



QUANTITATIVE
APPROACH, TYPE,
CHARACTERISTICS,
ADVANTAGES AND
DISADVANTAGES AND
DATA ANALYSIS

Quantitative Research

- Quantitative Research is an inquiry into a identified problem based on testing a theory composed of variables, measured with numbers and analyzed by using statistical technique.



QUANTITATIVE

CLASSIFICATION

I. Experimental Research design

- True experimental design
- Quasi experimental design
- Pre-experimental design

II. Non experimental Research design

- Descriptive design
- Correlational / ex post facto design
- Developmental research design
- Epidemiological design
- Survey research design

III. Other additional research designs

EXPERIMENTAL RESEARCH DESIGN

- Observation under controlled condition
- Examination of the effect of independent variable on dependent variable

Experimental
Research



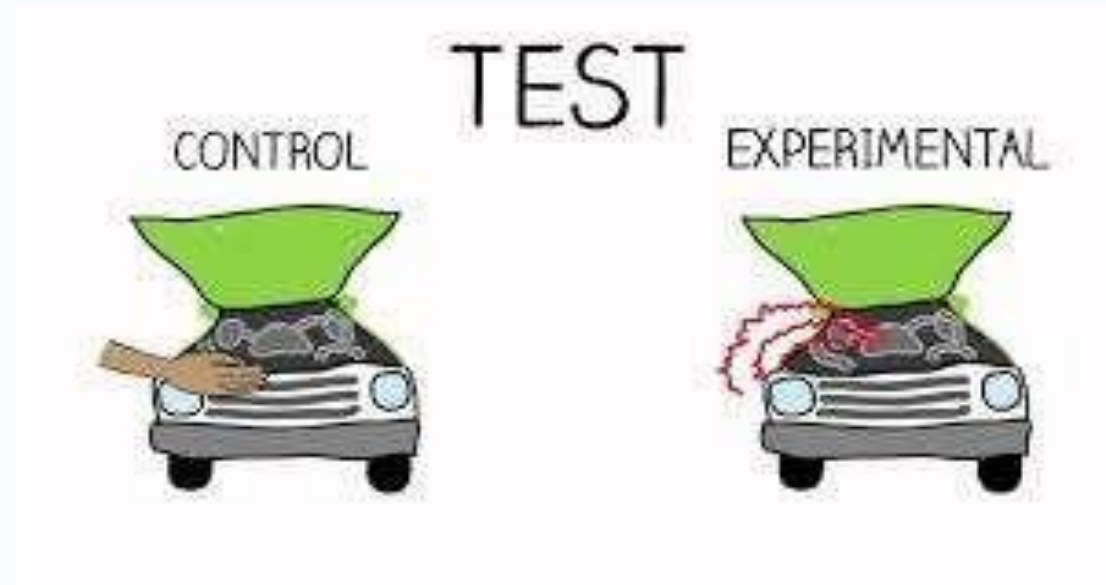


TRUE EXPERIMENTAL DESIGN

- Researcher have complete control over the extraneous variable and can predict confidently that the observed effect on the dependent variable is only due to the manipulation of independent variable.

characteristics

- Manipulation
- Control
- Randomization



CHARACTERISTICS

Manipulation : conscious control of the independent variable.

Randomization : every subject has an equal chance of being assigned to experimental or control group.

