1.2 Methods Psychological Research

Syllabus:

Ch 2: Types of research: Descriptive, evaluative, diagnostic and prognostic; Methods of Research: Survey, observation, case-study and experiments; Characteristics of experimental design and non-experimental design, Quasi-experimental designs; Focused group discussions, brain storming, grounded theory approach.

Ch 3: Major steps in Psychological research (problem statement, hypothesis formulation, research designs, sampling, tools of data collection, analysis and interpretation and report writing) Fundamental versus applied research; Methods of data collection (interview, observation, questionnaire); Research designs (ex-post facto and experimental); Application of statistical technique (t -test, two way ANOVA correlation, regression and factor analysis); Item response theory.

Previous Years' Questions

2016

Q. How can confounding variables invalidate the apparent results of an experiment? 10 marks [2016]

Q. Discuss with examples, the key characteristics of within-group and between-group designs. 15 marks [2016]

2015

Q. How far is it correct to state that most of the problems of psychology can be addressed more adequately by adopting quasi-experimental designs. 10 marks [2015]

Q. Under what kind of research conditions does the use of factor analysis become necessary? Discuss. 20 marks [2015]

Q. It is believed that non-experimental designs are more relevant for explaining the emerging issues like social evils that are seen prominently in India. Discuss. 20 marks [2015]

Q. With suitable examples, discuss the logic behind following the systematic steps in conducting psychological research. 15 marks [2015]

2014

Q. Describe the uses of factor analysis in Psychological research and indicate different types of rotations used in it. 10 marks [2014]

Q. In what ways does within-factorial design differ from between-factorial design? 10 marks [2014]

Q. What are multi-variate techniques used in Psychological research? Indicate their uses. 15 marks [2014]

Q. What are various kinds of threats to validity of experimental research? Illustrate your answer with the help of examples. 20 marks [2014]

2013

Q. What do you understand by 'effect size' and 'statistical power'? Explain their significance. 15 marks [2013]

Q. Describe the basic elements of observation and bring out the implications of the dimension of participation in observational research. 15 marks [2013]

Q. What are the requirements to be met by psychological assessment tools for offering accurate and useful measure of psychological constructs? 15 marks [2013]

2012

Q. Discuss the criteria of question writing in a survey research 12 marks [2012]

Q. Bring out the differences between sampling error and error in sampling. How sampling error is detrimental to scientific study? 12 marks [2012]

Q. Discuss the three basic conditions for using t-test of significance. Describe at least five different uses of t-test, with examples. 20 marks [2012]

Q. In which way Item Response Theory is an improvement over classical tests clearly? Compare the two approaches and critically evaluate Rasch's model of IRT. 30 marks [2012]

Q. Compare LISREL program with that of SPASS in the analysis of multivariate data. 12 marks [2012]

2011

Q. Suggest a plan of an experimental study to evaluate the effect of compensatory education on academic achievement of school- going students from low income group. 10 marks [2011]

Q.Critically evaluate internal consistency and stability coefficients as indices of reliability. 20 marks [2011]

Q. Examine the concerns for control, measurement and artifacts, and also indicate the threats they pose to the development of scientific psychology. 30 marks [2011]

2010

Q. Under what conditions would a researcher prefer to use focused group discussion over interviewing? 10 marks [2010]

Q. In what ways does an experimental desgn differ from a quasi-experimental design ? 10 marks [2010]

Q. What are the problems a researcher is likely to face in making causal inferences if the researcher were to use a single - group pre-test-post-test design ? 30 marks [2010]

2009

Q. With suitable examples distinguish between exploratory type and confirmatory type factor analysis. How do you examine the significance level of factors loadings? 20 marks [2009]

Q. Discuss the use(s) of SPSS program in psychological testing. 20 marks [2009]

2008

Q. Grounded theory takes a case rather than variable perspective. Elaborate this statement. 20 marks [2008]

Q. Can Item Response theory be called a latent trade theory? Describe the mathematical functions that are used in this theory and explain the various models related to the theory. 60 marks [2008]

Types of research

1.Descriptive/Statistical/Generative Research: type of research that describes the what of a situation, not how or why or what caused it. Purpose is to observe, describe and document aspects of a situation as it naturally occurs and sometimes to serve as a staring point for hypothesis generation theory development. e.g. noting down case study details thoroughly, or naturalistic observation of a football stadium crowd etc.

It is used to describe characteristics of a population or phenomenon being studied - mainly done when a researcher wants to gain a better understanding of a topic. It does NOT answer questions about how/when/why the characteristics occurred.

2. Evaluative Research: testing/assessing or evaluating existing solutions (theories) to see if it meets the demands.

3. Diagnostic/Correlational Research: Researcher tries to venture into root causes of a problem. She tries to describe the factors responsible for the problematic situation. It is a problem solving research design and consists mainly of

- emergence of problem
- diagnosis of the problem
- solution for the problem
- suggestions for the problem solution.

Even if correlation is established, causation cannot be established. To establish causation, the researcher should be able to say that the result is the outcome of the observed variable and not something else. Correlation is not causation.

4. Prognostic/Predictive Research: refers to any scientific investigation in which the main and stated purpose is to predict the future operation of the factors investigated, so that inevitable things that must be done may be controlled intelligently on the basis of knowledge about the analyzed trend of their occurrence over a definitely selected period of time.

Fundamental vs applied research

- Applied research
  - examines a *specific* set of circumstances
  - its ultimate goal is relating the results to a particular situation.
  - i.e. applied research uses the data directly for real world application.
  - In applied research the goal is to predict a *specific* behavior in a very *specific* setting,

- Fundamental Research
  - Focuses on fundamental principles and testing theories.
  - Mistakenly, it is sometimes implied that basic research doesn't have practical applications. But history of science (& psychology) is replete with examples of basic research leading to real world applications.
  - Just because a research study is not directed at specific set of circumstances does not mean that in future the finding from study will not be applied to a specific event(s).
  - Classical and operant condition principles were developed mostly from experimenting on non-human subjects. Since the discovery of these principles, they have been applied to a wide array of human problems, such as teaching declarative knowledge, treating autistic children, treating overweight individuals, and treating phobias etc.

"It is probably a mistake to view the basic-vs-applied distinction solely in terms of whether a study has practical applications, because this difference often simply boils down to a matter of time. Applied findings are of use immediately. However, there is nothing so practical as a general and accurate theory." - Keith E. Stanovich (Emeritus Professor of Applied Psychology and Human Development, University of Toronto and former Canada Research Chair of Applied Cognitive Science)

Major steps in Psychological research

Problem Statement - Hypothesis Formulation - Choosing a research design - sampling- data collection - analyzing data - report writing

1. Problem statement

- Stating topic as a question.
- e.g. if we are interested in finding out about use of alcoholic beverages by college students, we might pose the question, *"What effect does use of alcoholic beverages have on the health of college students?"*
- Main concepts or keywords in the question need to be identified.

