



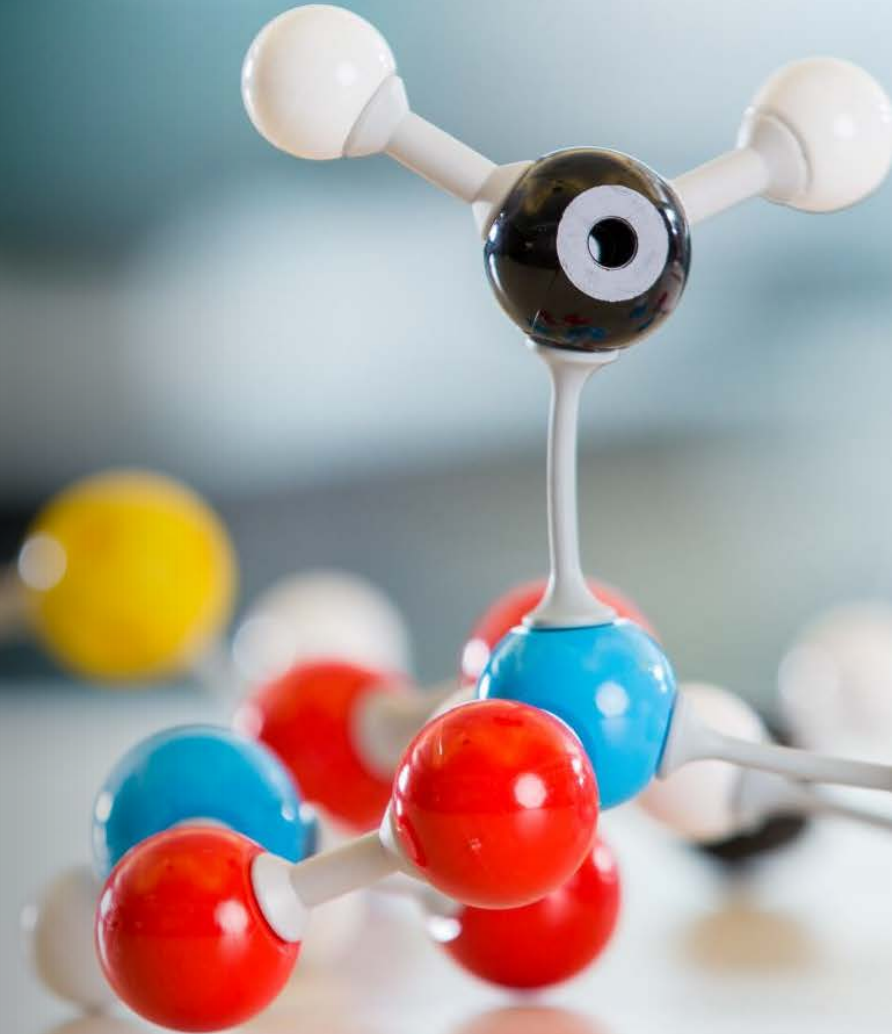
Types of Research

Prof. Kehinde S. Oluwadiya

College of Medicine

Ekiti State University, Ado-Ekiti

www.oluwadiya.com



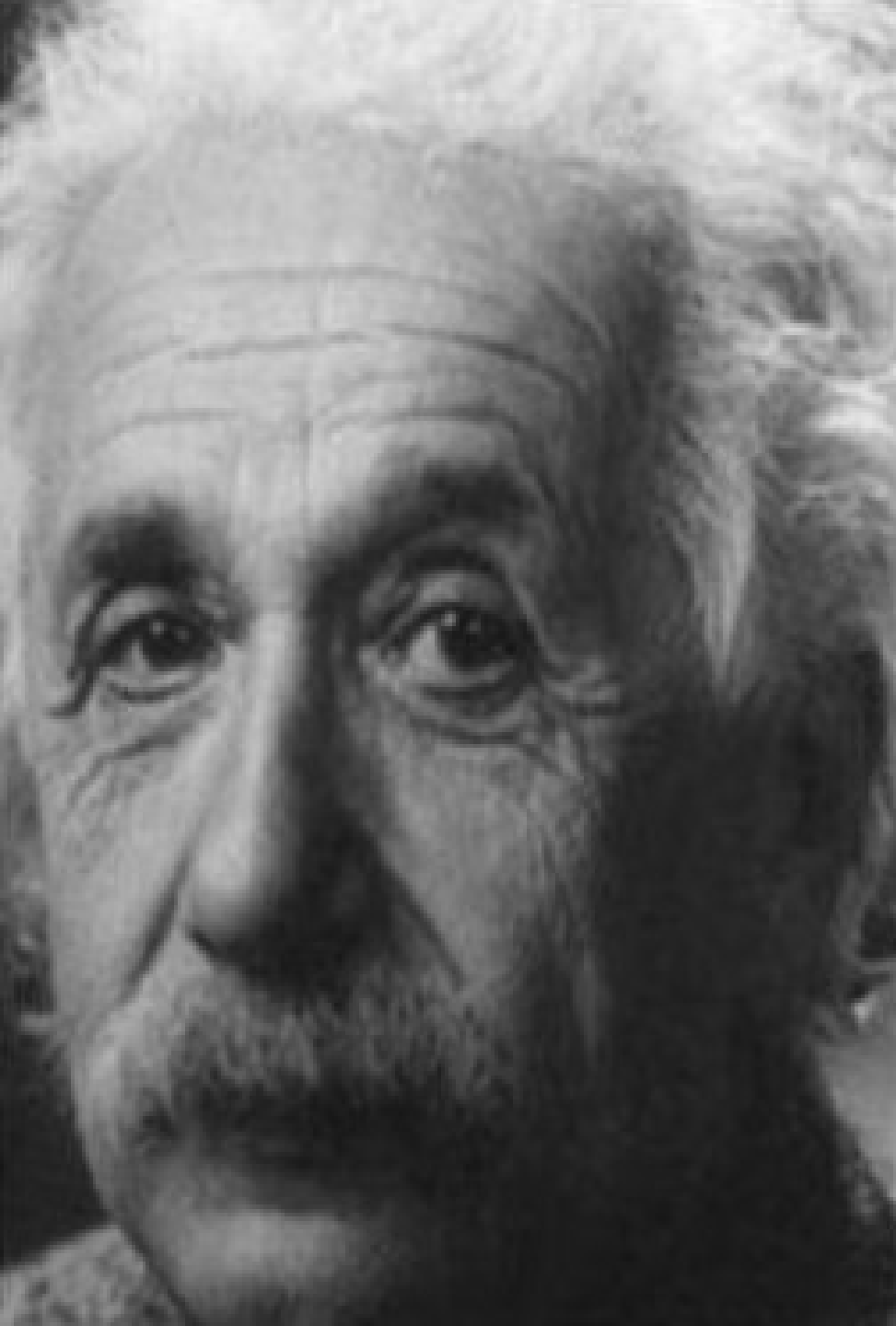
He who does not
research has
nothing to teach