Methods

- Flip of a coin
- Random table
- Drawing lots

Control

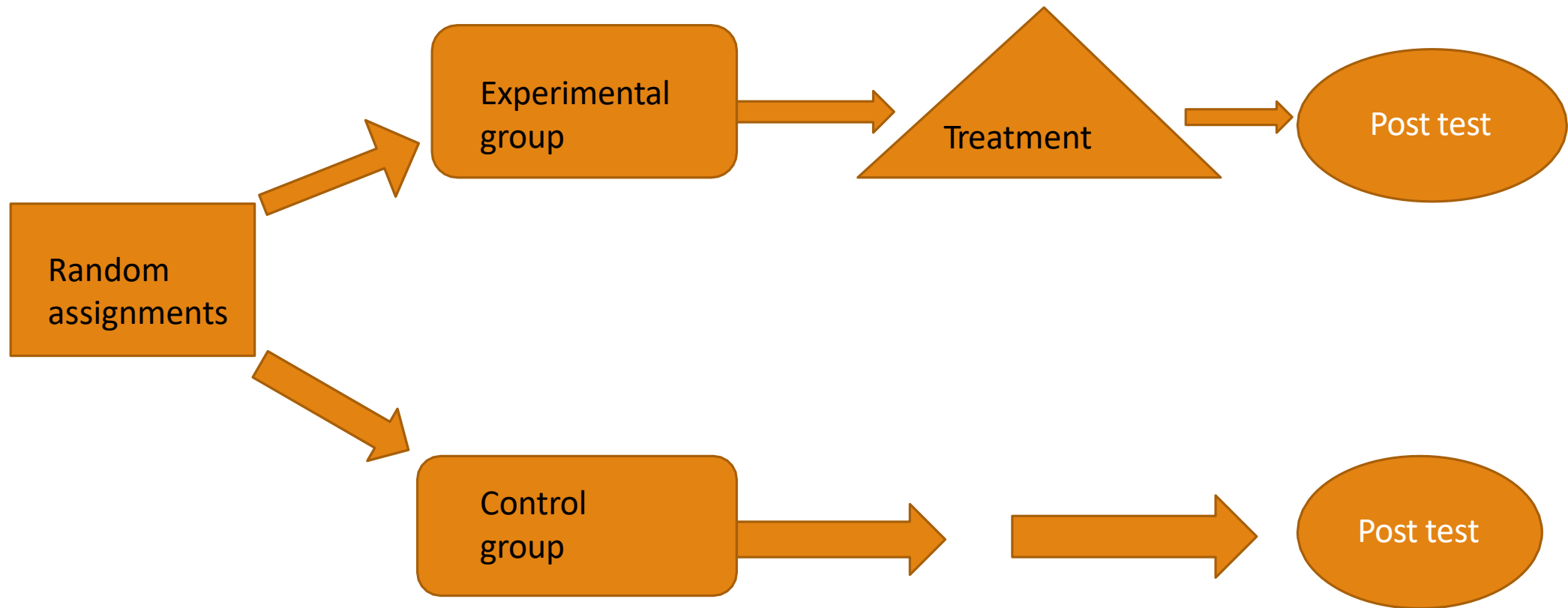
Use of control group and controlling the effects of extraneous variable on the dependent variable in which researcher is interested.

- ✓ Matching
- ✓ Counter balancing
- ✓ Homogeneity

True experimental design

- ❖ Post test only control design
- ❖ Pretest post test control design
- ❖ Solomon four group design
- ❖ Factorial design
- ❖ Randomized block design
- ❖ Cross over design

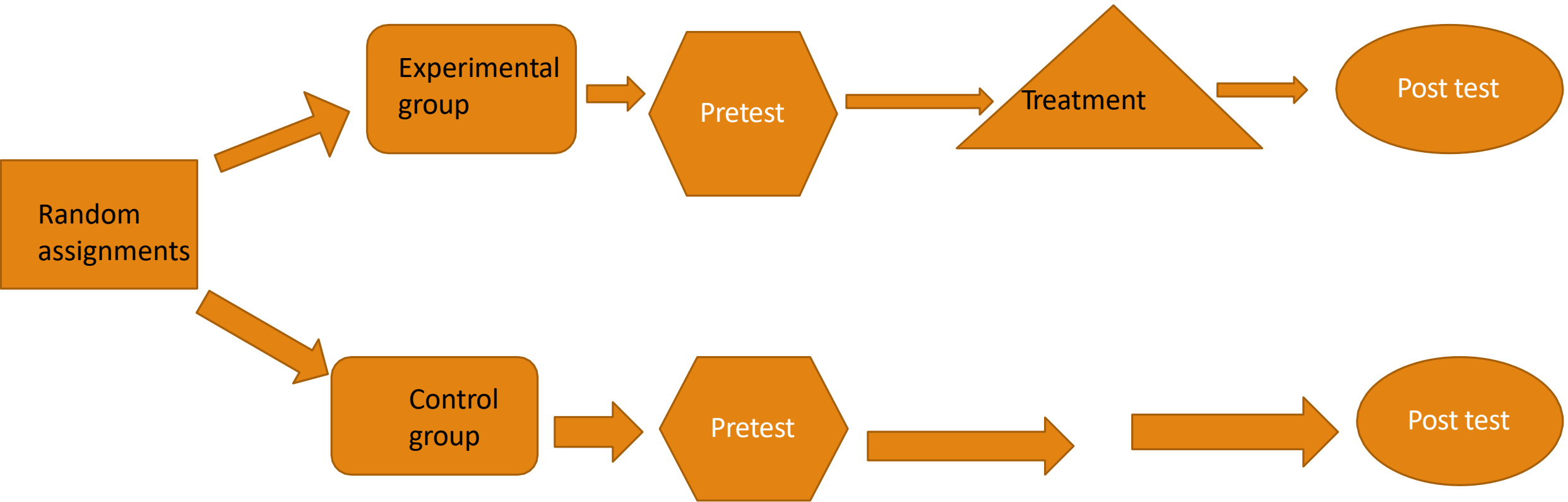
Post test only control design



EXAMPLE

A study to assess the effect of an educational intervention related to urinary incontinence on the subsequent help seeking behavior of older adults.

