

STATISTICAL TOOLS: AN AID FOR ANALYSIS AND INTERPRETATION OF DATA IN RESEARCH METHODOLOGY

Simrankaur Chhabra

Research Scholar, JG College of Education (PG), ASIA Campus, Drive-in Road, Ahmedabad
simran904kaur@gmail.com

Abstract

Research is a process which has utility to the extent that class of inquiry employed as the research activity vehicle is capable of adding knowledge, of stimulating progress and helping society and a human being can relate more efficiently and effectively to the problems that society and a being perpetuates and create. A prime responsibility of the educational researcher is that of being able to make either a probability or logical inference covering the tenability of his testable hypothesis. The acceptance or rejection of these hypotheses will ultimately determine what contribution the study makes to the development of a particular area. This is especially tried in the analysis for interpretation of data. When it comes to educational research, varied forms of sample size, population are carried out to evaluate the outcome. This is where statistical tools and techniques play an inevitable role in analysis and interpretation of the data collected. This paper will mainly throw a light on the basic strategy that can invariably be used in educational research from the collected data by the use of statistical tools.

The main function of research is to improve research procedures through the refinement and extension of knowledge. On the basis of precision (accuracy) the researches are: Experimental research and Non-experimental research. Experimental research is precise while non-experimental is not. Experimental research is research conducted with a scientific approach using two sets of variables. The first set acts as a constant, which you use to measure the differences of the second set. Quantitative research methods, for example, are experimental.

Keywords: Statistical tools, Educational researcher, Experimental research, Hypotheses, Interpretation of data

INTRODUCTION

Research Method:

Research methods are the strategies, processes or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create a better understanding of the research. In this paper, the research method used was experimental research.

The researcher has used pre-experimental research design.

Pre-experimental research design: A group, or various groups, are kept under observation after implementing factors of cause and effect. The researcher conducts this research to understand whether further investigation is necessary for these particular groups. The researcher can break down pre-experimental research further in three types:

- One-shot Case Study Research Design
- One-group Pretest-posttest Research Design
- Static-group Comparison

Out of the three designs mentioned above, the researcher has used One-group Pre-test and Post- test research design.

Population of the Study:

The term population in research is used in broader sense than is its common place meaning as a population of the people, the active group from which the sample has been selected is called the population. That group may consist of persons, objects, attributes, qualities and behaviour of the people.

According to the nature and scope of the research in hand, a population should be well defined in term of geographical limits, age, grade, sex, category, socio-economic status, physical attributes and psychosocial behaviour. Population in the present research comprised of secondary school students of grade IX from Ahmedabad city of Gujarat.

Sampling Method and Sample of the Study:

Sampling refers to the method used to select sample from the population. Sampling is a process of obtaining information about entire population by examining only a part of it. It is done in a way that the individuals represent the larger group from which they were selected.

In the present study a sample of 36 students of a secondary school of Ahmedabad city of Gujarat has been selected using purposive sampling technique.

Keeping in view of the research evidence, objectives and hypothesis experimental method was used in the present study, concerned with conditions or relationship that exists, options that are held, process that are going on, effects that are evident or trends that are developing. The experimental method is a systematic and scientific approach to research in which the researcher manipulates one or more variables and controls and measure any change in other variables.

METHODOLOGY

Procedure of Data Analysis: Statistical Technique

Statistical technique is a collection of methods which is used to process large amount of report overall trends and data. It is normally used in ascertaining relative performance that involves assumptions about functional relationship. For analysis of data, following statistical technique were used:-

Descriptive statistics like Mean, Median and Standard Deviation t-value were calculated for analysis.

Interrelationship between Statistical Technique and Educational Research

The most critical and essential supporting pillars of the research are the analysis and the interpretation of the data. With the help of the interpretation, step one was able to achieve a conclusion from the set of the gathered data.

Research Tool:

The tools help to analyze the responses of sample related variables. In order to collect the data tool was used in the present study.

✓ Standardized Mental Health Battery- By Dr. Manoj Shastri, Professor at Department of Education, Gujarat University, Ahmedabad

Editing and Classification of Data

Editing is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation. Tabulation is a part of the technical procedure wherein the classified data are put in the form of tables.

