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STATISTICAL METHODS AND PSYCHOLOGICAL RESEARCH

B.P.C.C.- 134

B.A. General - 4th Semester

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**Sample Preview
of the
Solved
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Papers**

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QUESTION PAPER

June – 2023

(Solved)

STATISTICAL METHODS AND PSYCHOLOGICAL RESEARCH

B.P.C.C-134

Time: 2 Hours]

[Maximum Marks: 50

Note: Attempt any five questions selecting at least two questions from each Section. All questions carry equal marks. Use of simple calculator is permitted.

SECTION-I

Q. 1. Describe various steps involved in a research process.

Ans. Ref.: See Chapter-1, Page No. 9, Q. No. 2.

Q. 2. Define sampling and describe sampling techniques.

Ans. Ref.: See Chapter-2, Page No. 14, 'What is Sampling', 'Sampling Techniques'.

16, 17, 16, 16, 18, 19, 20, 36, 41, 17, 15, 16, 19, 11, 10, 5, 6, 7, 8, 20

Q. 3. Compute mean, median and mode for the following data:

Ans.

$$\text{Mean} = \frac{16+17+16+16+18+19+20+36+41, 17+15+16+19+11+10+5+6+7+8+20}{20}$$

$$= \frac{333}{20} = 16.65$$

Median: Arrange the data in ascending order.
= 5, 6, 7, 8, 10, 11, 15, 16, 16, 16, 16, 17, 17, 18, 19, 19, 20, 20, 36, 41

$$= \text{Middle term} = \left(\frac{16+16}{2} \right) = 16$$

Hence, Median = 16

Mode: 16 appear maximum times, hence

$$\text{Mode} = 16$$

$$\text{Mean} = 16.65; \text{Median} = 16;$$

$$\text{Mode} = 16$$

Data-1 (X)	Data-2 (Y)	Rank-1 R_1	Rank-2 R_2	$R_1 - R_2$	$d^2 = (R_1 - R_2)^2$
16	2	3	10	-7	49
18	4	1	7	-6	36
17	3	2	8.5	-6.5	42.25
12	18	4	2.5	1.5	2.25
10	11	6	6	0	0
5	15	9	4.5	4.5	20.25
7	18	8	2.5	5.5	30.25
8	20	7	1	6	36
11	3	5	8.5	-3.5	12.25
4	15	10	4.5	5.5	30.25
					$\sum d^2 = 258.50$

Spearman's rho

$$P = 1 - \left\{ \frac{6\sum d^2}{N(N^2 - 1)} \right\}$$

$$= 1 - \frac{6 \times 258.50}{10(100-1)}$$

$$= 1 - \frac{1551}{990}$$

$$= 1 - 1.567$$

$$= -0.567$$

Q. 4. Compute Spearman's rho for the following data:

Data 1	Data 2
16	2
18	4
17	3
12	18
10	11
5	15
7	18
8	20
11	3
4	15

Ans.

Data 1	Data 2
16	10
18	7
17	8.5
12	2.5
10	6
5	4.5
7	2.5
8	1
11	8.5
4	4.5

SECTION-II

Q. 5. The number of students visiting the college library on daily basis is given below. Construct the cumulative frequency distribution table with class interval:

10, 12, 13, 14, 16, 18, 10, 12, 14, 17, 16, 13, 12, 10, 20, 32, 43, 55, 19, 23, 24, 36, 42, 45, 21, 26, 27, 18, 11, 52

Ans.

Class-interval	Frequency	Cumulative Frequency
10-15	11	11
15-20	6	17
20-25	4	21
25-30	2	23
30-35	1	24
35-40	1	25
40-45	2	27
45-50	1	28
50-55	2	30

Q. 6. Explain the types, advantages and limitations of observation.

Ans. Ref.: See Chapter-5, Page No. 37, 'Observation'.