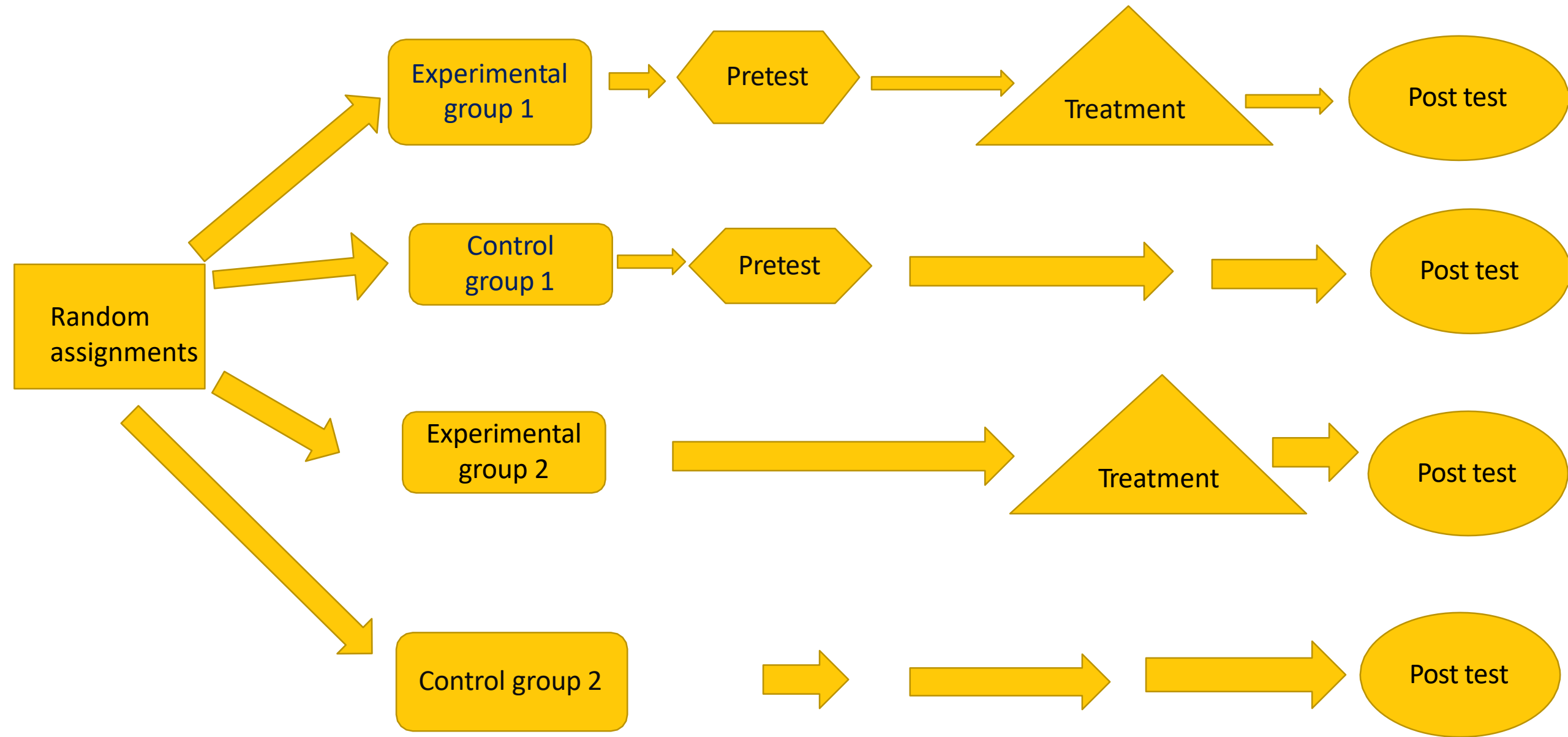
Pre test Post test only design



EXAMPLE

An experimental study to assess the effectiveness of cognitive behavior therapy interventions for patients with breast cancer.

Solomon four group design



EXAMPLE

- A study to assess the effectiveness of smoking prevention programme on standard five children.

Factorial design

- Researcher manipulates **2 or more independent variables** simultaneously to observe their effect on the dependent variable
- Useful when more than two independent variables to be tested
- Testing of several hypothesis at a single time

Factorial design EXAMPLE

Effect of two different protocols of mouth care on prevention of VAP when performed at different frequencies in a day.

