Chapter 8
Quantitative Research Design

2023

Aspects of quantitative design Intervention (treatment)

- **Experimental study:** researcher play an active role on administering intervention
- Manipulation

- **Non-experimental study**:
- the researcher observe the phenomena as they naturally occur without intervention

Characteristics of different quant. Designs

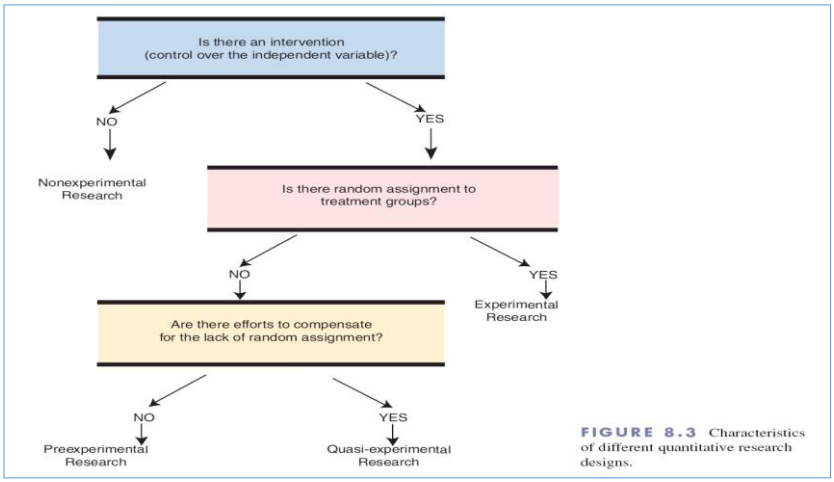
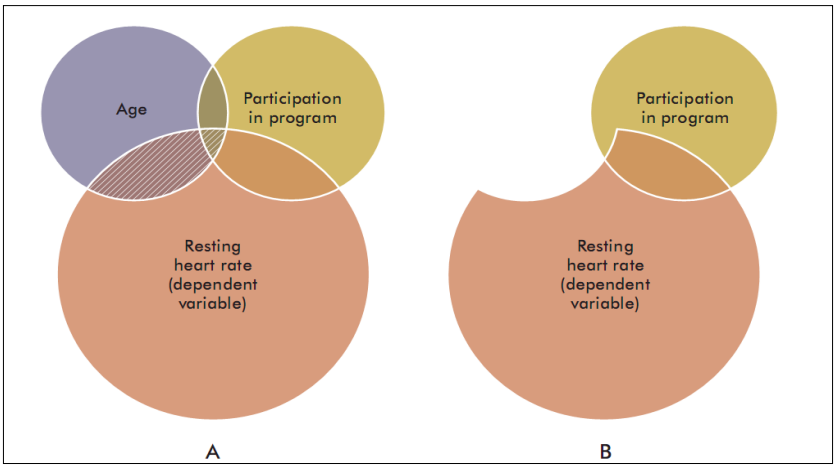


FIGURE 8.3 Characteristics of different quantitative research designs.

Aspects of quantitative design control of extraneous variable

- Extraneous variable: type of variable that is not the variable of interest to the researcher but that may influence the results of the study.
- Researcher must **control** these factors.

Think about this example



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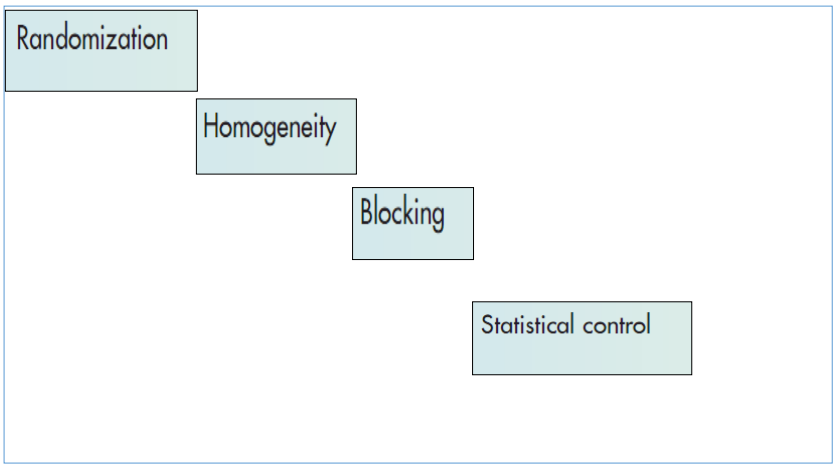
WAYS OF CONTROL



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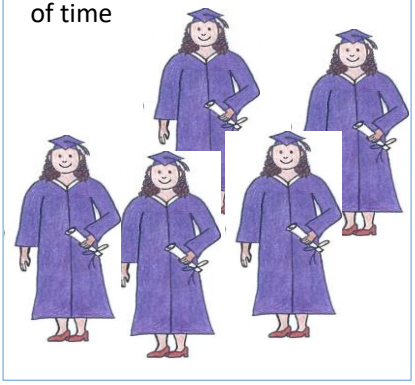
Aspects of quantitative design
Time of data collection

- **Cross sectional:**
  data are collected at one point of time



- **Longitudinal:** data are collected at two or more points of time over an extended period.

