_3 0_4 0_5	X	0_6 0_7 0_8 0_9 0_{10}
G_2 0_1 0_2 0_3 0_4 0_5		0_6 0_7 0_8 0_9 0_{10}

It is usually a complex setting with many events and trends that might affect the behaviour in question. The addition of a comparison group for which the same series of measures is available, but which is not exposed to the treatment whose effects are being studied, can be useful in clarifying the relationship between the treatment and any change in the series of behavioural measures being used.

3.4.9 Repeated Treatment Design

Repeated treatment design is one in which a treatment is withdrawn and then presented the second time (McBurney and White, 2007).

In this design the treatment is presented more than once. The subject's response is measured before and after the introduction of a treatment, then the treatment is withdrawn and the whole process is began again. The design is shown in following table

Table : A Repeated treatment design

$Pretest_1$	Treatment	$Posttest_1$	Withdraw	Treatment	$Pretest_1$	$Posttest_2$

Repeated treatment design can be explained with the help of a study of the effect of a ban on alcohol consumption in a small community , let us say the Toda Community in Tamil Nadu. Let us assume that the government has put a ban on alcohol consumption as it is detrimental to the health of the workers in that area. To assess the impact of alcohol policy changes on the productivity of the workers, medical problems related to alcohol consumption etc., were studied. The results indicated that the productivity improved as a result of this ban amongst the community persons.

3.4.10 Counter Balanced Design

Such designs are also called cross-over design (Cochran & Cox, 1957). The name counter balance was given by Underwood (1949). In this design the experimental control is achieved by randomly applying experimental treatment. Here each treatment appears once and only once in each column and in each row. A counter balance design in which four treatment have been randomly given to four groups on four different occasion is given below :

Group-A	X_1	X_2	X_3	X_4	0
Group-B	X_2	X_4	X_1	X_3	0
Group-C	X_3	X_1	X_4	X_2	0
Group-D	X_4	X_3	X_2	X_1	0

Variables like maturation, selection and experimental mortality posing threats to internal validity are well controlled by the counter balance design.

3.5 ADVANTAGES AND DISADVANTAGES OF QUASI EXPERIMENTAL DESIGN

Advantages

In social science, where pre selection and randomisation of groups is often difficult, they can be very useful in generating results for general trends.

E.g. if we study the effect of maternal alcohol use when the mother is pregnant, we know that alcohol does harm embryos. A strict experimental design would include that mothers were randomly assigned to drink alcohol. This would be highly illegal because of the possible harm the study might do to the embryos.

So what researchers does is to ask people how much alcohol they used in their pregnancy and then assign them to groups.

Quasi-experimental design is often integrated with individual case studies; the figures and results generated often reinforce the findings in a case study, and allow some sort of statistical analysis to take place.

In addition, without extensive pre-screening and randomisation needing to be undertaken, they do reduce the time and resources needed for experimentation.

Since quasi-experimental designs are used when randomisation is impossible and/or impractical, they are typically easier to set up than true experimental designs.

Utilising quasi-experimental designs minimises threats to external validity as natural environments do not suffer the same problems of artificially as compared to a well-controlled laboratory setting.

Since quasi-experiments are natural experiments, findings in one may be applied to other subjects and settings, allowing for some generalisations to be made about population.

This experimentation method is efficient in longitudinal research that involves longer time periods which can be followed up in difference environments.

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Disadvantages

Without proper randomisation, statistical tests can be meaningless.

A quasi experiment constructed to analyse the effects of different educational programs on two groups of children, for example, might generate results that show that one program is more effective than the other. These results will not stand up to rigorous statistical scrutiny because the researcher also needs to control other factors that may have affected the results.

The lack of random assignment in the quasi experimental design method may allow studies to be more feasible, but this also poses many challenges for the investigator in terms of internal validity. This deficiency in randomisation makes it harder to rule out confounding variables and introduces new threats to internal validity.

Because randomisation is absent, some knowledge about the data can be approximated, but conclusions of causal relationships are difficult to determine due to a variety of extraneous and confounding variables that exist in a social environment.

Moreover, even if these threats to internal validity are assessed, causation still cannot be fully established because the experimenter does not have total control over extraneous variables.

Thus one may conclude that disadvantages aside, as long as the shortcomings of the quasi experimental design are recognised, these studies can be a very powerful tool, especially in situations where 'true' experiments are not possible.

These are very useful to obtain a general overview and then follow up with a case study or quantitative experiment so as to focus on the underlying reasons for the results generated. They are very useful methods for measuring social variables.

3.6 LET US SUM UP

Quasi experiments may be performed when a true experiment is not possible. The main difference between true experimental design and quasi experimental design is random assignment of subject in groups. In quasi experimental design researcher does not have control over the assignment of subject to condition. There are different types of quasi experimental design. Some design involve two groups and other have single group. Some commonly used quasi experimental designs are non equivalent control group design, the separate pretest protest design, the double pretest design, mixed factorial design, interrupted time series design, multiple time series, design etc., repeated treatment design etc. The main advantage of quasi experimental design is that these can be used when randomisation of the group is impossible and or impractical. Because of the lack of random assignment the internal validity of quasi experimental design is very low. In these design there are possibility of selection bias because the participant are not randomly assigned.

3.7 UNIT END QUESTIONS

1) Define and describe the quasi experimental design.

2) Differentiate between true experimental design and quasi experimental design.

3) Discuss with example the non equivalent control group design.

4) What are the various types of quasi experimental designs.

3.8 GLOSSARY

Quasi experiment	**:**	Research procedure in which the scientist must select subjects for different conditions from preexisting groups.
Non-equivalent control group design	**:**	Research design having both an experimental and a control group wherein subjects are not randomly assigned to group.
Counter balance design	**:**	The design in which each treatment appeare once and only once in each column and row.
Interrupted time series design	**:**	Research design that allows the same group to be compared over time by considering the trend of the data before and after experimental manipulation.

3.9 SUGGESTED READINGS

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