Factorial design EXAMPLE

Frequency of mouth care	Protocols of mouth care	
	Chlorhexidine (α_1)	Saline (α_2)
4 hourly (β_1)	$\alpha_1 \dots \beta_1$	$\alpha_2 \dots \beta_1$
6 hourly (β_2)	$\alpha_1 \dots \beta_2$	$\alpha_2 \dots \beta_2$
8 hourly (β_3)	$\alpha_1 \dots \beta_3$	$\alpha_2 \dots \beta_3$

RANDOMIZED BLOCK DESIGN

When there is a large number of experimental comparison groups, the randomized block design used to bring **homogeneity** among selected different groups.

Example : Effect of three different antihypertensive drugs on patient with hypertension

RANDOMIZED BLOCK DESIGN Example

Type of antihypertensive drugs	Blocks		
	Patients with primary hypertension (I)	Diabetic patient with hypertension (II)	Renal patients with hypertension (III)
A	A, I	A, II	A , III
B	B, I	B, II	B, III
C	C, I	C , II	C, III

CROSSOVER DESIGN

- ❑ Subjects are exposed to more than one treatment, where subjects are randomly assigned to different orders of treatment.
- ❑ Repeat measure design
- ❑ Extremely powerful design, sometimes not effective

Example: Effectiveness of chlorhexidine and saline mouth care protocol on prevention of VAP

CROSSOVERDESIGN Example

GROUPS	PROTOCOLS OF MOUTH CARE	
Group 1	Chlorhexidine (α_1)	Saline (α_2)
Group 2	Saline (α_2)	Chlorhexidine (α_1)

ADVANTAGES

- Most powerful design to establish the causal relationship between the independent and dependent variable
- Controlled environment in which study is conducted can yield a greater degree of purity in observation
- Conditions not found in natural setting can be created in an experimental setting
- Researcher can pursue studies in more leisurely , careful and concentrated way.

disADVANTAGES

- Results cannot be **replicated** in studies conducted on human beings due to ethical problems.
- It is not possible to impose control over **extraneous variable**
- Difficult to get **co-operation** from the study participants
- Many of **human variables** neither have valid measurable criteria nor instrument to measure them.

QUASIEXPERIMENTAL RESEARCH DESIGN

- Involves manipulation of independent variable to observe the effect on dependent variable, but it lacks at least one of the two characteristics of the true experimental design: randomization or control group
- Quasi independent variable are used instead of true independent variable