The editing done on the basis of certain criteria are shown in Table 3.0 below:

Table 3.0 Editing of data

Sr. no.	Inappropriate/ Incomplete/ Notaccepted	Reason for not accepting the data
1	Inappropriate data	General information was not filled correctly as given to the students
2	2 samples/forms were not accepted out of 38 students	Not accepted because of incorrect data

Table 3.0: In this table, 38 students had submitted the data but due to incorrect details, only 36 students were selected as samples for analysis of data using statistical techniques

Classification of Data:

Classification can be one of the following two types, depending upon the nature of the phenomenon involved:

- Classification according to attributes
- Classification according to class-intervals

Unlike descriptive characteristics, the numerical characteristics refer to quantitative phenomena which can be measured through some statistical units. Data relating to income, production, age, weight, etc. come under this category. Such data are known as **statistics of variables** and are classified on the basis of **class intervals**.

The researcher classified the mental health battery score of students according to the number of students falling in three ranges of score and also presentation of graph as per the level of Mental Health Battery score is given in the following table 2.0 based on the specific objectives of the research study.

Objective number 1: To study the level of mental health among secondary school students.

The classification of level wise score of mental health battery according to the standardized test is shown in table no. 3.1

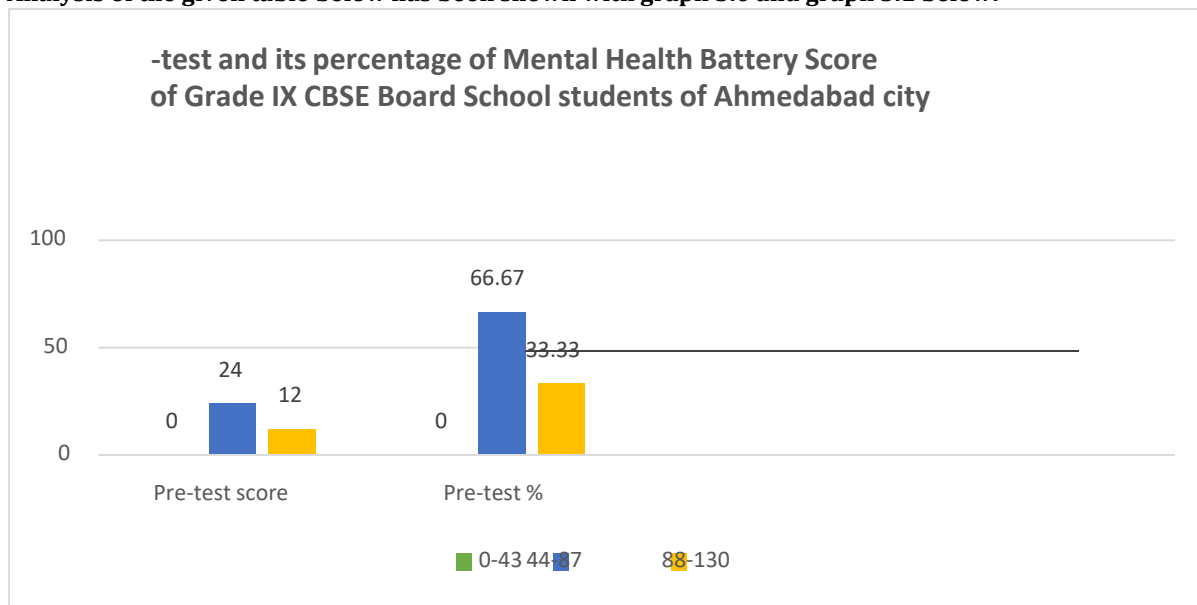
Table: 3.1

Frequency Distribution of Pre-test and Post-test of Mental Health Battery Score of Grade IX CBSE Board school students of Ahmedabad city

No.	Level of Mental Health Battery Score	Range of score	Pre-test Score	Pre-test Percentage	Post-test Score	Post-test Percentage
1	Low	0-43	0	0.00%	0	0.00%
2	Moderate	44-87	24	66.67%	22	61.11%
3	High	88-130	12	33.33%	14	38.88%