Proverb

PICTUREQUOTES.COM



Definition of Research



If we knew what it was we were
doing, it would not be called
research, would it?

— *Albert Einstein* —

Definition of research

- Research in common parlance refers to a search for knowledge
 - Research is a form of scientific investigation.
-

Definition of Research

- “a **careful investigation** or **inquiry** specially through search for **new** facts in any branch of knowledge.”

- *The Advanced Learner's Dictionary of Current English*, Oxford, 1952, p. 1069.

Definition of Research

- “**systematized** effort to gain **new** knowledge.”

L.V. Redman and A.V.H. Mory, *The Romance of Research*, 1923, p.10.

Definition of Research

- “the manipulation of things, concepts or symbols for the purpose of generalising to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art.”

The Encyclopaedia of Social Sciences, Vol. IX, MacMillan, 1930.

Definition of Research

- Research – combination of two words: **Re-** and **Search**.
 - **Re:** again
 - **Search:** to carefully look for someone or something.
- Research: careful study that is done to find and report **new** knowledge about something

Merriam Webster Dictionary

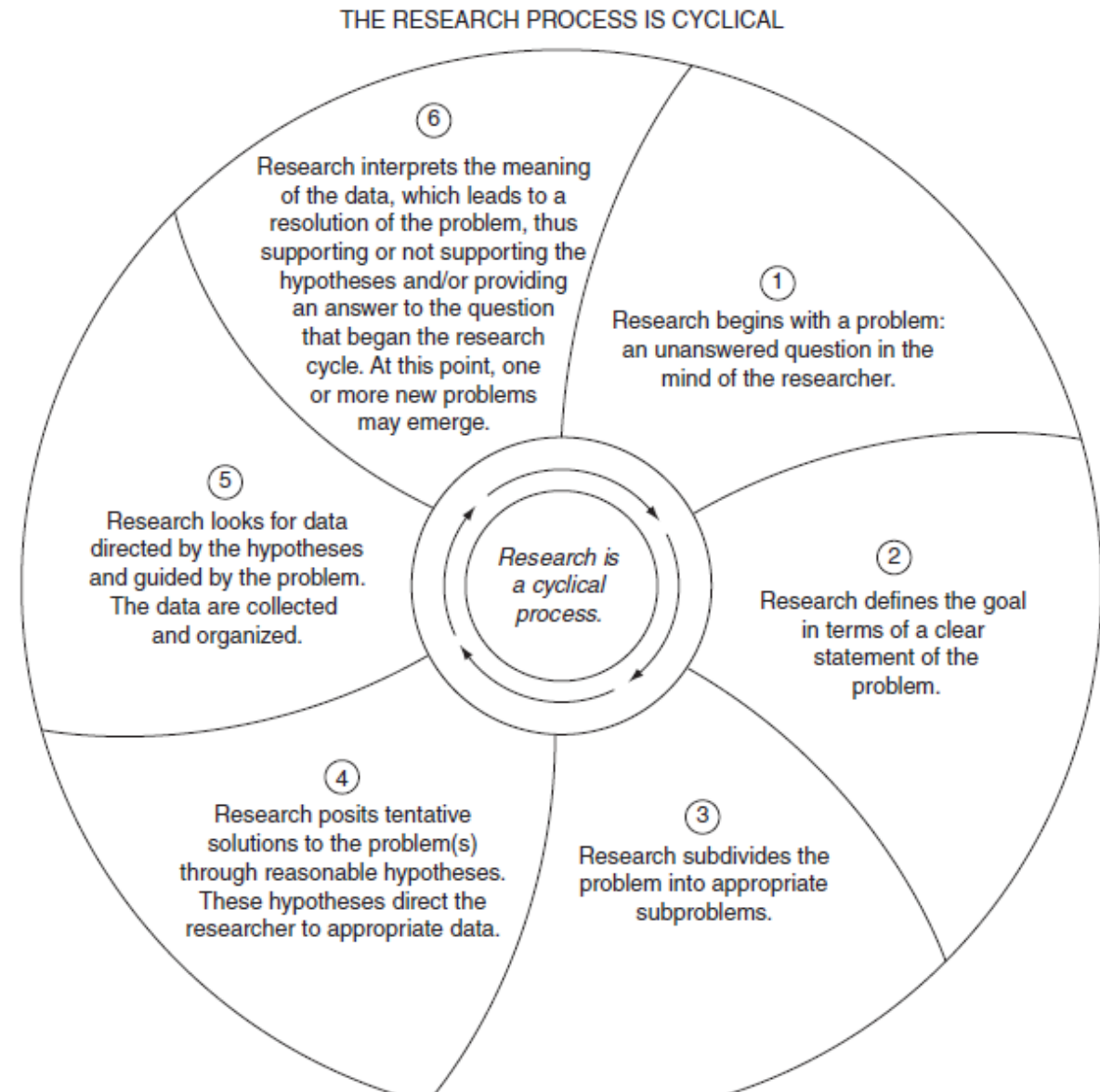
Definition of Research

- *Research is thus an original contribution to the existing stock of knowledge making for its advancement. It is the pursuit of truth with the help of studies, observations, comparisons and experiments.*