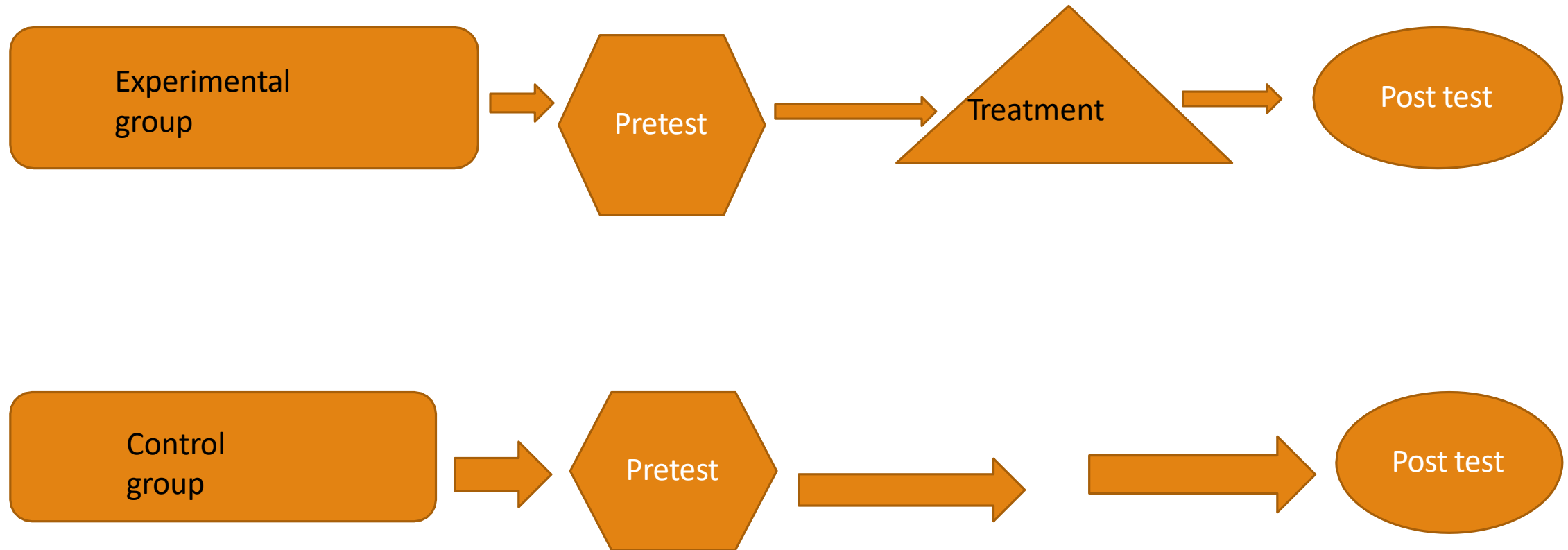
TYPES

- ❖ Non randomized control group design
- ❖ Time series design

Non randomized control group design

- Non equivalent control group design
- Identical to pretest post test control group design , except no random assignment of subjects

NONRANDOMIZED CONTROL GROUP DESIGN



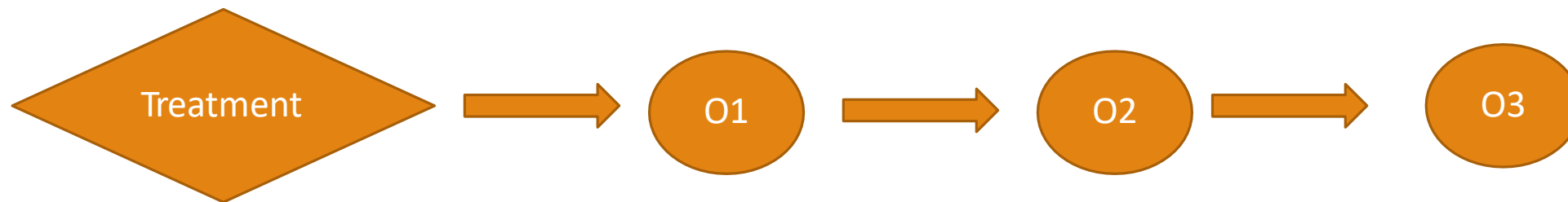
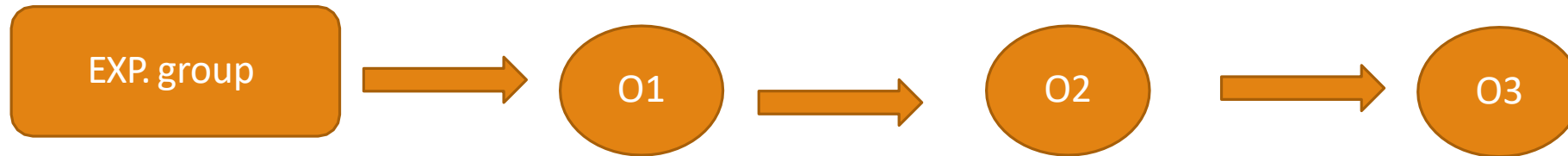
EXAMPLE

- To study the effects of integrated care on quality of work in nursing homes.

TIMESERIESDESIGN

- When experimenter wants to measure the effects of a treatment over a long period of time.
- Experimenter continue to administer the treatment and measure the effects a number of times during the course of the experiment.

TIME SERIES DESIGN



TIME SERIES DESIGN Example

- Measuring a child's school performance on a weekly basis and then introducing a new teaching technique. Then again measuring on a weekly basis.

ADVANTAGES

- Practical and feasible to conduct
- More suitable for real world natural setting than true experimental design
- Allow researcher to evaluate the impact of quasi independent variable under naturally occurring conditions
- May be able to establish causal relationship.

DISADVANTAGES

- No control over extraneous variables
- Absence of a control group make the results less reliable and weak for establishment of the causal relationship between independent and dependent variables.

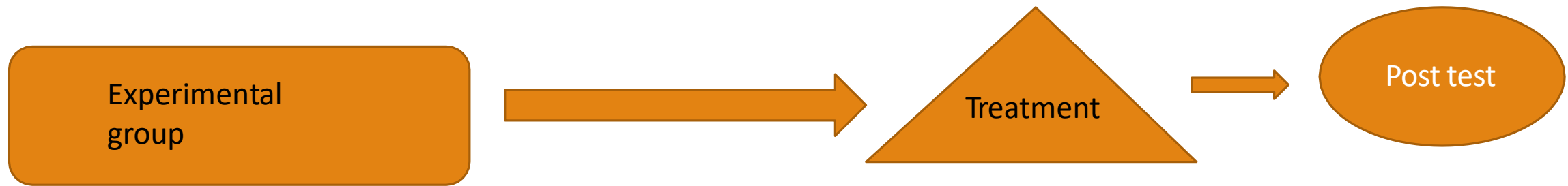
PRE EXPERIMENTAL RESEARCH DESIGN

- Considered as very weak, because the researcher has very little control over the experiment
- Types
 - One shot case design
 - One group pre test post test design