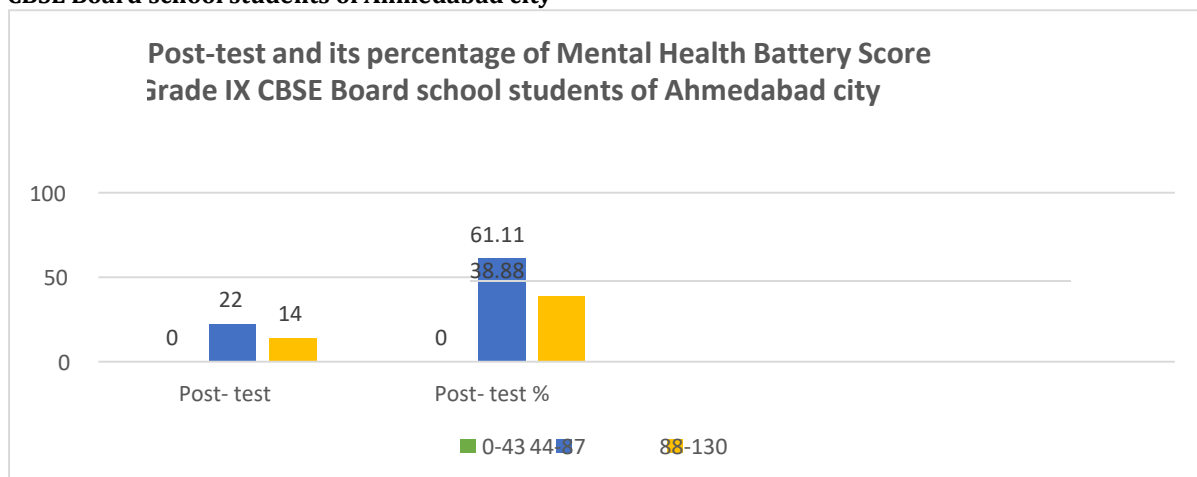
The Observation of table 3.1 suggests that minimum range of score starts from 0-43 and it goes maximum up to 130.

Analysis of the given table below has been shown with graph 3.0 and graph 3.1 below:



Graph 3.0

Graphical Representation of Pre-test and its percentage of Mental Health Battery Score of Grade IX CBSE Board school students of Ahmedabad city



Graph 3.1

Graphical Representation of Post-test and its percentage of Mental Health Battery Score of Grade IX CBSE Board school students of Ahmedabad city

Analysis of Data and Interpretation of the Result:

Analysis of data means studying the tabulated material in order to determine inherent facts or meanings. The researcher has analyzed the data using statistical tools like **Mean, Standard Deviation (SD), t-test and Critical Ratio (C.R.)** for interpretation of the result.

This analysis was done by using Microsoft Excel.

There are few abbreviations used in analysis of all the data in all tables for which full form was provided as follows:

N= Size of the population
r= Correlation Coefficient
SD= Standard Deviation
SED= Standard Error of Difference
C.R.= Critical Ratio

Hypotheses testing:

Objective number 2: **To check the effect of yoga on the mental health of secondary school students**

H01: There is no significant difference between the mean score of pre-test and post- test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city.

Analysis of Mean, SD and C.R. - value of Mental Health Battery score on pre-test and post-test score of grade IX CBSE Board school students of Ahmedabad city is shown in Table No. 2.1

Table 3.2

Mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city

Test	N	Mean	SD	r	SED	C.R.	Significance Level
Pre-test	36	72.97	19.89	0.93	7.67	0.86	NS*
Post-test	36	79.56	20.12				NS**