2. Hypothesis formulation

- A research hypothesis is a clear statement predicting how changes in the independent variable will affect the value of dependent variable(s).
- A hypothesis should also clearly state the population about which the researcher intends to draw conclusions.
- e.g. "Memory in people with sedentary lifestyles will improve upon daily cardio-exercise of 30 mins"

Types of hypothesis
Simple Hypothesis
Complex Hypothesis
Empirical Hypothesis
Null Hypothesis
Alternative Hypothesis
Logical Hypothesis
Statistical Hypothesis

Simple Hypothesis

Simple hypothesis is that one in which there exists relationship between two variables one is called independent variable or cause and other is dependent variable or effect. For example

Smoking leads to Cancer
The higher ratio of unemployment leads to crimes.

Complex Hypothesis

Complex hypothesis is that one in which as relationship among variables exists. In this type dependent as well as independent variables are more than two. For example

Smoking and other drugs leads to cancer, tension chest infections etc.
The higher ration of unemployment poverty, illiteracy leads to crimes like dacoit, Robbery, Rape, prostitution & killing etc.

Empirical Hypothesis

Working hypothesis is that one which is applied to a field. During the formulation it is an assumption only but when it is pat to a test become an empirical or working hypothesis.

Null Hypothesis

Null hypothesis is contrary to the positive statement of a working hypothesis. According to null hypothesis there is no relationship between dependent and independent variable. It is denoted by 'HO".

Alternative Hypothesis

Firstly many hypotheses are selected then among them select one which is more workable and most efficient. That hypothesis is introduced latter on due to changes in the old formulated hypothesis. It is denote by "HI".

Logical Hypothesis

It is that type in which hypothesis is verified logically. J.S. Mill has given four cannons of these hypothesis e.g. agreement, disagreement, difference and residue.

Statistical Hypothesis

A hypothesis which can be verified statistically called statistical hypothesis. The statement would be logical or illogical but if statistic verifies it, it will be statistical hypothesis.

A good hypothesis possesses the following certain attributes.

Power of Prediction

One of the valuable attribute of a good hypothesis is to predict for future. It not only clears the present problematic situation but also predict for the future that what would be happened in the coming time. So, hypothesis is a best guide of research activity due to power of prediction.

Closest to observable things

A hypothesis must have close contact with observable things. It does not believe on air castles but it is based on observation. Those things and objects which we cannot observe, for that hypothesis cannot be formulated. The verification of a hypothesis is based on observable things.

Simplicity

A hypothesis should be so dabble to every layman, P.V young says, "A hypothesis wo0uld be simple, if a researcher has more in sight towards the problem". W-ocean stated that, "A hypothesis should be as sharp as razor's blade". So, a good hypothesis must be simple and have no complexity.

Clarity

A hypothesis must be conceptually clear. It should be clear from ambiguous information's. The terminology used in it must be clear and acceptable to everyone.

Testability

A good hypothesis should be tested empirically. It should be stated and formulated after verification and deep observation. Thus testability is the primary feature of a good hypothesis.

Relevant to Problem

If a hypothesis is relevant to a particular problem, it would be considered as good one. A hypothesis is guidance for the identification and solution of the problem, so it must be accordance to the problem.

Specific

It should be formulated for a particular and specific problem. It should not include generalization. If generalization exists, then a hypothesis cannot reach to the correct conclusions.

Relevant to available Techniques

Hypothesis must be relevant to the techniques which is available for testing. A researcher must know about the workable techniques before formulating a hypothesis.

Fruitful for new Discoveries

It should be able to provide new suggestions and ways of knowledge. It must create new discoveries of knowledge J.S. Mill, one of the eminent researcher says that "Hypothesis is the best source of new knowledge it creates new ways of discoveries".

Consistency & Harmony

Internal harmony and consistency is a major characteristic of good hypothesis. It should be out of contradictions and conflicts. There must be a close relationship between variables which one is dependent on other.

Types of errors in hypotheses

A type I error (or error of the first kind) is the incorrect rejection of a true null hypothesis.

type II error (or error of the second kind) is the failure to reject a false null hypothesis. Examples of type II errors would be a blood test failing to detect the disease it was designed to detect, in a patient who really has the disease; a fire breaking out and the fire alarm does not ring; or a clinical trial of a medical treatment failing to show that the treatment works when really it does.

3. Research designs

- **Experimental Designs:**
  - can demonstrate cause and effect
  - have a sample of participants **randomly selected** and/or randomly assigned to experimental groups and control groups
  - have an independent treatment variable that can be applied to the experimental group
  - have a dependent variable that can be measured in all groups

- **Quasi-Experimental Designs (QEDs):**
  - A quasi-experiment is an empirical study used to estimate the causal impact of an intervention on its target population without random assignment. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but it specifically lacks the element of random assignment to treatment or control. Instead, quasi-experimental designs typically allow the researcher to control the assignment to the treatment condition, but using some criterion other than random assignment (e.g., an eligibility cutoff mark)

  - have participants that can not be randomly selected but may sometimes be able to be randomly assigned to experimental groups and control groups

In every other way quasi-experimental research is very much like experimental research. It has:

- an independent treatment variable that can be applied to the experimental group
- a dependent variable that can be measured in all groups
- can demonstrate cause and effect

Quasi-experiments are commonly used in social sciences, public health, education, and policy analysis, especially when it is not practical or reasonable to randomize study participants to the treatment condition.

E.g. : Aim : To study whether aggressiveness in children has a positive correlation with the amount of violence they suffer at home.

Procedure : We divide households into two categories: Households in which the parents beat their children, and households in which the parents do not beat their children. We can run a linear regression to determine if there is a positive correlation between parents' beating and their children's aggressive behavior.

However, to simply randomize parents to beat or to not beat their children may not be practical or ethical, because some parents may believe it is morally wrong to beat their children and refuse to participate.

Limitations of QEDs

  - Quasi-experiments are however, subject to concerns regarding **internal validity**, because the treatment and control groups may not be comparable at baseline. With random assignment, study participants have the same chance of being assigned to the intervention group (experimental) or the comparison group. As a result, differences between groups on both observed and unobserved characteristics would be due to chance, rather than to a systematic factor related to treatment (e.g., illness severity).

  - With quasi-experimental studies, it may not be possible to convincingly demonstrate a causal link between the treatment condition and observed outcomes. This is particularly true if there are **confounding variables** that cannot be controlled or accounted for.