Q. 7. What is standard deviation ? Compute standard deviation for the following data:

16, 20, 17, 18, 19, 21

Ans. Ref.: See Chapter-10, Page No. 97, 'The Standard Deviations (SD)'.

Also Add:

Scores	Deviation from Mean (x)	Deviation Squares (x) ²
16	-2.5	6.25
20	1.5	2.25
17	-1.5	2.25
18	-0.5	0.25
19	0.5	0.25
21	2.5	6.25
Total = 111		Σx² = 17.50

$$\text{Mean} = 111/6 = 18.5$$

$$\text{Standard deviation (S.D.)} = \sqrt{\sum x^2 / n}$$

$$= \sqrt{17.5/6}$$

$$= \sqrt{2.92} = 1.709 = \text{Ans.}$$

Q. 8. Explain the importance and properties of normal distribution.

Ans. Ref.: See Chapter-14, Page No. 132, 'Importance of Normal Distribution'.



Sample Preview of The Chapter

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STATISTICAL METHODS AND PSYCHOLOGICAL RESEARCH

BLOCK-1 : RESEARCH IN PSYCHOLOGY

Introduction to Research in Psychology



INTRODUCTION

In this chapter, we will explain psychological research and discuss its goals and principles. Ethical issues in psychological research will also be explained. The deductive and inductive methods will be discussed. Problem and hypotheses will also be elucidated. Topics like descriptive research, hypothesis testing, one-tailed, two-tailed tests and errors in hypothesis testing will also be explained. We will also discuss construct, variable and operational definition of variables.

CHAPTER AT A GLANCE

DEFINITION, GOALS AND PRINCIPLES OF PSYCHOLOGICAL RESEARCH

Research can be described as an analysis and recording of controlled observation that is objective and systematic in nature and this analysis and recording can result in generalizations and also development of theories. In simple terms – Research is a systematic investigation to find answer to a problem. (Burns, 2000)

Main features of the research are:

1. Systematic: Psychological research is systematic and scientific in nature. It also follows a pattern and scientific process. So, research should be carried out in a manner that the outcome of the research can be relied on and researchers have confidence in the outcome of the research.

2. It is objective: Objectivity is an important characteristics of research. So no subjectivity should

creep in to maintain the internal validity. Researchers' focus should be on reality which is objective in nature.

3. It seeks answer to certain problem: Psychological research is carried out with the aim which should be clear and specific. Researcher may come across some issues which need to be solved.

4. With the help of research, generalization can be made and theory and principles can also be developed: Based on the research result generalization can be done. And accordingly theory and principles can be developed.

Goals of Psychological Research

Psychology is devoted to understanding an individual's emotions, personality and mind through a series of scientific studies, observations, experiments and research. The main goals of psychological research are:

1. Description: The main goal of psychology is to describe the actual phenomenon in which humans behave in different situations. It involves information about what exactly is happening in a situation, with whom and where is it occurring. Describing a problem, an issue or behaviour is the first goal of psychology.

2. Explanation: Once a specific behaviour has been described, psychologists then try to go beyond the obvious and explain why people act the way they do. Explanation helps in providing answer to questions about why people react in a certain way, why they do the things they do and the factors which affect their personality, their mental status and their actions, etc.

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3. Prediction: Making predictions about how we think and act is the third goal of psychology. By analyzing past observed behaviour, psychological studies aim to predict and anticipate how a certain behaviour will appear again in the future. This allows psychologists to form a pattern of behaviour and better understand the underlying causes of people's action.

4. Control : Psychology aims to change, influence, or control behaviour to make positive constructive, meaningful and lasting changes in people's lives and to influence their behaviour for the better.

5. Application : This is final and most important goal of psychology. Inferences can be drawn based on the results obtained by carrying out the research and then these can be used for problem solving as well as decision-making.

Principles of Psychological Research

A good psychological research should be:

- (i) Systematic and scientific in nature
- (ii) Valid, verifiable and replicable
- (iii) Logical and develop theories and principles based on the research outcomes.