*0.01 table value 2.64 > Calculated value 0.86

**0.05 table value 1.99 > Calculated value 0.86

NS- Not significant

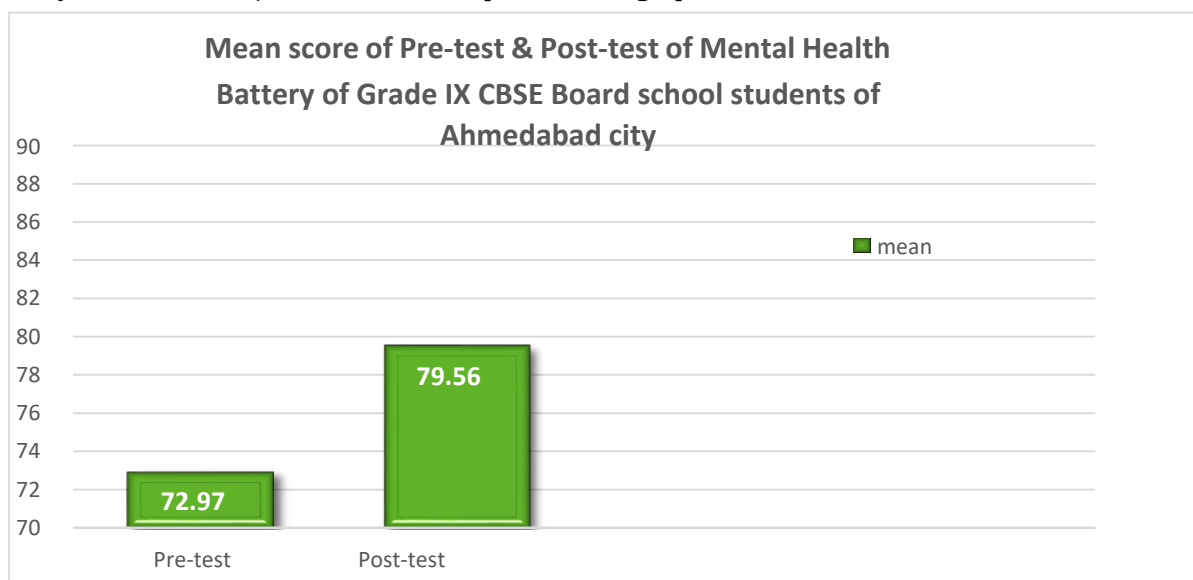
Interpretation of Table 3.2

The Observation of Table reveals that the mean score of pre-test and post-test of Mental Health Battery having 72.97 and 79.56, SD is 19.89 and 20.12, SED is 7.67 and C.R. value is 0.86 respectively which is less than the value of t-tab 2.64 at 0.01 and 1.99 at 0.05 level of significance. From the above table, it is evident that C.R. value is 0.86 which is less than 2.64 at 0.01 and 1.99 at 0.05 levels of significance.

So, **H01:** There is no significant difference between the mean score of pre-test and post- test of Mental Health battery of grade IX CBSE Board school students of Ahmedabad city and the hypothesis is not rejected.

This means that there is no mean difference in Pre-test and Post-test score of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city and whatever difference is visible in Mean is due to chance.

Analysis related to objective number 2 is presented in graph 3.2



Graph 3.2

Graphical representation of Mean score of Pre-test & Post-test of Mental Health Battery of Grade IX CBSE Board school students of Ahmedabad city

Objective number 3: **To check the effect of yoga on mental health in relation to category.**

H02: There is no significant difference between the mean score of pre-test and post- test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabadcity belonging to the GENERAL category.

Table 3.3

Mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to GENERAL category

Students belonging to GENERAL category	N	Mean	SD	r	SED	C.R.	SignificanceLevel
Pre-test	30	73.77	20.03	0.92	8.11	0.91	NS*
Post-test	30	81.17	20.30				NS**