- **Ex post facto design** aka **Causal-Comparative Design**
  - can not convincingly demonstrate cause and effect but can strongly suggest it
  - Ex-post facto design is sometimes simply called a quasi-experimental study examining how an independent variable, present prior to the study, affects a dependent variable
  - has participants that can be randomly selected and assigned to experimental groups and control groups based on preexisting conditions (male vs. female, smoker vs. non smoker, one ethnic group vs. another)
  - an independent treatment variable can not be manipulated as it is impossible, impractical, or unethical (usually a preexisting condition)
  - focuses first on the cause and searches for the effect..
  - So, there is something about the participant that we're going to study that we don't have to alter in the participant.
  - Named ex post facto because we are interested in a prior variable that is present in the participant.
  - It is a method in which groups with qualities that already exist are compared on some dependent variable.
  - Although differing groups are analyzed and compared in regards to independent and dependent variables it is not a true experiment because it lacks absolute random assignment.
  - The assignment of subjects to different groups is based on whichever variable is of interest to the researchers. For example, a researcher is interested in how weight influences self-esteem levels in adults. So the participants would be separated into differing groups (underweight, normal weight, overweight) and their self esteem levels measured. This is an ex post facto design because a pre-existing characteristic (weight) was used to form the groups.

Examples of how QEDs can be useful in many instances in Psychological research

e.g. 1 : Suppose one is interested in examining the IQ scores of people who score highly in each of the five 'Big Five' personality factors. Each of the five personality factors are a quasi-independent variable. Personality traits are inherent to each person, so random assignment cannot be used. Participants would initially be assigned to groups based on their personality assessment score across each of the five personality factors.

Now that one has the participant group assignments, s/he can examine the impact that personality factors may have on intelligence. If a true experimental design were used, each participant would be randomly assigned to each personality group regardless of whether or not they possessed those personality traits, which would not really address the question that was intended to answer.

e.g. 2 : Dr. Loyd is a multicultural expert and is interested in the effect that race has on academic dishonesty. People cannot be randomly assigned to different race categories, so a quasi-experimental design is used.

If she is interested in examining academic dishonesty among Caucasian, African-American, and Native American college students, then as participants volunteered for her study, they would be assigned to the appropriate group based on their self-identified race. Once the groups have been assigned, Dr. Loyd can expose each group to the measure of academic dishonesty that she created and evaluate the results to see if differences emerge between the groups.

Sampling

- The term sample in Psychology refers to the members of the population that have been chosen to take part in the research.
- Sampling procedures must ensure that the sample is representative of the population from which it is drawn.
- This means that the personal characteristics in the sample should be distributed in the same proportion as the sample

How does sampling help in Psychology

- Saves time and effort
- Helps in effective administration of tests or the experimental procedure
- Present a convenient method to come at conclusions and deductions -i.e. one does not need to go to 6 billion people of the world with the same questionnaire, it can be done with just a group of 100 odd people who are carefully and randomly selected to make them representative of the population.

Importance of Sampling with an example

In an actual study that was done in the mid-1970s in the US, a researcher mailed out surveys to a bunch of married women and asked them questions about their marriage. Only 4% of people responded, and of those who did, 98% said they were dissatisfied in their marriage, and 75% said they had or were having an extramarital affair.

As you can imagine, this study sent shockwaves through America as husbands looked at their wives and calculated the probability of dissatisfaction or affairs. But the sample (the 4% who responded) didn't reflect the population of married women. Those who got the survey, filled it out, and returned it were much more likely to be dissatisfied than those who didn't return it. Maybe those who were happy in their marriage were too busy having fun with their spouse to cheat.

Whatever the case, further research on samples reflecting that population showed that, in reality, about 93% of women, at that time, were satisfied in their marriage and only about 7% had extramarital affairs.

That's why sampling is so important to research. If a sample isn't chosen carefully and systematically, it might not represent the population. And if it doesn't represent the population, then the study can't be generalized to the world beyond the study.

Convenience Sampling
Using any person conveniently as a part of the sample. Such samples are essentially biased and research findings would not be reliable

Procedures for making a sample representative:

- **Random Sampling:** in which every member has an equal chance of getting selected. e.g. assign each person in the population a no. and then use some procedure like a lucky draw to randomly select sample

- **Stratified Sampling** and **Stratified random sampling:** processes by which the effects of a certain variable can be eliminated as a possible **confound** in an experiment. Steps involved are :
  - Identify property (age, IQ, sleep pattern etc.) that may pose to be a confounding variable.
  - Measure that property for each member of the population
  - Divide the population into particular strata (groups) based on values of the variable
  - Decide on the no. of participants required for the experiment
  - A stratified sample : Select participants in same proportion as in the population to make up the sample
  - A random-stratified sample: Select a *random* sample from each stratum proportionate to population and then combine these samples to form experimental sample.

Sampling Error and Error in Sampling

Guess based on different readings:

- Sampling Error=Faulty representation of sample when compared to population
- Error in Sampling = Human error while carrying out a complex process of sampling e.g. stratified sampling

5. Tools of data collection

- Identify a suitable tool for data collection e.g. survey, PI , questionnaire ,psychological tests, observation etc.
- Keeping in mind suitability, ethical, practical concerns.

6. Analysis and interpretation

- Quantitative Methods
  - Used for close-ended questions
  - Statistical methods used
  - Numbers assigned to depict results

- Qualitative Methods
  - Used for complex human behaviours
  - Inferences are in descriptive form rather than numbers
  - **Narrative analysis** is one of the methods in which subjects narrate their experiences.

Both these methods are not contradictory rather they complement each other. For an accurate analysis, a mix of both should be used.

Application of statistical techniques

- **t-test**
  - aka Student's t-test. 'Student' was actually a Chemist named William Gosset working in a Guinness Brewery in Ireland. He devised this technique to ensure quality of Guinness beer. As employers were afraid that other brewery competitors would come to know of this method of Gosset, they published it under the name of 'Student'
  - The t-test is based on comparing the means (usually) of two samples and essentially examines the size of the difference between the two means relative to the variability in the data.
  - A t-test is usually used to determine whether an effect is significant in terms of whether the mean score of two groups differ.
  - We could use a t-test to find out whether the mean depression score was higher in the cognitive behaviour therapy group than in the no treatment group.
  - A t-test is the mean of one group subtracted from the mean of the other group and divided by what is known as the standard error of the mean:

$$t = \frac{\text{mean of one group} - \text{mean of other group}}{\text{standard error of the mean}}$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where,
$\bar{x}_1$ = Mean of first set of values
$\bar{x}_2$ = Mean of second set of values
S_1 = Standard deviation of first set of values
S_2 = Standard deviation of second set of values
n_1 = Total number of values in first set
n_2 = Total number of values in second set.

- The value of t can be thought of as the ratio of the difference between the two means to the degree of the **variability** of the scores in the data.
- The standard error of the mean is a measure of the extent to which sample means are likely to differ. It is usually based on the extent to which scores in the data differ so it is

  also a sort of measure of the variability in the data.

- There are different versions of the t-test. Some calculate the standard error of the mean and others calculate the standard error of the difference between two means.
- If the individual scores differ widely, then the t value will be smaller than if they do not differ much.
- The bigger the t value is, the more likely it is to be statistically significant.

