
UNIT 1 INTRODUCTION TO PSYCHOLOGICAL RESEARCH – OBJECTIVES AND GOALS, PROBLEMS, HYPOTHESIS AND VARIABLES

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1.0 INTRODUCTION

Let us start our journey into the realm of human mind. A scientific quest for understanding will be the foremost in our journey. We want to know why we think, feel and behave as we do. What makes each of us different from all other people? Why do we often behave as alike in some situations ?

Psychologists try to answer these questions, develop the principles to explain them, and use those principles to solve various problems. The range of application of psychology is very wide. A cognitive psychologist may like to know the causes of forgetting. An organisational psychologist may try to find out nature of resistance among the employees to introduction of new performance appraisal system. A health psychologist may like to examine the relationship between smoking behaviour and coronary heart disease.

While evaluating major areas of psychological researches, a psychologist uses the principles and practices of scientific methods. This unit attempts to acquaint you with nature and relevance of psychological research. This is followed by the process of psychological research within the context of discovery and context of justification as well as distinctive goal of psychological researches.

Finally, the unit deals with indispensable stages of psychological research, i.e. statement of problem, formulation of hypothesis and identifying variables. All the three stages are considered as foundation pillars of psychological research in terms of research design. Precisely, without traveling through these stages the journey for achieving goal via psychological research can not be concluded.

1.1 OBJECTIVES

After reading this unit, you will be able to:

- Describe the research process in terms of how to conduct sound research and how to evaluate critically the research of others;
- Understand why people behave as they do;
- Discuss how to maintain objectivity and minimize the research bias in psychology research;
- Tell others the role of theory, hypothesis and paradigm in psychological research;
- Discuss the primary objectives and goals of psychological research;
- Identify some of the problems one encounters in trying to do reliable and valid research;
- Discuss how to identify and formulate a problem and know the ways in which problem is manifested;
- Enlist the characteristics of good hypothesis and functions of hypothesis; and
- Identifying the variable, types of variable and understand the cause and effect relationship through the manipulation of variables.

Psychology aims at gaining knowledge about behaviour and mental functions. Psychologists are dedicated to theory building and applications for problem solving. The results of empirical studies help verify the prepositions of a theory and may lead to

its modifications. The fruits of psychological research are used in problem solving, in personal, professional and societal contexts.

1.2 NATURE OF PSYCHOLOGICAL RESEARCH

Importance and relevance of psychological research is well recognised almost in every sphere of human life. Notable progress has been reported in the field of organisational behaviour, applied aspects of human being, medical sciences and education, through application of psychological research findings.

Empirical and theoretical researches in psychology are taking place in various fields, such as learning, motivation, perception, concept learning and memory and so on. In the quest of psychological facts, laws and theories, psychologists have found research studies very helpful in gauging human and animal behaviour.

Psychological research attempts to understand why people and animals behave as they do. Psychologists usually define behaviour as overt activities, such as eating, recalling stories, and so on. What about covert psychological processes, such as thinking and feeling? Although thoughts and feelings are not directly observable, they influence such aspects of behaviour as reaction time and blood pressure, which are often used to measure these covert processes.

Practical gains of psychological research are many, yet include discoveries such as improved methods of treating psychologically disordered people, better designs of vehicles to make them easier and safe to use, and new ways of enhancing the performance and happiness of workers.

Before we examine what researchers have found in the major areas of psychology, we need to identify the ways psychologists gather data about behaviour and mental processes. You may be a daily consumer of mass media reports on research findings. Some of these are valuable, some are worthless, and others are confusing and misleading. You will become a wiser consumer of research-based conclusions as you develop your understanding of how psychological research is conducted and why the scientific view of knowledge dictates such methods. Let us turn now how psychologists know what they know.

Recall that psychology is the scientific study of behaviour and mental functioning of individuals. It is scientific because it uses the principles and practices of the scientific method.

Empirical investigation in any field requires the use of the scientific method to observe, measure, and experiment. Even if you never do any scientific research in your life, mastering information on psychological research will be useful. You can improve your critical thinking skills by learning how to ask the right questions about behaviour and how to evaluate the answers you find.

Psychological research process can be divided into two major categories that usually occur in sequence, that is (i) getting an idea [context of discovery] and then (ii) testing it [context of justification].

1.3 THE CONTEXT OF DISCOVERY

This is the initial phase of research during which observations, belief, information, and general knowledge etc., lead someone to come up with a new idea or a different way of thinking about phenomena.