Types of research according to purpose

- Exploratory: conducted to explore a relationship, when little is known about the topic of the study.
- Descriptive study: phenomena is described or relationship between variables is examined
- Explanatory study: investigate a causal explanation, it is mainly experimental

Research design

I. Experimental design (cause & effect RS)

1. True experimental design
2. Quasi Experimental
3. Pre-experimental

- **R**= random assignment
- **O**=observation or measuring of dependent variable
- **X**=experimental treatment or intervention.

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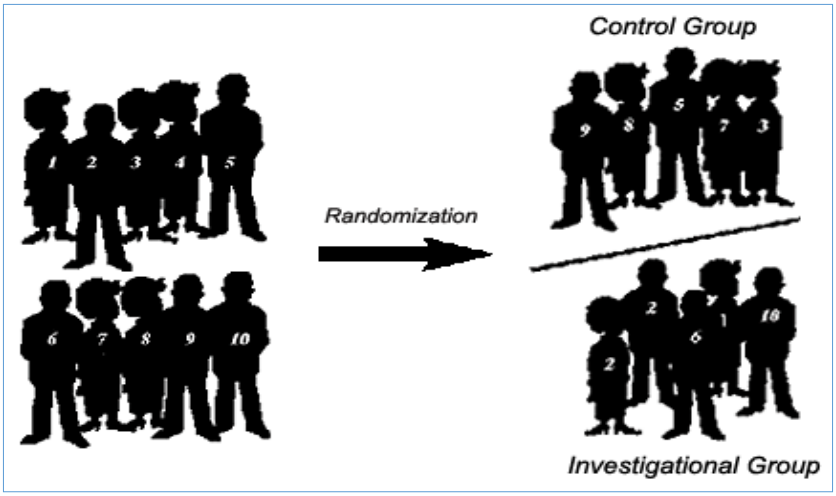

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Control Group Conditions

- **No intervention is used; control group gets no treatment at all.**
- **"Usual care" standard or normal procedures used to treat patients**
- **An alternative intervention is used (e.g., auditory vs. visual stimulation).**
- **A placebo or pseudo-intervention, presumed to have no therapeutic value, is used.**

1. True experimental design

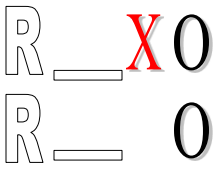
A. Pre post control group
   - Causality is maximized.
- Criteria of Experimental design
   - Manipulation of experimental variable
   - Random assignment.
   - Maximum control.
   - Comparison group (control group)

R O X O
R O O

True experimental design

B. Post only control group design

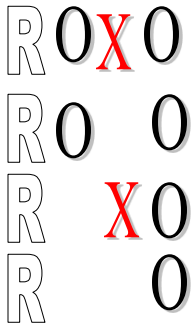
- Two groups would not receive a pretest



True experimental design

C. Solomon four group design

- **Use to control the effect of pretest on post test**



Advantages and Disadvantages of Experiments

- Advantages—most powerful for detecting cause and effect relationships
- Disadvantages—often not feasible or ethical, Hawthorne effect (knowledge of being in a study may cause people to change their behavior.), often expensive

2. Quasi-Experimental Design

- Used when the researcher cannot randomly assign subjects to group or there is no comparative group
- Types
  - A. nonequivalent control group
  - B. time series design

Quasi-Experimental Design

- A. non-equivalent control group design
  - It is similar to the pre-posttest control group design, but without random assignment

0 X 0
0 0

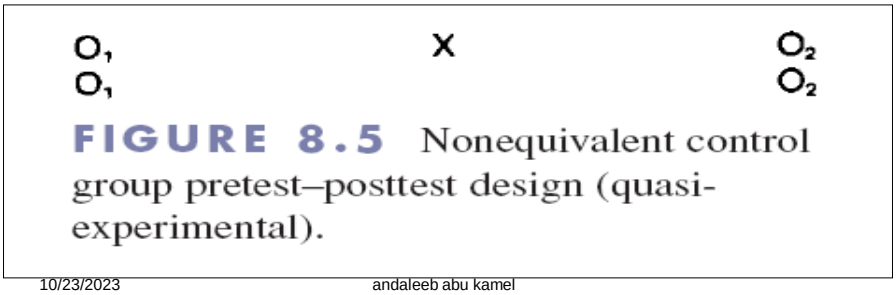


FIGURE 8.5 Nonequivalent control group pretest–posttest design (quasi-experimental).