ONESHOTCASEDESIGN

- No random assignment
- No control group
- A single experiment group is exposed to treatment and observations are made after treatment

ONESHOTCASEDESIGN



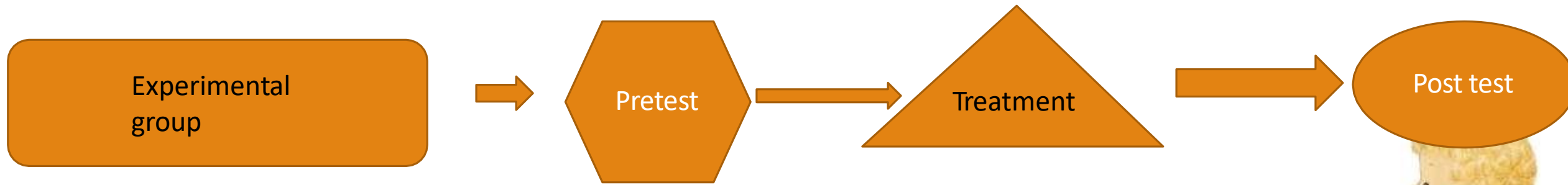
ONE SHOT CASE DESIGN EXAMPLE

- Lalitha, Premila & Balu (2006) conducted a study on nursing personnel registered for a day workshop on life skill education at MTIHS, Pondicherry.

ONE GROUP PRE TEST POST TEST DESIGN

- Simplest type
- Only the experimental group is selected
- No control group

ONE GROUP PRETEST POST TEST DESIGN



ONE GROUP PRE TEST POST TEST DESIGN EXAMPLE

- Effect of STP on level of knowledge regarding labour and newborn care among primigravida mothers.

ADVANTAGES

- Very **simple and convenient** to conduct these studies in natural setting
- **Most suitable** for beginners in the field of experimental research.

dsADVANTAGES

- Very **weak** experimental design because it controls no threat to internal validity
- **Very little control** over the research
- **Higher threat** to internal validity, may have a selection bias.

Nonexperimental research design

- Researcher observes the phenomenon as they occur **naturally** and no external variables are introduced.
- Variables are not deliberately manipulated nor the setting is controlled.
- Data obtained are analyzed and results may lead to the formation of hypothesis that can be tested experimentally


Need of non experimental design

- The studies in which the independent variables cannot be manipulated
- The studies in which it is unethical to manipulate the independent variable
- Not practically possible to conduct experiments
- Descriptive type studies that do not require any experimental approaches

Types

1. Descriptive design
2. Correlational / ex-post facto design
3. Developmental research design
4. Epidemiological design
5. Survey research design

DESCRIPTIVE DESIGN

- The purpose is to **observe, describe and document** aspects of a situation as it naturally occurs and sometimes to serve as a starting point for hypothesis generation or theory development
 - Types
 - Univariate descriptive design
 - Exploratory design
 - Comparative design
- 

FEATURES

- To observe, document and describe a phenomenon occurring in its natural setting.
- To gain more information about characteristics within a particular field of inquiry.
- Provides an impression of situation as it occur in natural setting

FEATURES

- To develop theories , identify problems with current practices, justify current practices, make judgements, or determine other practices in similar situation
- Bias is prevented through operational definitions of variables, large sample size, random sampling techniques, valid and reliable research tools and formal data collection methods
- Identification of a phenomenon of interest, identifying the variables within the phenomenon, developing operational definition of the variables and describing the variables

UNIVARIANT DESCRIPTIVE DESIGN

- To describe the frequency of occurrence of phenomenon.
- The basic purpose of the study is not only to describe each of the variables, but also to establish the relationship between those variables.
- Used to identify and describe perception, awareness, behavior, attitude, knowledge and practice of people.

EXAMPLE

- A descriptive study of the perceived causes of female foeticide among women in selected rural and urban communities of district Jaipur , Rajasthan

EXPLORATORY DESCRIPTIVE DESIGN

- Identify , explore, and describe the existing phenomena and its related factors. But it is in depth exploration and a study of its related factors to improve further understanding about a less understood phenomenon.