- **Pearson correlation coefficient (**or simply **correlation coeff.)**
  - A measure of the amount of association or relationship between two variables. shows the size of an association between two quantitative variables. It varies from –1 through 0 to 1:
    - A negative value or correlation means that lower values on one variable go together with higher values on the other variable.
    - A positive value or correlation means that higher values on one variable go together with higher values on the other variable.
    - A value of zero or close to zero means that there is no relationship or no linear relationship between the two groups and the outcome measure.

- Generally speaking, especially in introductory statistics textbooks, t-test and pearson correlation coeff. are regarded as two very different approaches to the statistical analysis of data.
- This can be helpful for learning purposes. However, they are actually very closely related.

- **ANOVA correlation** (ANOVA = Analysis of Variance)

- **One-way ANOVA**
  - is used when we have 1 Independent Variable (IV) with more than 2 levels (high noise, low noise , medium noise etc.)
  - It estimates whether the population means under the different levels of the IV are different.
  - An **independent one-way ANOVA** is used when there are different participants for each level of the IV (i.e. between participants).
  - If the same participants are used for each level of the IV a **one-way repeated measures ANOVA** (i.e. within subjects) should be used.

  - **Factorial ANOVAs (2-way ANOVA)**
    - When there are more than two groups or condition means to be compared, the most common null hypothesis test is the (ANOVA).
    - Factorial ANOVAs are used to test for differences when we have more than one independet variable (IV).
    - Including more than one IV, we can explore the effects of interactions between IVs.
    - The terms ‘IV’ and ‘factor’ are interchangeable. ANOVAs with more than one IV are called Factorial ANOVAs.
    - There are three broad Factorial ANOVA designs:
      - all IVs are between-participants - Participants take part in only one condition (i.e. independent measures).

        - all IVs are within-participants - Participants take part in all conditions (repeated measures).
        - a mixture of between-participant and within-participant IVs - Participants take part in more than one, but not all conditions .
- **Regression**
    - A regression analysis a way of investigating the relationship between a number of variables, when there is one dependant variable and one or more independent variables.
    - Specifically, a regression analysis explains how the value of the dependent variable changes when one of the independent variables is changed and the others stay the same.
    - In this way, we can investigate the effect of one independent variable on the dependent variable when a number of different variables are taken into account at the same time.
    - For ex :Let us suppose we have to study the effect of optimism on psychological well-being. This sounds as though it should be fairly simple, measure optimism and psychological well-being. However, there are two different types of optimism (Dispositional and explanatory) and other factors can have an effect on psychological well-being and some variables might have an effect on this relationship. Thus, it would be better to measure Psychological Well-Being, Dispositional Optimism, Explanatory Optimism, Perceived Stress, Resilience and Self Esteem. To measure the true effect that optimism has on psychological wellbeing, we need to know the effect that one of these variables, one of the two forms of optimism, has on psychological well being when all of these other factors are taken into account and controlled for. For this, a regression analysis can be used.
    - It can be done using programs like **SPSS (Statistical Package for Social Sciences)**
    - In simple **linear regression** a single independent variable is used to predict the value of a dependent variable. In **multiple linear regression** two or more independent variables are used to predict the value of a dependent variable. The difference between the two is the number of independent variables.
    - While correlation assesses the relationship between x and y, regression allows us to predict y from x. For example, how much does y change as a result of a change in x?
    - Linear regression allows us to assess if the score on x influenced the score on y. Multiple regression allows us to assess the effect that several predictor variables (e.g. x1, x2, x3 etc.) have on the outcome variable (y).

Factor Analysis

A factor analysis is a statistical procedure that is used in order to find underlying groups of related factors in a set of observable variables.

Suppose we have to research the grades of college students in an honor's Liberal Arts program. Our study sample consists of 150 college students, all who have taken five end-of-the-year exams- Mathematics, English literature, Science, Latin and Writing.

The students' grades on each of the five exams are positively correlated with each other: this means that students who have high grades on one exam usually have high grades on the others. However, suppose we find that there are some students who are only good at two or three subjects. We start to wonder if the students' performances on the five exams could be determined by different types of intellectual abilities. One way to answer this question is by conducting a factor analysis.

Factor analysis is a statistical method that is used to investigate whether there are underlying latent variables, or factors, that can explain the patterned correlations within a set of observed variables. In this case, the observed variables would be the five exam scores. Latent variables are underlying constructs that are not directly observable and cannot be measured by one single thing. For example, we cannot directly measure the quality of someone's marriage. Instead, we can use a combination of observable variables to measure marriage quality, including the amount of time the couple spends together, the environment, marital conflict, marital attitudes, etc.

The primary goals of factor analysis are as follows:

- Determine how many factors underlie a set of observable variables
- Provide a method of explaining variance among observable variables by using fewer, newly created factors
- Reduce data by allowing the user to extract a small set of factors (which usually are not related to each other) from a larger set of observable variables (which are usually correlated with each other). This allows for summarization of a large number of variables into a smaller number of factors
- Define the meaning or content of the factors

There are two types of factor analyses:

1. Exploratory factor analysis (or EFA) and
2. Confirmatory factor analysis (or CFA).

Exploratory Factor Analysis
EFA is used in situations when we do not have a predetermined idea of how many factors there are or the relationship between the factors and the observed variables. The purpose of the EFA is to explore the structure of the factors. The goal is to find the underlying relationships that exist between the variables.

Suppose that we decided to take the data that we collected from the 150 college students and conduct an EFA. We are not sure if there are any underlying relationships between the variables, and we have no hypothesis as to what the relationships might be. We are just curious to see if we can find any underlying factors.

We run the exploratory factor analysis and find that there are two factors. Students who have high scores in math and science are high on the first factor, while students who have high scores on English, Latin, and writing are high on the second factor. We have just figured out the underlying factor structure using EFA.

Confirmatory Factor Analysis
CFA is used in situations where we have a specific hypothesis regarding how many factors there are and which observed variables are related to each factor. The hypothesis is usually based on previous research or theory. The purpose of CFA is to confirm that there is a relationship between the factors and the observed variables.

Suppose in the example above, we notice in the bulk data that some students are good at math and science and have lower scores on English literature, Latin, and writing. There are also students who scored high on English literature, Latin, and writing but did not do so well on math and science.

We may hypothesize that the students' performances on the five exams could be determined by the two types of intellectual abilities. Specifically, math and science are determined by one type of intellectual ability, while English literature, Latin, and writing performance are determined by another type of intellectual ability. In this example, we would perform a CFA.