*0.01 table value 2.66 > Calculated value 0.91

**0.05 table value 2.00 > Calculated value 0.91

NS- Not significant

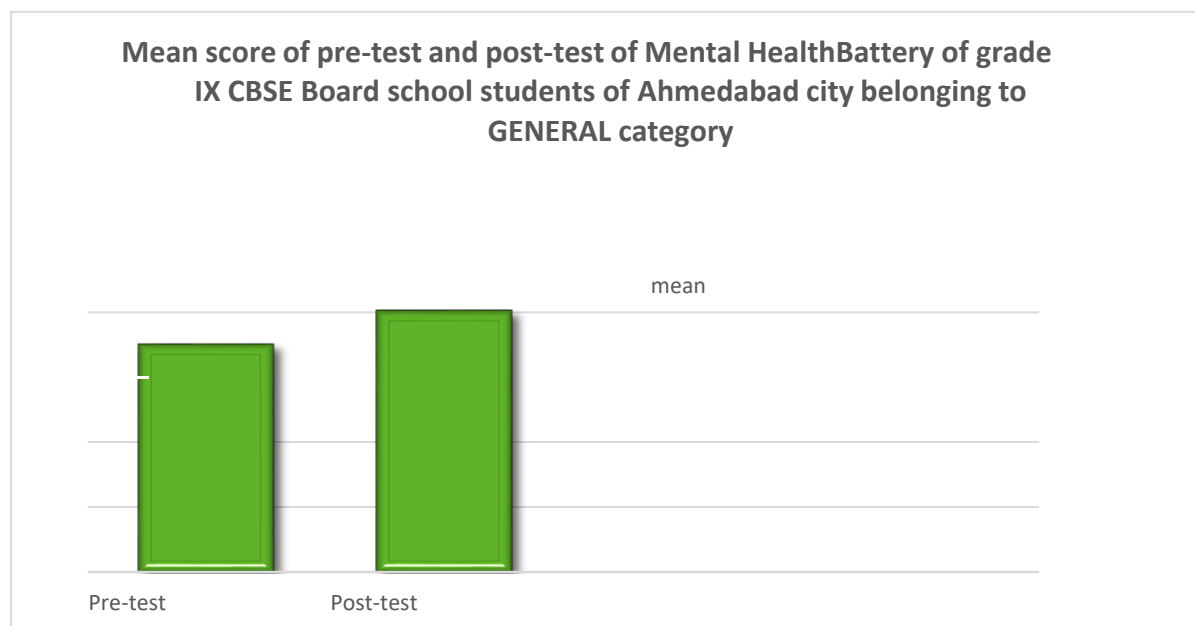
Interpretation of table 3.3:-

The Observation of Table 3.3 reveals that the mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to general category having 73.77 and 81.17, SD is 20.03 and 20.30, SED is 8.11 and C.R. value is 0.91 respectively which is less than the value of t-tab 2.66 at 0.01 and 2.00 at 0.05 level of significance. From the above table, it is evident that C.R. value is 0.91 which is less than 2.66 at 0.01 and 2.00 at 0.05 levels.

So, H02: There is no significant difference between the mean score of pre-test and post- test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to general category and the hypothesis is not rejected.

This means that there is no mean difference in pre-test and post-test score of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to general category and whatever difference is visible in Mean is due to chance.

Analysis related to objective number 3 is presented in graph 3.3



Graph 3.3

Graphical representation of Mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging toGENERAL category

Interpretation of graph 3.3:-

The graph 3.3 is the representation of the mean score of pre-test and post-test ofMental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to general category, which is 77.60 and 80.20 respectively. This means that there is no significant mean difference in the pre-test and post-test score of Mental Health Battery of grade IX CBSE Board students of Ahmedabad city belonging to general category and whatever the difference is visible in Mean is due to chance.

H03: There is no significant difference between the mean score of pre-test and post- test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabadcity belonging to OTHER category.

Table 3.4

Mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category

Students belonging to OTHER category	N	Mean	SD	r	SED	C.R.	SignificanceLevel
Pre-test	6	69.00	20.48	1.00	2.26	1.11	NS*
Post-test	6	71.50	18.72				NS**