Example

- An exploratory study on factors affecting bowel movements in orthopaedic patients admitted in civil hospital, Ludhiana

COMPARATIVE DESCRIPTIVE DESIGN

- Comparing and contrasting 2 or more samples of study subjects on one or more variables, often at a single point of time.
- Compare 2 distinct groups on the basis of selected attributes such as knowledge level, perceptions and attitudes, physical or physiological symptoms and so on.

Example

- A comparative study on the employment pattern among older people from rural and urban community in district Simoga , Karnataka.

CORRELATIONAL / EX-POST FACTO RESEARCH DESIGN

- Researcher examines the relationship between 2 or more variables in a natural setting without manipulation or control.
- Types
 - Prospective research design
 - Retrospective research design

FEATURES

- Researcher examines the strength of relationship between variables.
- The effect of independent variable is observed on dependent variable without manipulating the independent variable
- Magnitude and direction of relationship of independent variable and dependent variable is measured by using the correlation of coefficient statistical measure.
- Cause and effect study . It can be investigated in forward manner or backward.

PROSPECTIVERESEARCHIDESIGN

- A design in which the researcher relates the present to the future
- It starts with a presumed cause and then go to presumed effect
- Longitudinal
- Eg:- A prospective correlational study on the effect of earthquakes on migration of people in Gujarat

RETROSPECTIVE RESEARCH DESIGN

- Researcher studies the current phenomenon by seeking information from past .
- Back ward approach
- Effect to identify the cause
- Eg:- A retrospective correlational study on the alcohol consumption pattern among patients diagnosed with alcoholic liver cirrhosis at gastroenterology department, CMCH, Ludhiana

Developmental research design

- Examines the phenomenon with reference to time
- Used as adjunct research design

A red speech bubble graphic with a white outline, containing the word 'TYPES' in white serif font. The bubble has a tail pointing downwards and to the right.

TYPES

- Crosssectional design
- Longitudinal design
 - Trend studies
 - Panel studies
 - Follow up studies

CROSSECTIONAL DESIGN



- Researcher collects data at a particular point of time
- Easier and more convenient
- Example:- assessing the awareness on swine flu among people in rural area .

LONGITUDINAL DESIGN


- Collect data over a **extended period of time**
- Its value is in its ability to demonstrate **change over a period of time**

Trend studies

- Help to investigate a sample from general population over a time with respect to some phenomenon.
- Permits researcher to examine pattern and rate of changes and to make prediction about future direction based on previously identified pattern and rates of changes

Example



- A trend study to determine whether gender differences associated with coronary artery revascularization changed over time.
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PANEL STUDIES

- Sample of people involved in study
- Same people are involved and over a period of time they become more informative on the phenomenon than the subject in trend studies because the researcher can not only examine the patterns of change, and but also the reasons for change
- The same selected people are contacted for 2 or more times to collect further data

Example

- Wu and Pender tested Pender's Health Promotion Model using data from a two-wave panel study of Taiwanese adolescents.

Followup studies

- To determine the subsequent states of subjects with a specified condition or those who have received a specific intervention

Example

- Lukkarinen and Henttenien (2006) conducted a follow up study of 280 patients who had undergone various treatments for coronary artery disease. Data relating to the patients quality of life were gathered 1 year and 8 years after their treatment.



Epidemiological research design

- To investigate causes of different disease in either prospective approach (cohort studies) or retrospective approach (case control studies)



Cohort studies

- Longitudinal approach is used to investigate the occurrence of a disease in existing presumed causes.
- Ex: A researcher longitudinally observes the smoker for development of lung cancer




Case control studies

- Causes of a disease are investigated after the occurrence of a disease
- Ex:- Researcher investigates the history of smoking in patients diagnose with lung cancer




SURVEY RESEARCH DESIGN

- Used to collect information from different subject within a given population having same characteristics of interest
- 



Features

- Process of gathering current required data from the subjects
 - Information is collected from a mix of subjects who represent the total population in the characteristics being studied.
 - Mode of enquiry that relies upon the validity of verbal reports
 - Common method is questioning
- 



Example

- A study to assess the factors influencing postnatal depression among the postnatal mothers at Bagalkot, Karnataka (2006).

Types
Depending on nature
of phenomenon

- Descriptive survey
- Exploratory survey
- Comparative survey
- Correlational survey

Types Methods of data collection

- Written survey - written structured tools (questionnaire, opinionnaires)
- Oral survey – face to face, oral interview, telephonic conversation
- Electronic survey – electronic means (e- mail, sms, web)

ADVANTAGES

- Closest to real life situations
- Most suitable for nursing research studies
- More suitable in situation where conduction of true experiment is not practical

disadvantages

- The results obtained and relationship between dependent and independent variable can never be absolutely clear and error free.
- These are conducted for comparative purposes using non randomly selected groups, which may not be homogenous and tend to be dissimilar in different traits or characteristics, which may affect authenticity and generalizability of the study results.