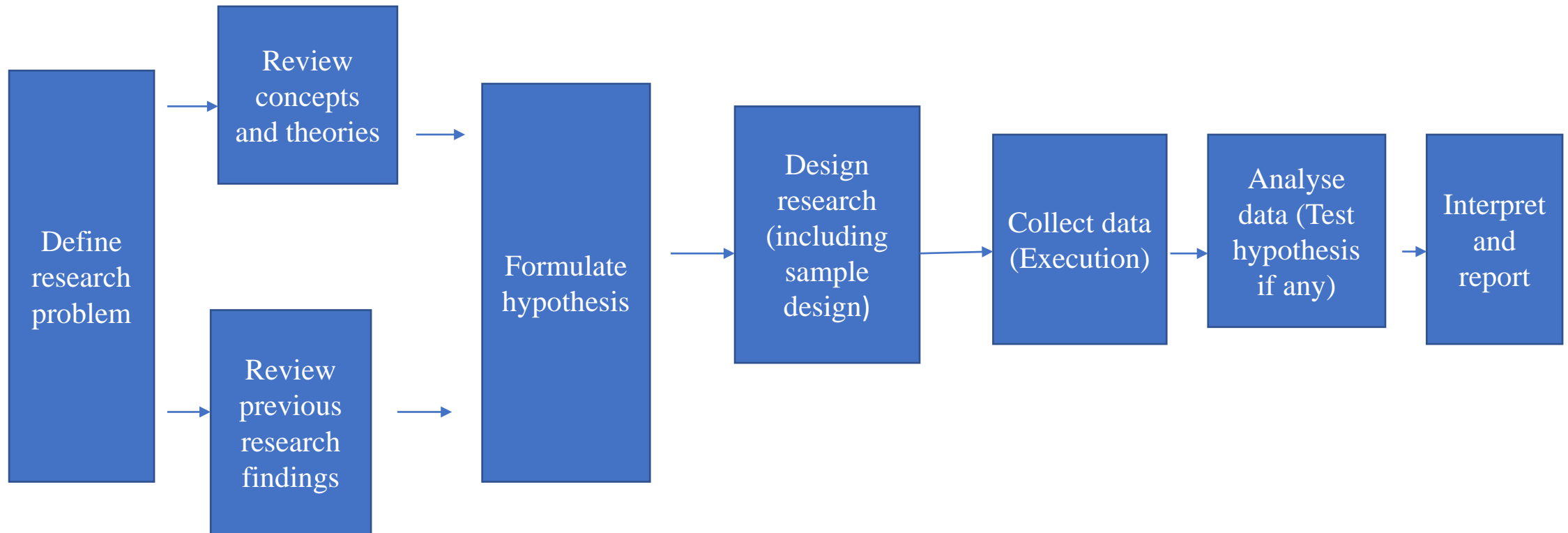
Before Research....

- In order to be able to contribute new knowledge, we must be aware of what is already known.
- To know what is already known, we must do a literature review / search.
- **Review** – combination of two words: Re- and View
- **Re:** again
- **View:**
 - to look at (something) carefully;
 - to think about (someone or something) in a particular way.
- **Review:**
 - to look at or examine (something) carefully especially before making a decision or judgement;
 - to study or look at (something) **again**