- Item analysis is the process of 'purifying' the measure. Item–total correlations simply correlate each individual item with the score based on the other items.
- Those items with high correlations with the total are retained.
- An alternative is to use factor analysis, which identifies clusters of items that measure the same thing.
- In psychology, factor analysis is a mathematical way to reduce a large number of variables to a smaller number of variables for an experiment.
- Factor analysis is much more feasible than in the past because of the availability of high-speed computers.
- The smaller number of variables are the ones that are actively reported at the conclusion of the experiment.
- Using factor analysis in experiments helps researchers find similarities between any variables that are being used
- Researchers use factor analysis to explain the results of tests and experiments.
- Once it was a specialised field but now it is readily available and calculated in seconds using statistical packages such as **SPSS Statistics**.
- One example is the **g factor experiment** conducted by the British psychologist **Charles Spearman**, who is also credited with the invention of factor analysis. Spearman concluded that children who scored high on tests that assessed their verbal ability also did well on other tests that required the use of verbal skills. Spearman used factor analysis to correlate and isolate the factor that all of the tests had in common in order to reach his conclusion.

Procedure

- First, in factor analysis the computer calculates a **matrix of correlations** (an ex. shown in table below) between all of the items on the test or measure.

Table — Correlation matrix for the ten-item honesty scale

	Honest	Offend	Street	Untruth	Change	Phone	Shoplift	Hurts	Boss	Affair
Honest	1	−0.169	0.540	0.583	0.553	0.431	0.476	0.239	−0.169	−0.283
Offend	−0.169	1	−0.037	0.196	−0.027	0.046	0.303	0.090	0.999	0.676
Street	0.540	−0.037	1	0.554	0.464	0.583	0.448	−0.004	−0.037	0.082
Untruth	0.583	0.196	0.554	1	0.771	0.720	0.703	−0.077	0.196	0.208
Change	0.553	−0.027	0.464	0.771	1	0.553	0.717	0.035	−0.027	0.078
Phone	0.431	0.046	0.583	0.720	0.553	1	0.341	−0.288	0.046	0.504
Shoplift	0.476	0.303	0.448	0.703	0.717	0.341	1	0.144	0.303	0.164
Hurts	0.239	0.090	−0.004	−0.077	0.035	−0.288	0.144	1	0.090	−0.314
Boss	−0.169	0.999	−0.037	0.196	−0.027	0.046	0.303	0.090	1	0.676
Affair	−0.283	0.676	0.082	0.208	0.078	0.504	0.164	−0.314	0.676	1

- Then mathematical routines are calculated which detect patterns in the relationships between items on the psychological test.
- These patterns are presented in terms of factors.
- A factor is simply an empirically based hypothetical variable which consists of items which are strongly associated with each other.
- Usually, there will be several factors which emerge in a factor analysis. The precise number depends on the data and it can be that there is simply one significant or dominant factor.

Drawback

- The drawback of using factor analysis for research is that it is only as good as the available data.
- It also cannot identify causality, so the available data is often interpreted in a variety of ways.

Uses and Applications

- Factor analysis is most often used in intelligence research, although it is also used in other psychological studies, such as those dealing with personality, attitudes and beliefs.
- Its primary uses are in the context of psychological test and measure construction.

Item Response Theory aka **latent trait theory**, **strong true score theory**, or **modern mental test theory**

- is a paradigm for the design, analysis, and scoring of tests, questionnaires, and similar instruments measuring abilities, attitudes, or other variables

- It is a theory of testing based on the relationship between individuals' performances on a test item and their levels of performance on an overall measure of the ability that item was designed to measure.

- Several different statistical models are used to represent both item and test taker characteristics.

- Unlike simpler alternatives for creating scales and evaluating questionnaire responses, it does NOT assume that each item is equally difficult. This distinguishes IRT from simpler assumptions like in Likert scaling that "All items are assumed to be replications of each other or in other words items are considered to be parallel instruments"

- In contrast, IRT treats the difficulty of each item (the ICCs-item characteristic curve) as information to be incorporated in **scaling** items. (i.e. which item has to be given a higher weightage and which a lower)

- IRT is based on the idea that the **probability** of a correct/keyed response to an item is a mathematical function of person and item parameters. The person parameter is construed as (usually) a single **latent trait** or dimension. Examples include general intelligence or the strength of an attitude. Parameters on which items are characterized include their difficulty (known as **"location"** for their location on the difficulty range), **discrimination** (slope or correlation) representing how steeply the rate of success of individuals varies with their ability, and a **pseudoguessing parameter**, characterising the (lower) asymptote at which even the least able persons will score due to guessing (e.g.25% for pure chance on a MCQ with 4 choices).

- The name item response theory is due to the focus of the theory on the item, as opposed to the test-level focus of classical test theory. Thus IRT models the response of each examinee of a given ability to each item in the test. The term *item* is generic: covering all kinds of informative item. They might be MCQs that have incorrect and correct responses,or statements on questionnaires that allow respondents to indicate level of agreement, or patient symptoms scored as present/absent, or diagnostic information in complex systems.

- IRT is used profusely in high stake tests such as GRE and GMAT

7. Report writing

Methods of Research /Data collection
1. Survey
2. Observation
3. Case Studies
4. Experiments
5. Psychological Testing
6. Correlational (already explained)

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1. Survey: can be seen as a group of following methods of inquiry:

- **Personal Interviews (PI):** can be either

- structured/standardized PI: interviewer has no liberty to change questions ; set of questions are fixed; it is also close-ended i.e. interviewee has to choose from a fixed set of responses

- unstructured/non-standardized PI: Interviewer in this case has liberty to change order of questions and also what questions to ask; the questions are open ended i.e. the interviewee can describe her answers in her own ways

  PI can be carried out as

- Individual to Individual
- Individual to group
- Group to Individual
- Group to Group (e.g. a group of teachers to a group of students)

- **Questionnaires/Self reports**: can be looked at as highly structured PI. Questionnaires can also have open ended or close ended questions

- **Telephonic Surveys**: call people and question them *//and get blocked as spam on truecaller*

  Disadvantages of Questionnaires and Telephonic Surveys

- Uncooperativeness, reluctance and superficial answers by interviewees/respondents

- Biased results may be received due to differences (in gender, age, income etc.) between those responding and those not responding

- **Controlled observations:** collecting info. was observing people in controlled environment.

General advantages of Survey Research Method

a) Is a Quick method of data collection. Has become even more faster with the advent of ICT.

b) Data related to large no. of persons can be collected

c) Public opinions on new issues can be obtained almost as soon as the issue arises (e.g. Brexit), which is not the case with other methods

Disadvantages of Survey Method

a) Limited or no liberty with the interviewer to change words or language of a questions

b) Fixed set of questions i.e. questions cannot be added or removed.

c) Reluctance, superficial responses and uncooperativeness of respondents.

d) Can sometimes be misleading if the group respondents are not true representative of the target population in terms of gender, religion, income levels, educational levels, cultural background etc.

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2. Observation

Steps:

i) Selection: Select a particular behaviour for study

ii) Recording: Marking tallies when the event occurs; taking notes describing the behaviour; photographs, videos etc.

iii) Analysis

Types of observations

a) Naturalistic (in homes, hospitals, schools etc.) vs Controlled(in a lab)

b) Non-Participant Observation: From a distance; Disadv: may make subjects conscious and thus may not give accurate results vs Participant observation: Observer becomes part of the group and then records behaviour; degree of involvement of the participant may vary depending on the focus of the study; Disadv: can be labourintensive, time consuming + susceptible to observer bias (Hence the observer should record the behaviour as it happens and should not interpret the behaviour at the time of observation itself.)