Following are the characteristics of adequate psychological research:

1. The purpose and objectives of the research needs to be stated in clear and specific manner.
2. To ensure objectivity the research procedure needs to be planned adequately.
3. Research design needs to be appropriately selected based on the purpose and objectives of the research.
4. Appropriate tools need to be used for data analysis.

Steps in Research Process

The main steps involved in a research process are as follows:

1. Research idea needs to be developed.
2. Stating the problem and formulating the hypothesis(es).
3. Research design that is appropriate needs to be selected.
4. Data collection.
5. Data analysis.
6. Deriving conclusions and making generalizations.

ETHICAL ISSUES IN PSYCHOLOGICAL RESEARCH

Various studies brought ethical issues and concern for safety and welfare of participants in the light. The

Belmont Report was presented by US Department of Health, Education and welfare in 1979 in which three ethical principles were highlighted:

- (i) **Respect for Participant (s) :** Recognizing the autonomy of the participants and protecting those with lower autonomy.
- (ii) **Beneficence :** Maximizing benefits and minimizing any harm and risk to the participants.
- (iii) **Justice :** Fairness in terms of who receives the benefits of research and faces risks.

These principles were stated as regulations by Department of Health and Human Services and the Food and Drug administration. And in 1991 these were adopted by the Federal Policy for the Protection of Human Subjects.

Research should be carried out after consideration of risk and benefit ratio:

- (i) If risks are high and benefits are low, there is no use of carrying out the research.
- (ii) If the benefits are high and risks are low, and minimal risks can be taken care of the research can be initiated.
- (iii) If both risks and benefits are low, there is no point of carrying out the research.
- (iv) If risks and benefits are high then decision is difficult. But such researches can be carried out by managing the risks. The vulnerability of the population also needs to be kept in mind.

Certain significant ethical issues, which should be taken care of before any research is carried out are:

- (i) **Beneficence and Non-maleficence :** Benefit of result to the participant should be ensured in the research.
- (ii) **Privacy and Confidentiality:** Privacy and confidentiality of the participant should also be ensured.
- (iii) **Anonymity:** In anonymity researcher may not be able to identify participant. In this, Participant may have objection to others knowing they participated in the research, but may have no problem with their performance details being shared.
- (iv) **Informed Consent:** Participants need to be informed about the details of the research, it could be done by sharing informed consent to the participants.
- (v) In case of animals, ethical guidelines need to be followed.

While the research is being written and reported, the researcher needs to ensure that there is no plagiarism and that the sources cited in the research are duly acknowledged.

DEDUCTIVE AND INDUCTIVE METHODS

There are two important methods in research- deductive and inductive.

Deductive Method: Deductive method is also known as top-down approach. It involve testing of a theory, then hypothesizes are formulated and tested to validate or invalidate the theory.

Inductive Method: Inductive method is known as bottom up approach or method of discovery. This method is used to obtain a new theory.

Table : Difference between Deductive and Inductive Method

Deductive Method	Inductive Method
Main focus on testing a theory	Main focus on building a new theory
Top- down approach is adopted	Bottom-up approach is adopted
A large sample is taken in order to facilitate generalisation of the findings	Less focus on generalisation
More structured	Less structured
Less time is consumed	Time consuming process

STATEMENT OF THE PROBLEM AND FORMULATION OF HYPOTHESES

Stating the problem and formulation of hypotheses are the two important components of any research. They help researcher to find out what is supposed to be done. Problem and hypothesis help in confirmation or disconfirmation of a certain theory.

Statement of the Problem

When a problem clearly stated is problem half solved. This statement signifies the need for defining a research problem. The problem to be investigated must be defined unambiguously for that will help to discriminate relevant data from the rest data. A proper definition of research problem will enable the researcher to be on the track to find the solution. Three main criteria have been stated by Kerlinger in a good statement of problem:

- (i) It focuses on relationship between two or more variables in the research.
- (ii) It needs to be stated clearly and should lack any ambiguity.
- (iii) It should be possible to subject it to scientific testing.