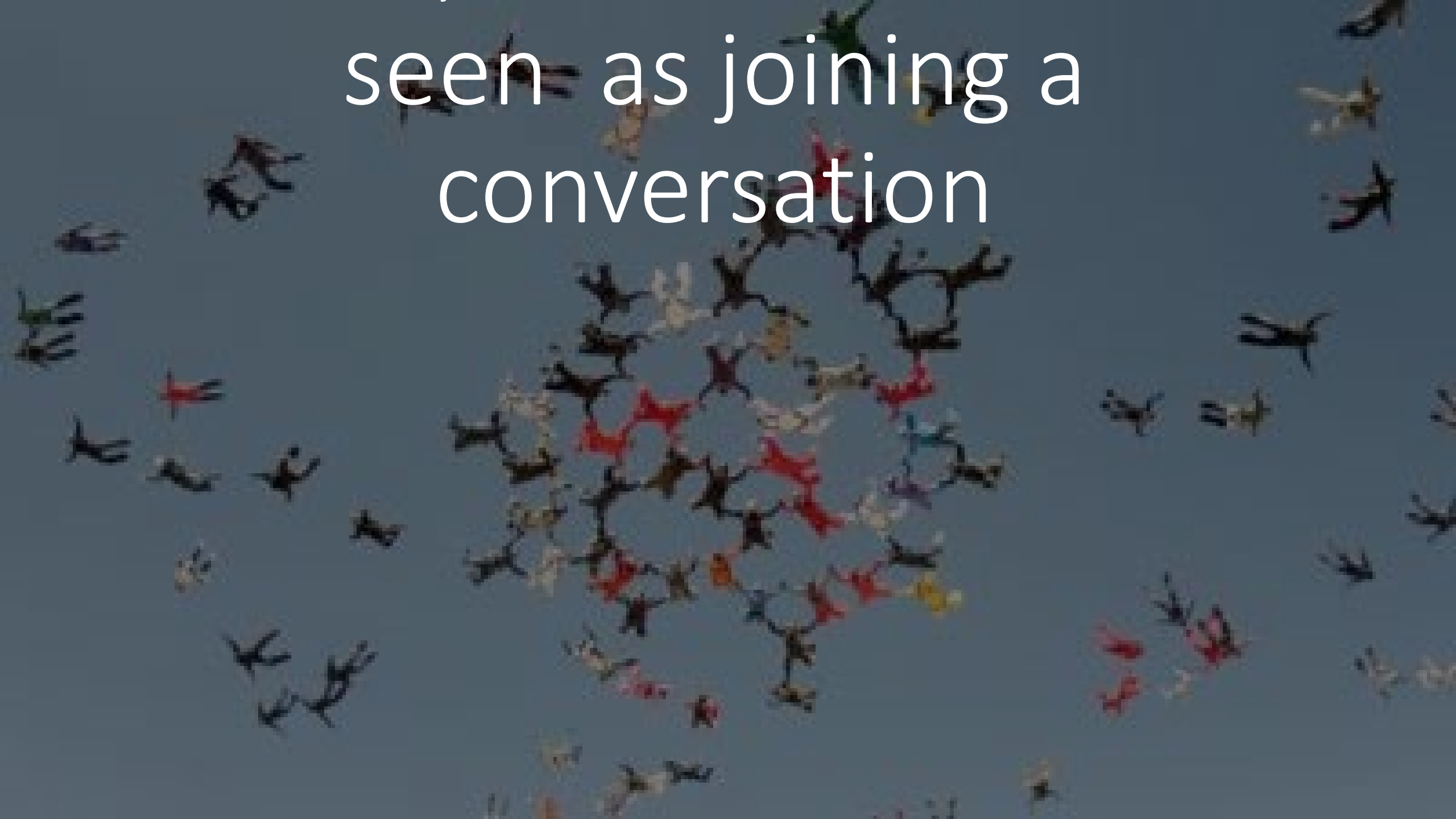
The Research Cycle



Research Profile



seen as joining a
conversation



Research Methods versus Methodology: Is there a difference?

- *Research methods* are the tools or components a quantitative method such as questionnaire that are used for conduction of research.
- Methodology is the justification for using a particular research method.
- For example, if I intend to study the effect of an intervention on backpain, I may choose to do a case control study. But decisions such as whether to use a placebo or gold standard as control, sample size determination and statistic to use, are methodological issues.
- Methods are parts of methodology.

Objectives of research



To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as *exploratory* or *formulative* research studies)



To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as *descriptive* research studies)

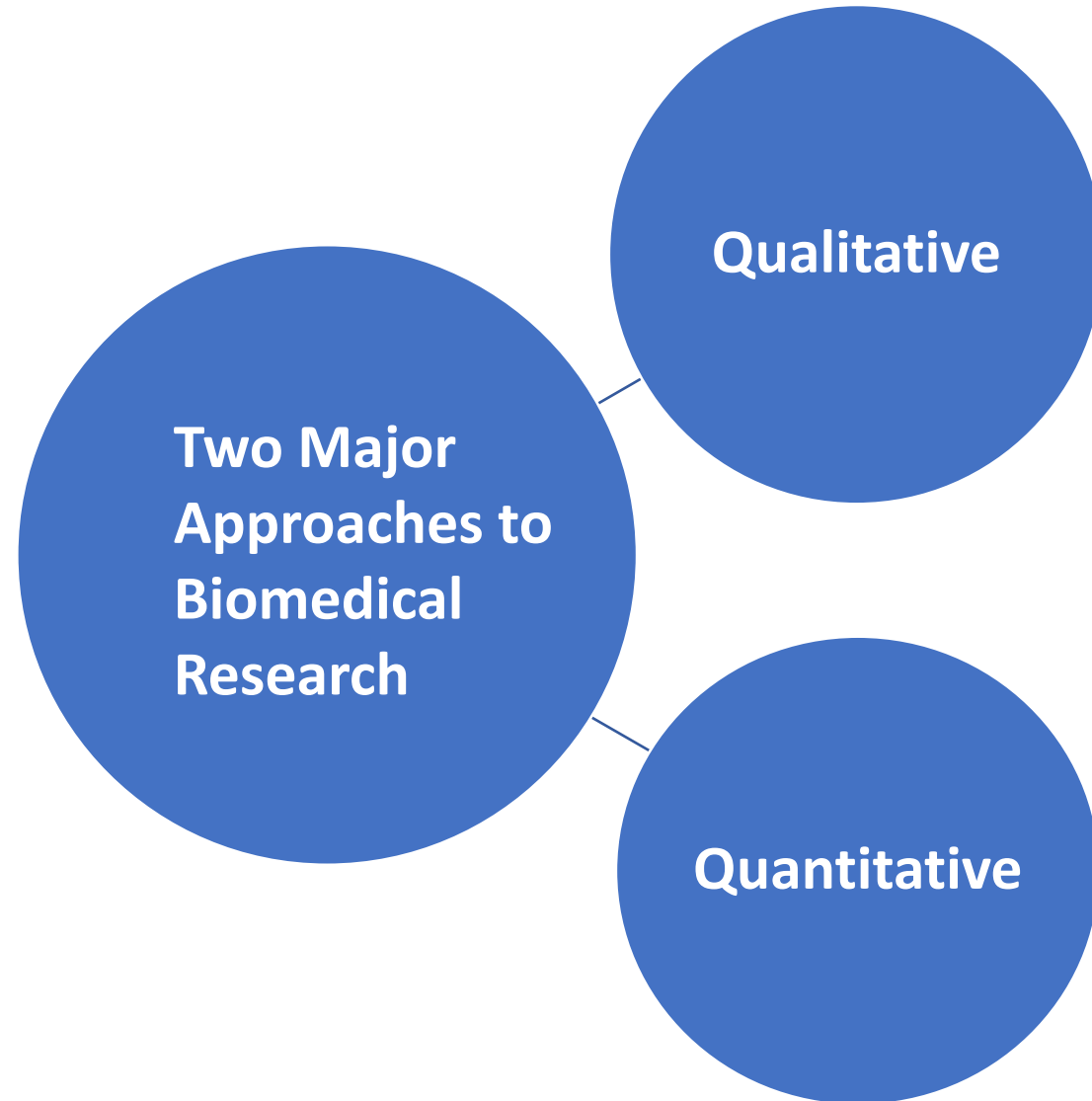


To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as *diagnostic* research studies);



To test a hypothesis of a causal relationship between variables (such studies are known as *hypothesis-testing* research studies).