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3. Case Studies

Can be done on

- Individuals (e.g. persons with psychological disorders)
- A small group of individuals with common characteristics (e.g. Literary geniuses)
- Institutions (e.g. poorly or successfully functioning schools or corporates)
- Specific events (e.g. children exposed to Tsunami destruction)

Examples of Case Studies

- In Freud's Psychoanalytic theory
- Piaget’s theory of cognitive development
- Minturn and Hitchcock’s study on socialization of Rajput children of Khalapur
- S. Anandalaskhmy’s case study on aspects of childhood in a weavers’ community in Varanasi

Cautions with case studies

- Before generalizing, info should be collected using multiple strategies from different sources of info by a no. of investigators.

- Careful planning of data collection should be done so that the data serves as an evidence for a chain of events and does not become irrelevant to the question.

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4. Experiments

Imp. concepts

- **Variable**: Attributes which can vary
- Independent variable: which experimenter controls or varies (e.g. amount of smoke in room)
- Dependent variable: phenomenon which the researcher attempts to explain (e.g. reaction of participants in terms of reporting an emergency)
- **Experimental Group**: Members in this group are exposed to independent variable manipulation.
- **Control Group**: All other conditions are the same except that the independent variable is absent. This group acts as a reference.

Cautions in experimental method

1. The distribution of participants in all experimental and control groups should be **RANDOM** to eliminate the effect of personal/demographic attributes.
2. All relevant variables that might influence the dependent variables need to be controlled.

- Orgasmic variables: e.g. anxiety, intelligence, personality
- Situational or environmental variables: e.g. noise, temperature, humidity etc.
- Sequential variables: e.g. exposure to many exp. conditions one after the another may result in experimental fatigue or practice effects.
- **Confounding Variables** *Q. How can confounding variables invalidate the apparent results of an experiment? 10 marks [2016]*
  - aka *confounding factor*, a *confound , a lurking variable* or a *confounder* or *third variable problem*
  - To confound means to confuse, and this effect is exactly why confounding variables are undesirable.
  - a variable that correlates (directly or inversely) with both the dependent variable and an independent variable, in a way that "explains away" some or all of the correlation between these two variables.
  - just like the independent variable, they provide an alternative explanation for any observed difference in the dependent variable.
  - in other words variables which either wholly or partially account for the relationship between two other variables are known as confounding variables.
    For ex :In almost all experiments, participants' intelligence quotients (IQs) will be an extraneous variable. But as long as there are participants with lower and higher IQs at each level of the independent variable so that the average IQ is roughly equal, then this variation is probably acceptable (and may even be desirable). What would be bad, however, would be for participants at one level of the independent variable to have substantially lower IQs on average and participants at another level to have substantially higher IQs on average. In this case, IQ would be a confounding variable. Consider a hypothetical study in which participants in a positive mood condition scored higher on a memory task than participants in a negative mood condition. But if IQ is a confounding variable—with participants in the positive mood condition having higher IQs on average than participants in the negative mood condition—then it is unclear whether it was the positive moods or the higher IQs that caused participants in the first condition to score higher.

Techniques to control relevant variables

- **Elimination**: e.g. eliminate sound by using a sound proof room
- **Hold the variable constant**: if elimination is not possible
- **Matching:** relevant variables in two groups are equated or held constant by taking matched pairs across the conditions of the experiment. This is done to eliminate the effect of orgasmic variables like fear, motivation etc. and personal background variables like rural/urban, caste, socio-economic status
- **Counterbalancing:** to minimize the sequential variables, half the group may receive tasks in order A, B and other half in the order B, A (where A & B) are tasks.
- **Random assignments**: of participants to different groups.

Criticism of Experimental Methods

1. **External Validity**: Since experiments are conducted in a controlled lab setup, some argue that they do not generalize well to the outer world or they lack external validity.

2. Can't be carried out in every situation: e.g. to check effects of nutritional deficiency on IQ, one cannot give bad nutrition to a particular experimental group (ethically wrong)

3. Difficult to know and control all relevant variables

Types of Experiments

- Controlled Experiments: In a controlled situation in lab.

- Field experiments: experimenters go to the 'field' i.e. actual place where the behaviour occurs and experiment there. Taken up in cases where lab setting is not possible or not desired.

- **Quasi-experiments**: where the experimental variable is just selected rather than manipulated or varied by an experimenter. e.g. to study listening abilities of blind people vs. normal visioned people, the experimenter can make an experimental group of blind people and a control group of normal people. He does not take people and make them blind :P (no manipulation, just selection). Note that participants are not randomly assigned.

An experiment that involves more than just one independent variable is called a **factorial experiment**

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5. Psychological Testing (PT)

Standardized and objective instrument which is used to assess an individual's standing in relation to others on some mental or behavioural characteristics.

Cautions in PT

- wordings of questions should be such that it conveys same meaning to all subjects.

- all respondents should be clearly instructed before hand on the method of answering.

- all questions should be related only to the particular behaviour in question.

- procedures for administering the test such as environmental conditions, time limit, mode of administration (individual or group) should be spelt clearly. Also, the procedures for scoring should be described clearly to the participants.

Characteristics of a good Pscyh Test/ Steps in construction of a good Psych Test

- **Reliability:** No variation should be there when the same test is given to a group/individual on different occasions. aka Temporal Stability

  How can reliability be ensured?

- **Test-Retest Reliability**: find out correlation coeff b/w 2 sets of scores on same set of persons.
- **Split-Half Reliability**: this is to test internal consistency of a question set. Ques. are divided into 2 groups (e.g. odd sl. no. ques. in one group and even in other) and then finding correlation b/w the scores of the two sets.

- **Validity**: "Does the test measure what it claims to measure?" . It shouldn't measure language proficiency in a Mathematics test.

Validity

Validity refers to the extent to which a study produces accurate results (*internal* validity) and produces results that are widely applicable (*external* validity). In our study of TV programmes and aggression, we need to know that the study does test the effects of watching TV and that our results apply in other situations as well as our own study.

Internal validity

Internal validity refers to the extent to which an experiment actually tests the hypothesis it claims to test. This is independent of the results – a valid study may not support the hypothesis, while an invalid study may do so. Internal validity depends on the logic of the study's design, the appropriateness of the measurements used and especially the adequacy of the experimental control (Rosnow and Rosenthal, 2003).

In the example of television and aggression, we may find that the group watching a violent programme does show more aggression. However, if group members were already more aggressive than members of the other group, the study really has no validity – the results aren't a test of the hypothesis but a reflection of a pre-existing difference. Similarly, asking people to say how aggressive they feel on a scale of 1 to 5 probably isn't adequate as a measurement.