Example of a nonequivalent control group pretest—posttest design:

Johnson, Budz, Mackay, and Miller (1999) evaluated the effect of a nurse-delivered smoking cessation intervention on smoking status and smoking self-efficacy among patients hospitalized with cardiac disease. Experimental subjects were admitted to one cardiac unit, and comparison subjects were admitted to another. The researchers preferred this approach to randomization within units because information sharing among patients in the same unit could have contaminated treatment conditions. By collecting pretest data, the researchers learned that the two groups were comparable with regard to demographic characteristics and preintervention smoking histories.

Quasi-Experimental Design

0 0 0 0 X 0 0 0 0

- B. time series design
- Researcher frequently observe or measure the subjects, the treatment or intervention administered between two or more observation.

O_1 O_2 O_3 O_4 X O_5 O_6 O_7 O_8

FIGURE 8.8 Time series design (quasi-experimental).

O_1 O_2 O_3 O_4 X O_5 O_6 O_7 O_8

O_1 O_2 O_3 O_4 O_5 O_6 O_7 O_8

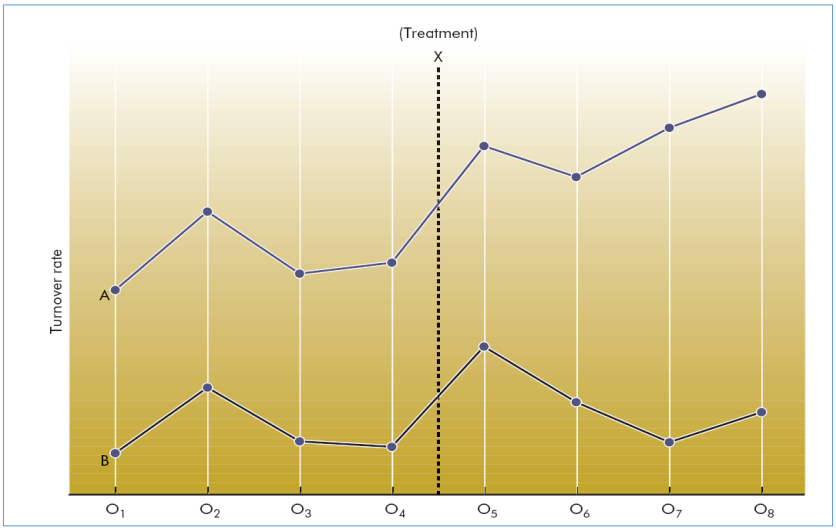
FIGURE 8.10 Time series nonequivalent control group design (quasi-experimental).

O_1 O_2 X O_3 O_4 X O_5 O_6 X O_7 O_8

FIGURE 8.11 Time series with multiple institutions of treatment (quasi-experimental).

Example of a time series nonequivalent control group design:

Song, Daly, Rudy, Douglas, and Dyer (1997) examined rates of absenteeism and turnover among nurses working in a nurse-managed special care unit compared with nurses working in a traditional intensive care unit. The two units were compared over a 4-year period.



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Advantages and Disadvantages of Quasi-Experiments

- May be easier and more practical than true experiments, **but**
  - They make it more difficult to infer causality.
  - Usually there are several alternative **rival hypotheses** for results.

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3. Pre-experimental design

- A. one-shot case study
  - A single group is exposed to an experimental treatment and observed after treatment.

X O

- B. one group pre-post test design.

O X O

Example of a posttest-only experimental design:

Milne (2000) used a posttest-only design to study the effect of an educational intervention relating to urinary incontinence on the subsequent help-seeking behavior of older adults. One group received individualized instruction and written information, and the other received written information alone. Two months later, Milne determined how many subjects in each group sought professional help for urinary incontinence.

Example of a pretest—posttest experimental design:

Sandgren, McCaul, King, O'Donnell, and Foreman (2000) conducted an experiment to test the effectiveness of a cognitive-behavioral telephone therapy intervention for patients with breast cancer. Women in the study were randomly assigned to the intervention or to a control group. Measures of the dependent variables (e.g., psychological distress, coping, and quality of life) were measured at baseline and at follow-up, and changes over time were determined.

Group	Data Collection	
	Before	After
Experimental—with pretest	X	X
Experimental—without pretest		X
Control—with pretest	X	X
Control—without pretest		X

FIGURE 8.1 Solomon four-group experimental design.