Research Approaches



Definitions

Quantitative Research

- Quantitative methods emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques.
- Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon

Qualitative Research

- Qualitative research is a type of research that collects and works with non-numerical data and that seeks to interpret meaning from these data that help us understand social life through the study of targeted populations or places.



Quantitative versus Qualitative Research

QUANTITATIVE

AIM: count & classify features, then construct statistical models to explain the observation.

Recommended during latter phases of research projects.

All aspects of the study are carefully designed before data is collected.

Researcher uses tools, such as questionnaires to collect numerical data.

QUALITATIVE

AIM: complete, detailed description.

Recommended during earlier phases of research projects.

The design emerges as the study unfolds.

Researcher is the data gathering instrument.

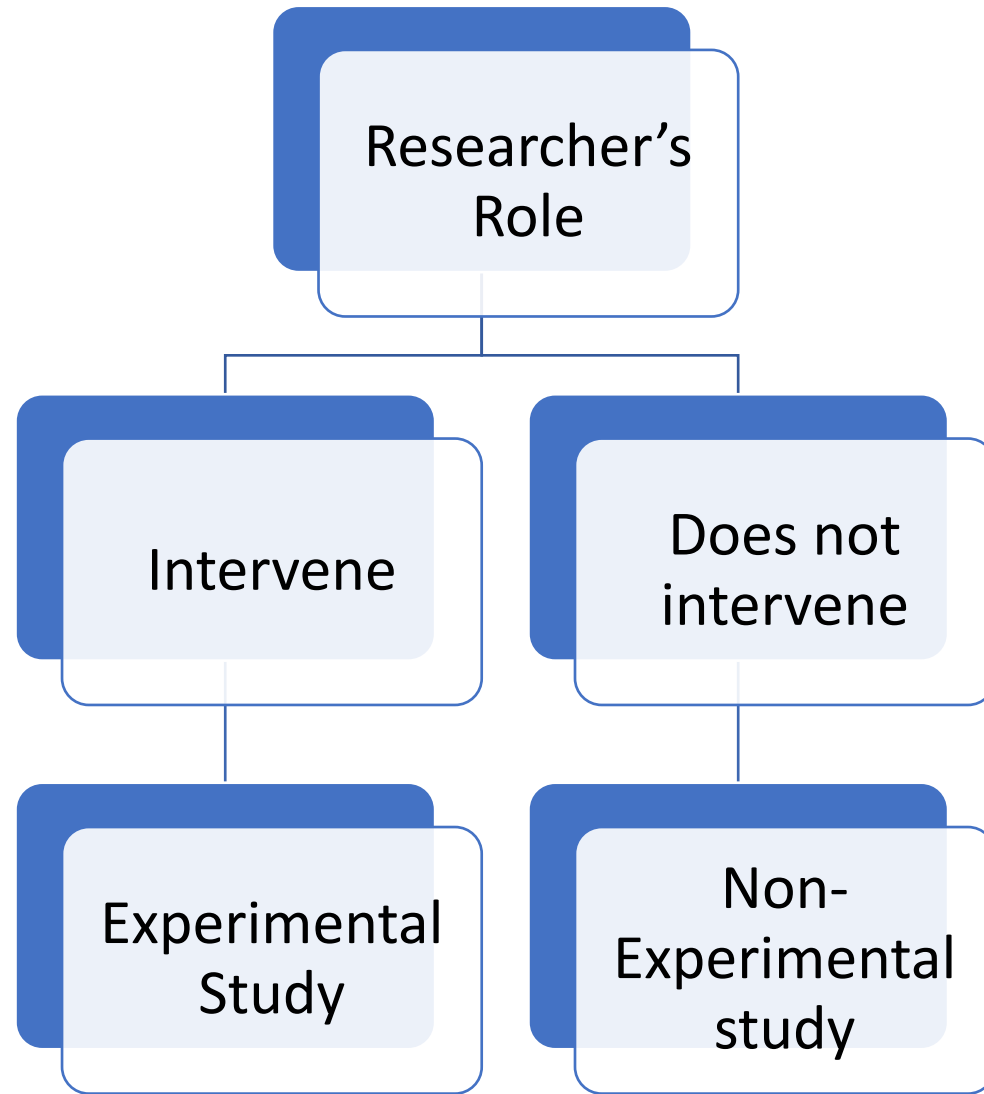
Quantitative versus Qualitative Research

Quantitative	Qualitative
Data is in the form of numbers and statistics.	Data is in the form of words, pictures or objects.
Objective - uses precise measurement & analysis of target concepts, e.g., questionnaires	Subjective – individuals' interpretation of events is important ,e.g., in-depth interviews etc.
Quantitative data is more efficient, able to test hypotheses, but may miss contextual detail.	Qualitative data is more 'rich', time consuming, and less generalizable.
Researcher tends to remain objectively separated from the subject matter.	Researcher tends to become subjectively immersed in the subject matter.

Quantitative Versus Qualitative Software

Quantitative Software	Qualitative (CAQDAS)
Older History: dated back to the early days of computers	First programs started emerging in the early 1980s
Widely employed by researchers in the field	More limited usage, many researchers still employing traditional methods
Most packages do the same thing, only their approaches are slightly different, and their coverage as well	Vastly more different, no two qualitative programs take quite the same approach
Actually used to analyze the data	Merely serves as an aid to the analysis process. The researcher does the analysis

Aspects of Quantitative Studies 1: Experimental versus nonexperimental studies



Aspects of Quantitative Studies 2: Comparisons

In some studies, researchers develop comparisons to provide a context for interpreting results. The most common of types of comparison are as follows:

- ***Comparison between two or more groups.***
For example, suppose we wanted to study the effect of safety education on pedestrian behavior of school children. To do this, we might compare the score of children who had road safety education on pedestrian safety questionnaire with children who did not have the training

Aspects of Quantitative Studies 2: Comparisons

- 2. Comparison of one group's status at two or more points in time:** Seen in pre and post test studies.
- 3. Comparison of one group's status under different circumstances:** For example, we might compare people's heart rates during two different types of exercise.
- 4. *Comparison based on relative rankings:*** We may compare outcome of patients with different severity of diseases following an intervention.
- 5. Comparison with other studies:** Researchers may directly compare their results with results from other studies, sometimes using statistical procedures.