External validity

External validity refers to the extent to which the results of an experiment can be applied to other situations. We may find that watching a violent programme leads to an increase in aggression in the laboratory, but would the same results be found in the real world? We usually want studies to allow generalisation, enabling us to make claims about the world in general on the basis of our findings. Studies that lack external validity only tell us about behaviour in the specific experimental setting.

There are two main threats to external validity. One results from a tradeoff between internal and external validity (McGhee, 2001). The more we try to control every unwanted factor in an experiment, to improve internal validity, the more artificial we make the experimental setting. For example, to investigate immediate memory we might ask people to learn made-up words, to control for familiarity with real words. However, in the real world, people seldom have to remember lists of invented words. Our study may have excellent internal validity but limited applicability to the real world.

The second threat to external validity comes from the people we study. If we want to explain human behaviour we can't test everyone, so we test a subset or sample instead. We hope that the sample is typical of the people we want to describe. We can only generalise our results if the sample is indeed typical or representative. If we're looking at gender differences in school achievement, we want to make claims about all girls and boys in the school system. We can't test all girls and boys, so we use a small group of children instead and we hope that they are representative. If, however, all the children selected are educated at home, then they are not representative of children in the school system and our study loses validity. Most psychology studies rely on using undergraduate students as participants, but make claims about people in general. However, studies show that students differ from the wider population, typically being young, intelligent, introspective and male (Valentine, 1992). These differences may have a distorting effect on the validity of studies as explanations of general human behaviour. (See also Chapter 39 for a fuller discussion of the use of samples.)

Self-test:

- What is the difference between internal and external validity?
- What are the two main threats to external validity?

- **Norms:** Normal or Average performance of a group is calculated after conducting the test on a large no. of people. This norm sets a reference point to compare performance of an individual.

Types of Psychological Tests

Based on language

- Verbal: requires literacy

- Non-verbal: symbols and pictures

- Performance tests: requires movements of objects from their respective places in a particular order.

Based on administration of the test

- Individual: One to one e.g. for children, others who do not know the language

- Group: many people at once (written).

Adv: Easy to administer + Less time consuming
Diasdv: respondents may give fake responses or may nt be too motivated to answer questions.

Speed and Power Tests

- **Speed Tests**: Constrained time limit + All items are of same difficulty level

- **Power Tests**: Sufficient time + Items arranged in increasing level of difficulty

It is difficult to construct a pure speed test or a pure power test. Most are a combination of the two.

Experimental and non-experimental research designs

Experimental research design:

- based on a clear hypothesis

- purpose = confirm or refute the validity of the hypothesis.

- have an independent variable, a control (dependent) variable, and a control group

- most exp. conducted in a lab. in a controlled environment

- studies the what, why and even how questions

- experimenter can manipulate variables has a control group and a placebo

- The control group receives the treatment that the experimenter wants to test and the placebo group is tested without any treatment.

- Differences in results of both groups are compared.

- Test is repeated in the same environment

Non-experimental research design

- carried out in natural settings

- no control group here and the research design is highly flexible. However, due to absence of control group the researcher cannot ascertain that the final results are the direct effect of the variable that has been studied

- purpose = study a situation, people or phenomenon over a time period to observe changes.

- no manipulation of the situation, event, circumstances or people.

- e.g. Survey, case studies, correlational studies, comparative studies, longitudinal studies and descriptive studies

- The non-experimental research design study the phenomenon, people or situation in a natural setting without manipulating it, hence the findings can be applied to a wide audience.

Within and Between Group Designs

Lorinda is doing a study. She thinks that girls will do better on a math test than boys will. So she gives the test to boys and girls and then grades the results to see which group does better.

Every social science research study has one or more groups of subjects, or sets of participants who are being studied. In Lorinda's case, she has two groups: girls and boys. But what happens if she discovers that there are more differences between two girls than there are between a boy and a girl?

To help Lorinda out, let's talk about within-group and between-group research.

Between-Group Differences
As we said, Lorinda is giving a math test to two groups, boys and girls, and she wants to see if there's a difference between the two groups. What she's looking for are between-group differences, or data that shows that two or more groups are different.

Between-group research is the most common type of research, and it can take many forms. In Lorinda's case, her groups are established already. That is, her subjects are already boys and girls, even before her study.

Sometimes, though, a researcher might create groups for their research. For example, if Lorinda wanted to test how well a math game helps students, she might create two groups: an experimental group, which plays the math game before taking the test, and a control group that does not play the math game before the test.

The number of groups can vary as well. For example, Lorinda is looking at two groups: boys and girls. But what if she wants to divide her subjects by age? She might have three or four groups if she's looking at different ages.

Whether the researcher creates the groups or they exist already, and regardless of whether there are two groups or more, between-group research focuses on the differences between the groups (hence its name).

Within-Group Differences
Like most researchers, Lorinda is looking for between-group differences, based on the average score on a math test. In other words, she wants to know if the mean score for girls is different from the mean score for boys.

But not every girl will perform equally on the test. There might be a lot of different scores when Lorinda looks at all the girls. When the data shows differences among subjects that are in the same group, this is known as within-group differences.

Within-group research can take a number of different forms. Often, a researcher only wants to look at one group; therefore, their research will only look at within-group differences. For example, if Lorinda only wanted to look at the scores of seven-year-old girls, and didn't want to compare them to any other group, she would look for trends and differences within that group of people (i.e., the seven-year-olds).

Within-group differences often come to light when a researcher is conducting a between-group research study. For example, there are many studies that talk about the differences between boys and girls. These might point out, for example, that one group does better on math tests, or that the two genders communicate differently, or even that there are differences in the brains of boys and girls. These are all between-group studies.

However, when you look closely at these studies, you might see something interesting. The within-group differences are often greater than the between-group differences. To understand what this means, let's go back to Lorinda's study on gender and the math test.

Let's say that the mean score for boys on the math test is 87, and the mean score for girls is 93. Sounds like there's a difference in the genders, right? But what if the scores for the girls ranged from 76 to 100, while the scores for the boys ranged from 80 to 97? In that case, the within-group differences (24 points for girls and 17 points for boys) are much larger than the difference in the mean scores between the two genders (6 points).

Does this mean that girls are better at math than boys are? Looking at the between-group differences, you might think so. And you might be right. But when you look at the variation within groups, you might see that there doesn't appear to be much of a difference between boys and girls after all. In fact, if you compared two girls' scores, you might find that their scores are more different than if you compared a boy and a girl. Within-group differences do not always contradict or cancel out between-group differences, but they can help paint a fuller picture of what's going on.

Summary
Every social science research study has one or more groups of subjects, or sets of participants who are being studied. There are two ways to look at the data about these groups. Between-group differences show how two or more groups are different, whereas within-group differences show differences among subjects who are in the same group. Within-group differences can come to light when looking at a between-group research study. While within-group differences do not always contradict or cancel out between-group differences, they can help paint a fuller picture of what's going on.