1.3.1 Role of Theories, Hypotheses and Paradigms in Psychological Research

Psychological research focuses on four sets of concerns:

- i) the stimulus events that cause a particular response to start, stop, or change in quality or quantity;
- ii) the structure of behaviour that links certain actions in predictable, orderly ways to other actions;
- iii) the relationships between internal psychological processes or psychological mechanisms and observable behaviour patterns; and
- iv) the consequences that behaviour has on the individual's social and physical environment.

Researchers begin with the **assumption of determinism**, the idea that all events (physical, mental and behavioural) result from specific causal factors. Researchers also assume that behaviour and mental processes follow set patterns of relationships that can be discovered and revealed through research.

Psychological theories, in general, attempt to understand how brain, mind, behaviour, and environment function and how they may be related. Any particular theory focuses on a more specific aspect of this broad conception, using a body of interrelated principles to explain or predict some psychological phenomenon.

The value of a theory is often measured in terms of the new ideas, or hypotheses, that can be derived from it and tested. A hypothesis is a tentative and testable explanation of the relationship between two or more events or variables.

A **variable** is any factor that changes, or varies, in size or quality. To illustrate this mood may be a variable, since people's moods may vary from one situation to another. Test performance is another variable, since a person's score may vary from one test to the next.

A **hypothesis** is a testable explanation of the relationship between variables, it is a tentative proposition based on observations, or it could be a hunch about how ideas go together. An instructor, for example, may have a hypothesis about how varying teaching techniques will cause changes in students' test scores. Thus, instructor may have formed this hypothesis by observing students; idea about better teaching techniques is also generated from research in educational psychology.

Finally, our understanding of a complex process is also aided by using the correct paradigm. A **paradigm** is a model of the functions and interrelationships of a process, a "way of thinking" about the world and how to study it. Entire field of knowledge, including psychology, can change directions when new paradigm challenges existing ones. When paradigms shift, revolutions of knowledge usually follow (Kuhn, 1970).

Before a new theory, hypothesis, or paradigm makes a difference in science, it has to undergo an "ordeal of proof." Most often this happens when researchers publish (i.e. make public) their findings, and other scholars investigate whether they find the same patterns in their own data. This process of publication and communication moves scientific research into the public eye, where ideas are tested and proven.

1.3.2 Research Biases

One of the challenges, while doing research is to remain objective and free from biases. Most of your ideas and beliefs are probably linked with certain bias because they are

influenced by your opinions or values. A variety of biases have been found to distort people's impressions of collected data.

External influences such as one's culture or the media can influence people to accept a particular world view.

Personal bias distorts estimating or evaluating processes as a result of personal beliefs, attributes, or past experiences.

Observer bias operates when one's biases act as "filters" through which some events are noticed or seen as meaningful while others are not. It must be kept in mind that researchers themselves were raised in certain cultures and societies. They also might have been exposed to certain gender role expectations. These background factors can all affect the way that researchers observe and interpret events in their lives.

Expectancy bias can affect observations of behaviour by triggering reactions to the events being observed. Researchers sometimes expect to find specific outcomes, and being only human, they may see what they expect to see rather than remain objective. Unfortunately, if one is not alert to the possibility of expectancy bias, it may seem as though the observed events are being "discovered" instead of created by the observer's expectations.

Finally, placebo biases operate when people strongly want to believe a treatment is successful. Believing in the treatment may make an ineffective treatment appear effective. For example, many people may claim to feel better after taking a placebo such as a sugar pill. In those cases where the outcome involves a subjective judgment about results, that is, how well a person feels well or whether the pain has been reduced or relieved, the desire for a drug or therapeutic method to work may be enough to achieve the desired result.

1.4 CONTEXT OF JUSTIFICATION

The context of justification is the second phase of research in which results are prepared for useful communication with other scientists. Psychologists face a difficult challenge when they try to get accurate data and reliable evidence that will generate valid conclusions. They rely on one ally to succeed: the scientific method. Scientific method is a general set of procedures for gathering and interpreting evidence in ways that limit errors and yield dependable conclusions. The scientific method also demands special attitudes and values on the part of research scientists.

1.4.1 Scientific Attitudes and Values

Scientists are motivated by a curiosity about the unknown and the uncertain. Since the truth may be disguised, the scientific method demands a critical and skeptical attitude toward any conclusion until it has been duplicated repeatedly by independent investigations.

By remaining somewhat opened-minded, scientists keep the truth "provisional" subject to revision after new discoveries, but agree to evaluate the phenomena they may personally doubt or suspect. For example, instead of rejecting any possibly that psychic process like ESP (extrasensory perception) really exist; scientists collect evidence on which to base judgments.