OTHER ADDITIONAL RESEARCH DESIGNS

- **Methodological studies**
- **Meta – analysis**
- **Secondary data analysis**
- **Outcome research**
- **Evaluation studies**
- **Operational research**

Methodological studies

- Conducted to develop , validate , test, and evaluate the research instruments and methods.
 1. Defining the behavior or construct to measure
 2. Formulating items for tool
 3. Developing instruments for users and respondents
 4. Testing the reliability and validity of research tool

Example

- Ulrich and Colleagues (2005) used an RCT design to test alternative incentives to participate in a survey among non-physician health care professionals(nurse practitioners and physical assistants)

Meta-analysis

- Analysis of analysis
- Quantitatively combining and integrating the findings of the multiple research studies on a particular topic.
- Statistical analysis of a large amount of analyzed results from individualized studies for the purpose of integrating the findings

Meta-analysis steps

1. Define hypothesis
2. Locate the studies
3. Input data
4. Calculate effect sizes
5. Analyze variables

Example

- Lee and Johnson (2005) did a systematic review of research on the effective management of central venous catheters and catheter sites in acute care pediatric patients.

Secondary data analysis

- Data collected by one researcher is reanalyzed by another researcher, usually to test hypothesis.
- Researcher collect lots of data in a study out of which some of the data is left unused or unanalyzed that is later taken by another researcher.

EXAMPLE

- Gleason (2006) studied racial disparities in testicular cancer using data on nearly 8000 men from a National Cancer Institute Database.

Gleason studied whether there were racial / ethnic differences in the relationship between men's age and their stage of testicular cancer

Outcome research

- Involves the evaluation of care practices and systems in place.
- In nursing to develop EBP and to improve nursing practices
- Focus is predominantly on patient's health status and cost of care
- Eg:- An outcome research study on patients satisfaction with existing nursing care model in DMCH, Ludhiana

Outcome research



Evaluation studies

- Involve the judgement about how well a specific programme, practice, procedure or policy is working.
- To determine the effectiveness or value of processes, personnel, equipment, and material used in a particular setting
- Formative or summative evaluation research

Evaluation studies

- Formative – focus on evaluation process of a programme rather than the outcome
- Summative – assessment of the outcome of a programme after completion of programme.
- Ex:- An evaluation study on the effectiveness of an indigenous nursing service and nursing education integration model at AIIMS, Rishikesh

Operational research

- Involves study of complex human organisations and services to develop new knowledge about institutions, programmes, use of facilities and personnel in order to improve working efficiency of an organization.
- Ex: An operational research study on the patients perception about different patient assignment methods for administering nursing care in chosen hospitals of Hyderabad

CHARACTERISTICS

- An interest in variable
- Control over variables
- Use of measurement
- Comparison of groups
- A priory selection of a design

Quantitative data analysis

Rationale of Statistical Test Applied through SPSS

Sr. No	Test	Rationale	Example
1	One Sample t test	Comparison of one sample mean with a population mean	Comparison of human nature understanding of BS 5 th with remaining students enrolled in department
2	Pared samples t test	Comparison of mean a single sample in before after conditions	Comparison on anxiety in women in prenatal and postnatal period
3	Independent samples t text	Comparison of two independent groups means	Gender differences in depression
4	One-Way ANOVA	Comparison of three of more independent groups means	Age differences in sociability
5	Two-Way ANOVA	Comparison of means with two independent categorical variables	Gender differences in happiness in the students of Pakistan and India
6	Repeated Measures ANOVA	Comparison of the mean scores of a single group repeated measures	Effect of treatment sessions on social anxiety
7	Pearson Correlation	Study of relationship between two or more continuous variables	Relationship between depression, anxiety and stress
8	Simple Linear Regression Analysis	Prediction on one dependent variable on the basis of one independent variable	Hope as predictor of happiness
9	Multiple Regression Analysis	Prediction on one dependent variable on the basis of two or more independent variables	Hope and optimism as predictors of happiness
10	Man Whitney U Test	A non-parametric comparable of independent sample t test	Gender differences in brain functioning
11	Kruskal-Wallis H Test	A non-parametric comparable of One-Way ANOVA	Age differences in brain functioning
12	Friedman Test	A non-parametric comparable of Repeated Measures ANOVA	Effect of counselling sessions on positivity
13	Chi-Square Test	Association of two independent categorical variables	Gender differences in brain damages