Research design

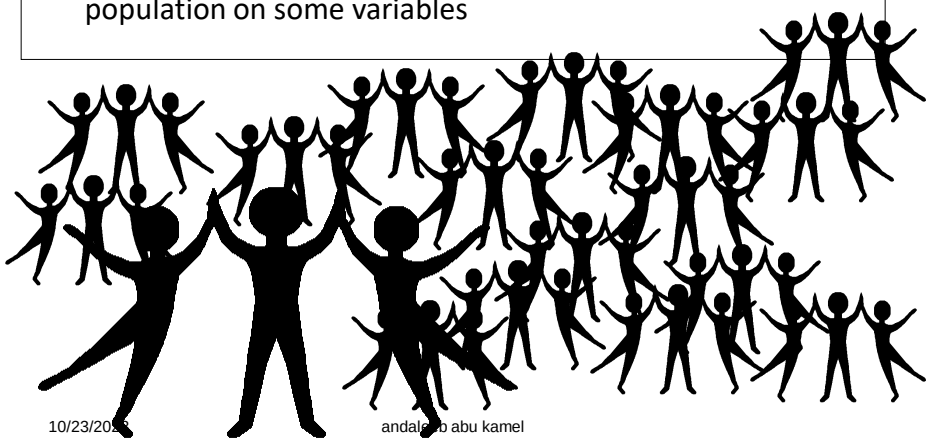
II. Non-experimental design

- If researchers do not intervene by controlling independent variable, the study is nonexperimental (observational).
- Not all independent variables ("causes") of can be experimentally manipulated.
  - For example, gender cannot ever be manipulated.
  - Smoking cannot **ethically** be manipulated.

- Survey
- Correlational study
- Prospective
- Retrospective

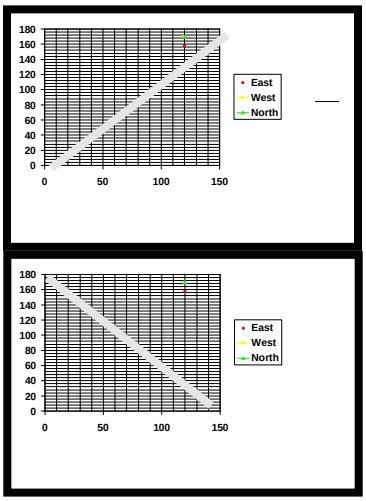
Non-experimental design

- A. survey study
  - Self report data are collected from samples to describe the population on some variables



Non-experimental design

- B. correlational study
  - Researcher examined the strength of the relationship between variables by determine how change in one variable is associated with changes in another variable.
  - X-Y relationship
  - Positive correlation
  - Negative correlation



Non-experimental design

- **C. Prospective study**
  Present independent TO future dependent variable
- **D. Retrospective (Ex post facto)**
  present dependent AND past independent variable

GROUP A	O	Ex post facto design
GROUP B	O	

Example of a prospective nonexperimental study:

Brook, Sherman, Malen, and Kollef (2000) conducted a prospective cohort study to examine clinical and cost outcomes of early versus late tracheostomy in patients who require prolonged mechanical ventilation. Early tracheostomy was found to be associated with shorter lengths of hospital stay and lower hospital costs.

Example of a retrospective study:

Heitkemper, Jarrett, Taylor, Walker, Landenburger, and Bond (2001) used a retrospective design in their study of factors contributing to the onset of irritable bowel syndrome (IBS). They compared samples of women with and without IBS in terms of their history of sexual and physical abuse, and found that abusive experiences were more prevalent among women with IBS.

Advantages and Disadvantages of Nonexperimental Research

- Does not yield persuasive evidence for causal inferences, but efficient way to collect large amounts of data.

Validity of design

- Internal validity the degree to which changes in the dependent variable can be attributed to the independent variable.
- Threat to internal validity: factors other than the independent variable influence the dependent variable.

- External validity: the degree to which study results can be **generalized** to other people and other setting.
- With what degree of confidence can the study findings be **transferred** to other population?

Threat to internal validity

- **1. selection bias:** the subjects are different before independent variable was manipulated (before intervention).
- **2. history:** some events beside the intervention occur during the intervention , this event influence the dependent variable.

- **3. Maturation:** change that occur within the subjects during the study influence the results.
- **4. Testing:** when the pretest influence the results of post test.

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Threat to internal validity

- **5. Instrumentation**: when the researcher change the measuring instrument between two points of data collection.

- **6. mortality**: drop out the subjects

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Threat to external validity

- 1. Howthorn effect: when the subject respond in a certain manner because they are aware that they are being observed.
- 2. Experimenter effect: the researcher characteristics influence the subject behavior or response.