Formulation of Hypotheses

According to Kerlinger, “Hypothesis is a conjectural statement of the relation between two or more variables.” Hypothesis should be formulated clearly and unambiguous manner so that it can be empirically tested.

There are two types of hypothesis:

Null Hypothesis: Null hypothesis is referred to as hypothesis of no difference as null hypothesis implies that there is no difference between two groups.

Alternative Hypothesis: Alternative hypothesis can be referred as a counter proposition to the null hypothesis. This hypothesis states that there is a significant difference between two groups.

DESCRIPTIVE RESEARCH, HYPOTHESIS TESTING, ONE-TAILED, TWO-TAILED TESTS AND ERRORS IN HYPOTHESIS TESTING

Descriptive research involves description of certain phenomenon or event. It mainly involves observation and recording about the phenomenon or event n helps to describe certain behavioural patterns and can be effectively manipulation of variables that are being studied is not possible. There are three main types of descriptive research – naturalistic observation, case study and surveys.

(i) **Naturalistic Observation:** Naturalistic observation is research based on the observation of everyday events in a natural setting. Naturalistic observation is a research method used in psychology and other social sciences in which research participants are observed in their natural environments. Unlike lab experiments that involve testing hypotheses and controlling variables, naturalistic observation simply requires recording what is observed in a specific setting. It is sometimes referred to as field work because it requires researchers to go out into the field (the natural setting) to collect data on their participants.

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(ii) Case Study: Sometimes the data in a descriptive research project are based on only a small set of individuals, often only one person or single small group. These research designs are known as case studies.

(iii) Survey Method: In survey method, a large number of people are involved to carry out a survey.

Hypothesis Testing

Hypothesis testing is referred to as a process involving statistical decision making with regard to population value that is based on the sample value.

Steps in Hypothesis Testing: The steps in hypothesis testing are:

- (i) Null hypothesis/alternative hypothesis are specified.
- (ii) A level of significance is selected.
- (iii) According to the parameter specified in the null hypothesis, the statistic is calculated.
- (iv) Decision is made whether to accept or reject the null hypothesis.

One-tailed and Two-tailed Tests

Hypotheses can have a direction. In particular, a directional hypothesis not only states that an effect exists, but also states the direction of the effect. In the

terminology of hypothesis testing, this is known as the number of tails of the hypothesis.

One-tail: The hypothesis has an implied direction. For example, if the researcher is studying whether gender difference exists with regard to emotional intelligence, a one-tailed hypothesis would be “Females have higher emotional intelligence than males” or “Males have higher emotional intelligence than females”. Figure ahead provides the figure for both 0.05 and 0.01 levels of significance. To reject a null hypothesis, the score needs to fall in the upper tail, which is in the top 5% of the distribution. A one-tailed test can be tested in either of the direction.

Two-tailed: It is non-directional and will be stated as Gender difference will exist with regard to emotional intelligence. In this case a null hypothesis can be rejected if the score falls in the either of the top 2.5 of the distribution. So the level of significance is maintained at 0.05 levels.

Errors in Hypotheses Testing

Type I and Type II Errors: In hypothesis testing two errors could occur, type I and type II errors. Table below is provided for reference.

Table : Type I and Type II Errors

	Null Hypothesis is true	Null Hypothesis is false
Null Hypothesis is Rejected	Type I error	Decision is correct
Null Hypothesis is Accepted	Decision is correct	Type II

From this table we find that a researcher will be making a correct decision when a false null hypothesis is rejected and when a null hypothesis that is true is accepted. But this may also happen that a null

hypothesis is rejected even when it is true and this is termed as type I error and when a false null hypothesis is accepted then it termed as type II error.