*0.01 table value 3.11 > Calculated value 1.11

**0.05 table value 2.20 > Calculated value 1.11

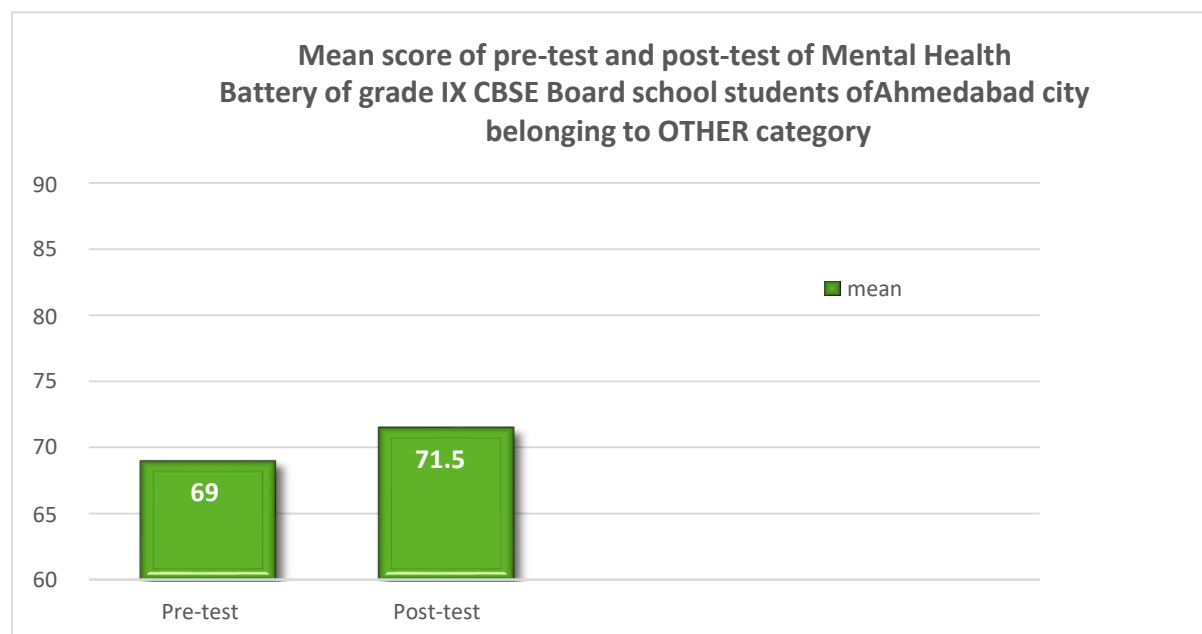
NS- Not significant

Interpretation of table 3.4

The Observation of Table 3.4 reveals that the mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category having 69.00 and 71.50, SD is 20.48 and 18.72, SED is 2.26 and C.R. value is 1.11 respectively which is less than the value of t-tab 3.11 at 0.01 and 2.20 at 0.05 level of significance. From the above table, it is evident that C.R. value is 1.11 which is less than 3.11 at 0.01 and 2.20 at 0.05 levels.

So, H03: There is no significant difference between the mean score of pre-test and post- test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category and the hypothesis is not rejected.

This means that there is no mean difference in Pre-test and Post-test score of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category and whatever difference is visible in Mean is due to chance. **Analysis related to objective number 3 is presented in graph 3.4**



Graph 3.4

Graphical representation of Mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category

Interpretation of graph 3.4:-

The graph 3.4 is the pictorial representation of the mean score of pre-test and post-test of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category, which is 69.00 and 71.50 respectively. This means that there is no significant mean difference in the pre-test and post-test score of Mental Health Battery of grade IX CBSE Board school students of Ahmedabad city belonging to OTHER category

and whatever the difference is visible in Mean is due to chance.

CONCLUSION

- [1] There is no minimum sample size required to perform a t-test.
- [2] In fact, the first t-test ever performed only used a sample size of four.
- [3] However, if the assumptions of a t-test are not met then the results could be unreliable.
- [4] Also, if the sample size is too small then the power of the test could be too low to detect meaningful differences in the data.
- [5] A two sample t-test is used to test whether there is a significant difference between two population means.
- [6] These statistical techniques make the following assumptions:
 - Independence: The observations in each sample should be independent.
 - Random Sampling: The observations in each sample should be collected using a random sampling method.
 - Normality: Each sample should be roughly normally distributed.

REFERENCES

- [1] Field, A. (2005). Discovering statistics using SPSS. 2ndEd. London: Sage Publications.
- [2] Mann, Prem. (2001). Introductory statistics. 4th Ed. Upper New York: John Wiley & Sons.
- [3] Weinberg, S.L. & Abramowitz (2008). Statistics using SPSS: An integrative approach. 2ndEd. New York: Cambridge University Press.
- [4] Hair, J.F., Black, B.J., Babin, B.J., Anderson, R.E. & Tatham, R.L. (2010). Multivariate data analysis. 7thEd. Upper Saddle River: Pearson Prentice Hall.
- [5] Ott, R.L. & Longnecker. (2001). An introduction to statistical methods and data analysis. 5thEd. Pacific Grove: Duxbury.
- [6] Satish Prakash Shukla (2018), Research Methodology, Ahmedabad, Gujarat.
- [7] Koul Lokesh, Methodology of Educational Research (4th Edition), New Delhi