Focused Group Discussions (FGD)

- Effective method of healthy communication/to discuss a specific topic of interest.

- Exchange of Ideas, knowledge and opinions

- Not more than 12 and not less than 6 members

- group of participants is guided by a moderator (or group facilitator) who introduces topics for discussion and helps the group to participate in a lively and natural discussion

- strength of FGD relies on allowing the participants to agree or disagree with each other so that it provides an insight into how a group thinks about an issue, about the range of opinion and ideas, and the inconsistencies and variation that exists in a particular community in terms of beliefs and their experiences and practices.

FGDs can be used to

- explore the meanings of survey findings that cannot be explained statistically
- range of opinions/views on a topic of interest
- collect a wide variety of local terms.
- In bridging research and policy, FGD can be useful in providing an insight into different opinions among different parties involved in the change process, thus enabling the process to be managed more smoothly.
- FGDs are good method to employ prior to designing questionnaires.

Process outline of FGDs

- identifying the main objective(s) of the meeting
- developing key questions
- developing an agenda
- planning how to record the session
- identify and invite suitable discussion participants;
- ideal number is between six and eight.

Facilitation/Moderation- the key of FGDs : imp. points to bear in mind in facilitating FGDs :

- Ensure even participation
- Careful wording of the key questions
- Maintaining a neutral attitude and appearance
- Summarising the session to reflect the opinions evenly and fairly.
- A detailed report should be prepared after the session is finished.
- Any observations during the session should be noted and included in the report.

FGDs can be also done online-particularly useful for overcoming the barrier of distance.

Brainstorming

a.k.a. storm ideas, creativity and brainstorming, idea generation or creative thinking.

- A group problem-solving/ creativity technique

- Group of people uses their collective intelligence to approach a creative problem.
- Purpose: Inspires people to come up with creative ideas.
- Should be used at the very beginning of a project/research, should address a specific question.

Background

Brainstorming was originally discovered in the late 1940s by Alex Osborn. It was developed to inspire employees to produce creative ideas for ad campaigns.

Variations

- Brainstorming sessions, through poor facilitation or lack focus, can be less productive than expected.
- The six thinking hats technique, created by Edward de Bono, can overcome this problem.

- When wearing one hat at a given point of time, a group can focus on one aspect of the issue at hand, increasing the productivity of the brainstorming session.

Using the Technique

- Define a problem or opportunity and craft a specific question.

- Identify participants: can include 8 to 16 people. Not every group member needs to be an expert on the specific question.

- Participants should be trained in advance, so that they understand the brainstorming process prior to tackling the major issue.

- Set a time limit.

- Ask participants to shout out ideas, encouraging all participants to be active in the process.

- Record solutions. Typically, 2 facilitators capture ideas from the group on a whiteboard or flipchart.

- Participants are encouraged to provide unusual/creative answers. Criticism is reserved.

- Ideas can be combined and improved to form better solutions.

Inputs

A specific question must be asked, such as, “How might we increase the computer literacy among elderly people?”

Outputs

The process will yield a large quantity of answers.

Next Steps after Exercise

- Once creative/good ideas are formed and listed, it is necessary to prioritize them to reach the best solution.
- In order to prioritize them, select the 5 best ideas through team consensus.
- Choose five criteria for judging ideas that best solve the problem.

- Give each idea a score.

- The idea with highest score will be a strong solution.

Example of BS : The design firm IDEO used the brainstorming technique to develop the first Apple mouse.

Grounded Theory Approach

- a systematic methodology in the social sciences involving the construction of theory through the analysis of data.

- GT method does not aim for the "truth" but to conceptualize what is going on by using empirical research.

- operates almost in a reverse fashion from social science research in the positivist tradition.(Positivism states that positive knowledge is based on natural phenomena and their properties and relations. Thus, information derived from sensory experience, interpreted through reason and logic, forms the exclusive source of all authoritative knowledge. Positivism holds that valid knowledge is found only in this derived knowledge.)

- Unlike positivist research, a study using GT is likely to begin with a question, or even just with the collection of qualitative data.

- As researchers review the data collected, repeated ideas, concepts or elements become apparent, and are tagged with codes, which have been extracted from the data.

- As more data are collected, and as data are re-reviewed, codes can be grouped into concepts, and then into categories. These categories may become the basis for new theory.

- Thus, GT is quite different from the traditional model of research, where the researcher chooses an existing theoretical framework, and only then collects data to show how the theory does or does not apply to the phenomenon under study.

Rationale of GT to be grounded is that this theory helps close the gap between theory and empirical research

GT mainly came into existence when there was a wave of criticism towards the fundamentalist and structuralist theories that were deductive and speculative in nature.

Highly significant in the fields of medical sociology, psychology and psychiatry.

Stages of analysis in GT

Stage	Purpose
Codes	Identifying anchors that allow the key points of the data to be gathered
Concepts	Collections of **codes** of similar content that allows the data to be grouped
Categories	Broad groups of similar **concepts** that are used to generate a *theory*
Theory	A collection of categories that detail the subject of the research

Some Keywords in GT

- **Fit** has to do with how closely concepts fit with the incidents they are representing, and this is related to how thorough the constant comparison of incidents to concepts was done.

- **Relevance.** A relevant study deals with the real concern of participants, evokes "grab" (captures the attention) and is not only of academic interest.

- **Workability**. The theory works when it explains how the problem is being solved with much variation.

- **Modifiability.** A modifiable theory can be altered when new relevant data are compared to existing data. A GT is never right or wrong, it just has more or less fit, relevance, workability and modifiability.

Use in various disciplines : Used in Psychology (e.g. to understand the role of therapeutic distance for adult clients with attachment anxiety), sociology, Public Health, Business, Software Engineering, Nursing etc.

Pros:

- **Ecological validity:** the extent to which research findings accurately represent real-world settings. GTs are usually ecologically valid because they are similar to the data from which they were established.

- **Novelty**: Because grounded theories are not tied to any preexisting theory, grounded theories are often fresh and new and have the potential for innovative discoveries in science and other areas.

- **Parsimony**: involves using the simplest possible definition to explain complex phenomenon. GTs aim to provide practical and simple explanations about complex phenomena by converting them into abstract constructs and hypothesizing their relationships.

- It legitimizes qualitative research as scientific inquiry.

- It provides explicit, sequential guidelines for conducting qualitative research.

- GT approach has touched and been useful in variety of disciplines.

Cons:

- It is misunderstood status as theory (is what is produced really 'theory'?),

- The notion of 'ground' (why is the idea of 'grounding' one's findings important in qualitative inquiry—what are they 'grounded' in?)

- The claim to use and develop inductive knowledge.

- Some argue that it’s impossible to free oneself of preconceptions in collection and analysis of data

- It is said that because of constant modifiability, GTs evades testing of theory.

- GT approach can be criticized as being empiricist; that it relies too heavily on the empirical data.