Dimensions of Research methods 1: Type of group Comparison

- **Between-subjects:** Subjects in groups being compared are different people. E.g., the hypothesis that tamoxifen reduces the rate of breast cancer in high-risk women could be tested by comparing women who received tamoxifen and those who did not. In this example, those getting the drug are not the same people as those not getting it
- **Within-subjects:** Subjects in groups being compared are the same people at different times or in different conditions. E.g., we might want to look at the effect of an analgesic in patients with back pain using visual analogue scale before and after giving the analgesic in the same group of patients.

Dimensions of Research Methods 2: Time

Data may be collected once in a study or on multiple occasions:

- **Cross-sectional studies:** collection of data at one point in time
- **Longitudinal studies:** A study in which data are collected at more than one point in time *over an extended period.*

Types of Longitudinal Research

- 1. Trend studies** are investigations in which samples from a population are studied over time with respect to some phenomenon. Different samples are selected at repeated intervals, but the samples are always drawn from the same population.
- 2. Cohort studies** are a particular kind of trend study in which specific subpopulations are examined over time for a particular phenomenon. The samples are usually drawn from specific age-related subgroups. For example, the cohort of women born from 2015 to 2020 may be studied at regular intervals with respect to health care utilization.

Types of Longitudinal Research

- 3. Panel studies:** the *same* people are used to supply data at two or more points in time. The term **panel** refers to the sample of subjects providing data. Because the same people are studied over time, researchers can identify individuals who did and did not change and then examine characteristics that differentiate the two groups.
- 4. Follow-up studies** are similar to panel studies but are usually undertaken to determine the subsequent development of individuals who have a specified condition or who have received a specified intervention—unlike panel studies, which have samples drawn from more general populations. For example, patients who have received a particular nursing intervention or clinical treatment may be followed to ascertain the long-term effects of the treatment.

Dimensions of Research methods:

3. Control over independent variable

- **Experimental:** Manipulation of independent variable, control group, randomization
- **Quasi-experimental:** Manipulation of independent variable, but no randomization or no control group
- **Preexperimental:** Manipulation of independent variable, no randomization or control group, limited control over extraneous variables
- **Nonexperimental:** No manipulation of independent variable

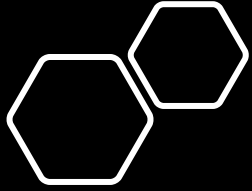
Characteristics of Experimental studies

A **true** experimental design is characterized by the following properties:

- **Manipulation**—the experimenter *does* something to some of the subjects
- **Comparison**—the experimenter introduces controls over the experimental situation, including the use of a control group
- **Randomization**—the experimenter assigns subjects to a control or experimental group on a random basis

Group	Randomized?	Pre-test	Intervention	Post-test
Treatment Group	YES	O_1	Yes	O_2
Control Group	YES	O_1	None	O_2

Symbolic representation of a pretest–posttest (before–after) experimental design



Manipulation

- This involves *doing* something to study participants. The introduction of that “something” (i.e., the experimental **treatment** or **intervention**) constitutes the independent variable. The experimenter manipulates the independent variable by administering a treatment to some subjects and withholding it from others (or by administering some other treatment). The experimenter thus consciously *varies* the independent variable and observes the effect on the dependent variable.

Control

Control is the situation when an intervention is withheld from a comparison group. This is achieved in an experimental study by the following:

1. Manipulation
2. Randomization,
3. Carefully planned experimental protocols, and
4. Creating a comparison group.

The term **control group** refers to a group of subjects whose performance on a dependent variable is used to evaluate the performance of the **experimental** or **treatment group** (the group that receives the intervention) on the same dependent variable.

Types of Controls

- No treatment/Intervention: Not always feasible or ethical
- Placebo
- Standard or Gold treatment/Intervention
- An alternative treatment
- Different doses of treatment
- Delayed intervention/treatment

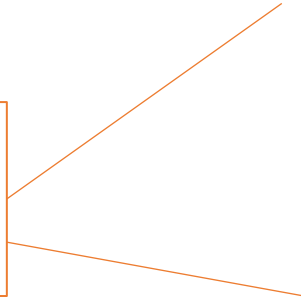
Randomization

- This is also called **random assignment**
- It involves placing subjects in groups at random.
- *Randomization* essentially means that every subject has an equal chance of being assigned to any group. If subjects are placed in groups randomly, there is no **systematic bias** in the groups with respect to attributes that could affect the dependent variable.
- Randomization remains the most trustworthy and acceptable method of equalizing groups.

Experimental Designs

NAME OF DESIGN	PREINTERVENTION DATA?	WITHIN- OR BETWEEN-GROUPS	FEATURES
Posttest-only (after-only)	No	Between	One data collection point after the intervention; not appropriate for measuring <i>change</i>
Pretest-posttest (before-after)	Yes	Between	Data collection both before and after the intervention; appropriate for measuring change; can determine differences between groups (experimental) and change within groups (quasi-experimental)
Solomon four-group	For some subjects	Between	Data collection before and after the intervention for one experimental and one control group, but after only for a second experimental and control group, to assess pretest effects
Factorial	Optional	Between	Experimental manipulation of more than one independent variable; permits a test of <i>main effects</i> for each manipulated variable and <i>interaction effects</i> for combinations of manipulated variables
Randomized block	Optional	Between	Random assignment to groups within different levels of a blocking variable that is not under experimental control (e.g., gender)
Crossover/repeated measures	Optional	Within	Subjects are exposed to all treatments but are randomly assigned to different orderings of treatments; subjects serve as their own controls

These 2 are similar to each other



Factorial Designs

- Experimental designs with more than one independent variable.
- The term factor refer to each of manipulated independent variables
- For example, gender has two levels (male and female) while economic status may have three levels (low, middle and upper classes).
- A factorial design may investigate the effects of gender and economic status on a dependent variable e.g., Outcome of a disease.

Convention
for
presenting
factorial
designs

Multiplication Notation is
commonly used for this

Multiplication Notation

A 3 x 4 factorial design

The number of numbers indicates how many factors there are.

There are 2 factors because there are 2 numbers (3&4).

Multiplication Notation

A 3 x 4 factorial design

The number *values* tell you how many levels are in each factor.

- Factor 1 has 3 levels.
- Factor 2 has 4 levels.

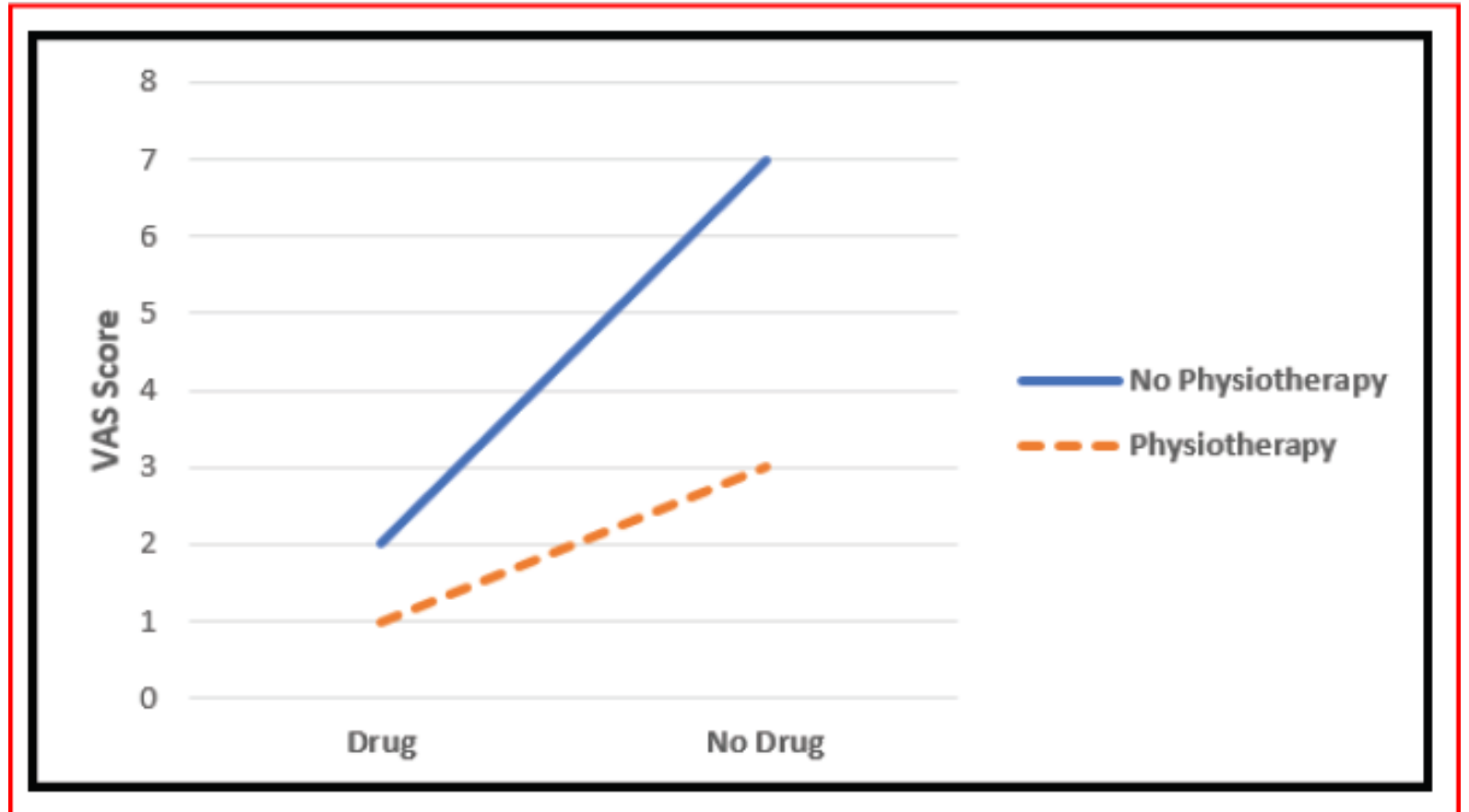
Outcomes in Factorial Designs

Two types of effects can emerge in multi-factorial designs:

- **Main Effects:** This is the effect of one independent variable on the dependent variable, ignoring the effects of all other independent variables. There is one main effect for every independent variable in the study
- **Interaction Effects:** When the effect of one independent variable on the dependent variable changes depending on the level of another independent variable. The interaction effect is what makes factorial designs much more powerful than single factor designs.

Outcomes in Factorial Designs

Outcome of treatment of back pain with drugs and physiotherapy. Outcome of treatment was measured with the Visual Analogue Scale (VAS), in which a lower score means better pain control.



Covariate Design

- Covariates are used when the subjects differ because of the influence of a continuous variable.
- The variable is measured before the interventions are applied, and during statistical analysis the differences caused by the covariate would be accounted for.
- Covariates are the variables you adjust for in your researches.
- For instance, if you are testing a new drug for the treatment of hypertension. Knowing weight of patients will affect their blood pressure, you can measure the weight of the patients, and use that continuous variable as a covariate in the subsequent analysis that would control for the weight of the patients and statistically equalize it.

QUASI-EXPERIMENTAL DESIGN

- **Quasi-experiments**, like true experiments, involve the manipulation of an independent variable, that is, an intervention. However, quasi-experimental designs lack randomization to treatment groups, which characterizes true experiments.
- The pre and post test designs ensure that pre-experimental differences/similarities can be detected during analysis. It is a sort of compensation for the lack of randomization

Randomized?	Pre-test	Intervention	Post-test
No	O_1	Yes	O_2
No	O_1	None	O_2

Symbolic representation of a pretest–posttest (before–after) quasi-experimental design

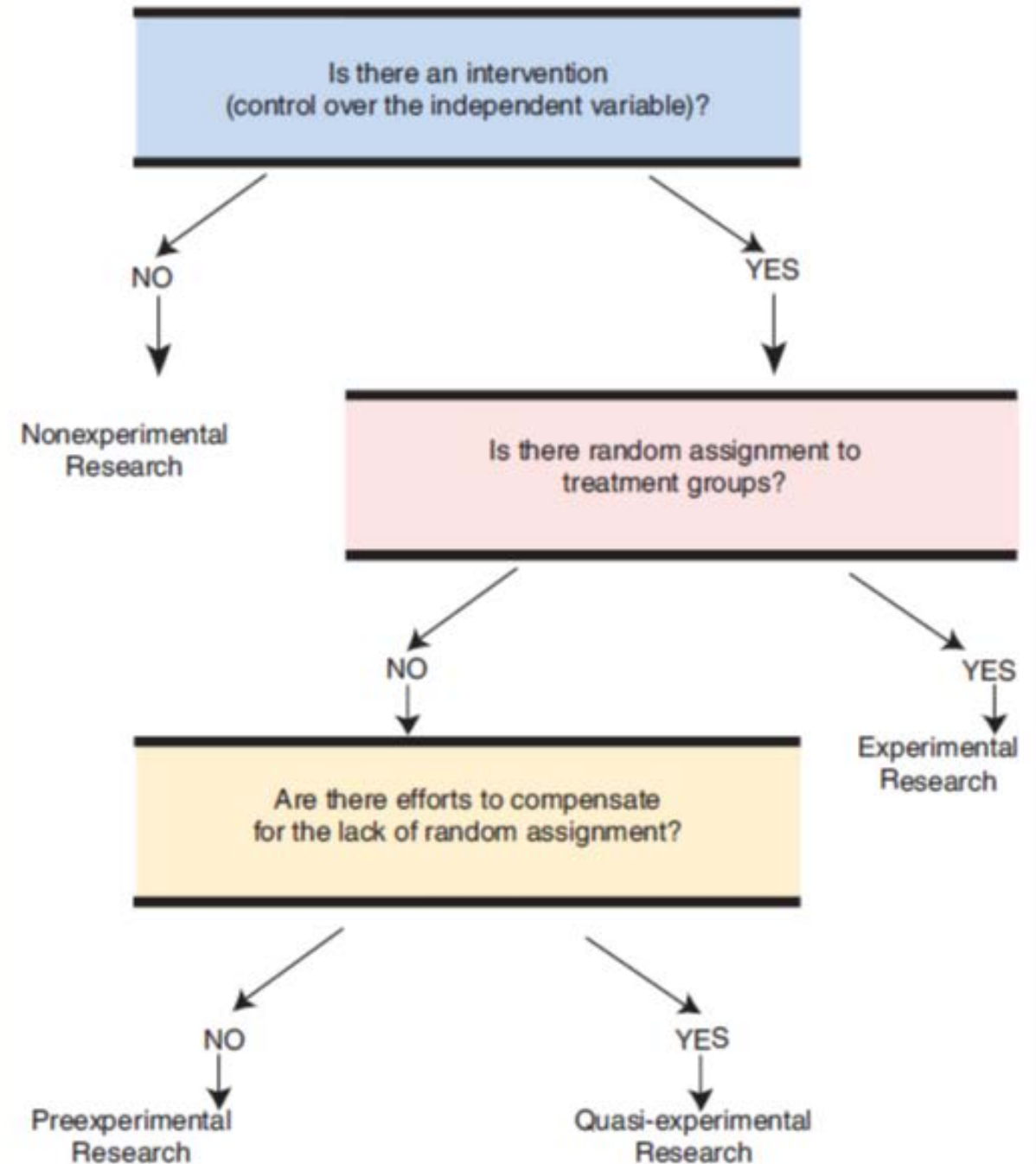
Pre-experimental Design


- **Pre-experiments**, like true experiments, involve the manipulation of an independent variable, that is, an intervention. However, pre-experimental designs lacks both randomization to treatment groups as well as a pre-test.
- Thus, one cannot really say if the observed difference in group was not due to an underlying difference between the groups.

Randomized?	Pre-test	Intervention	Post-test
No	None	Yes	O_2
No	None	None	O_2

Symbolic representation of pre-experimental design


Flow diagram
different
quantitative
research designs.





Advantages of Experimental method

1. It provides researchers with a high level of control.
2. There is no limit to the subject matter or industry involved.
3. Experimental research provides conclusions that are specific.
4. The results of experimental research can be duplicated.
5. Natural settings can be replicated with faster speeds.
6. Experimental research allows cause and effect to be determined.
7. It can be combined with other research methods.



Disadvantages of Experimental method

1. Results are highly subjective due to the possibility of human error.
2. Experimental research can create situations that are not realistic.
3. It is a time-consuming process.
4. There may be ethical or practical problems with variable control.
5. Extraneous variables cannot always be controlled.
6. Participants can be influenced by their current situation.
7. Human responses in experimental research can be difficult to measure.

In conclusion

- The advantages and disadvantages of experimental research show that it is a useful system to use, but it must be tightly controlled in order to be beneficial. It produces results that can be replicated, but it can also be easily influenced by internal or external influences that may alter the outcomes being achieved. By taking these key points into account, it will become possible to see if this research process is appropriate for your next product, theory, or idea.



Thank You

To ask questions, please join the forum at
www.oluwadiya.com