Secrecy is banned from the research procedure because all data and methods must eventually be open for public verifiability. Other researchers must have the opportunity to review the data and conclusions and then attempt to replicate the results. Thus science

is not a set of rules but rather a process of asking, observing, explaining, testing, and retesting explanations of reality.

Scientific knowledge is based on respect for empirical evidence obtained through controlled observations and careful measurement. In the realm of science, when good data clash with the opinions of experts, the data win. Science is a way of knowing, and not a hierarchy of experts. You do not need a special degree to act like a scientist, but you do need to make a commitment to objectivity.

1.4.2 Objectivity Safeguards

This consists of (i) procedural safeguards, (ii) standardisation, (iii) operationalisation, (iv) avoiding of bias. Let us take each of these and discuss.

Procedural safeguards

Since subjectivity must be minimized in the data collection and analysis phases of scientific research, **procedural safeguards** are used to increase objectivity. These safeguards begin with keeping complete records of observations and data analyses in a form that other researchers can understand and evaluate. As a result, most scientific reports are written in a similar form and published by organisations of scientists. These reports communicate ideas to the entire scientific community and open those ideas to criticism.

Standardisation

A second safeguard is standardisation. **Standardisation** means using uniform, consistent procedures in all phases of data collection. All subjects should receive the same instructions and be treated in the same way. By applying a standard treatment for all participants in the course of study, researchers ensure they will have the same basic experience.

Operationalisation

A third safeguard involves Standardising the meaning of concepts, known as **operationalisation**. An operational definition of a concept defines that concept in terms of how it is measured or what operations produce it.

For example, an operational definition of the letter grade A in one psychology class might be “90% or higher of all test points possible.” This definition tells you that this instructor calculates each student’s total performance percentage to determine whether or not that person’s work deserves an A.

Operational definitions are especially important because many psychological processes are popular issues and everyday concerns. For example, if new drugs promise to reduce anxiety, you need to know whether the drug manufacturer’s definition of anxiety is the same as yours.

For you, “anxiety” may mean occasional nervousness before being evaluated or judged. But for the pharmaceutical company, “anxiety” could mean a set of symptoms experienced by patients in psychiatric hospitals. A drug developed to reduce that kind of anxiety may be inappropriate for your concept of anxiety.

Avoidance of bias

Researchers must also safeguard objectivity by avoiding bias. As explained earlier, bias from external influences, personal beliefs, observers’ perspectives, and human

expectations can all distort data. To control, if not totally eliminate such biases, researchers use various controls. If not totally eliminate such biases, researchers use various control procedures to test hypotheses in ways that are fair and error-free.

One control strategy is to keep subjects uniformly ignorant of the purpose of the study. This makes them less likely to perform to researchers' expectations. An even better strategy is to keep subjects uninformed, or blind, about the purpose of the study; this makes them less likely to perform to researchers' expectations.

An even better strategy is to employ uniformed testers to observe uniformed subjects, called the double-blind control. Similarly, when placebo effects might occur, researchers employ a placebo control and compare those who received actual treatment with those who received only attention or a "dummy drug."

For example, to test whether a new drug will help people sleep; some subjects will be given the drug in tablet form while others are given identical tablets (placebo) that do not contain the drug. If the drug is effective, those given the placebo will not sleep better or faster, if it not effective, subjects' sleeping experience will all be similar.

Finally, researchers must be careful to consider all possible influences on the behaviour being studied. As discussed earlier, the independent variable is the factor assumed to influence the behaviour or mental process of interest, the dependent variable. If another factor – called a confounding variable could be confused with the independent variable, it should be eliminated or controlled by keeping it the same ("constant").

For example, a teacher gives some students essay tests and others multiple choice tests on the same material. Which students do you think will do better? Unfortunately, the essay students were all in early morning classes, while the multiple choice students were in late afternoon classes.

Because the time difference is confounded with the test difference, test performance cannot be clearly explained. The teacher should have kept the conditions as similar as possible, with the test type as the only difference, so that other explanations could be ruled out.

Self Assessment Questions

True /False

- 1) Explaining the reasons for occurrence of a phenomenon indicates control (True/False).
- 2) Statement about the likelihood that certain behaviour will occur is called prediction (True / False)
- 3) Independent variable is deliberately manipulated in the experimental group (True/False).
- 4) An investigator comes up with a new idea or a different way of thinking is known as context of discovery (True/False).
- 5) Use of uniform consistent procedure in all faces of data collection is known as Standardisation. (True/False).

1.5 CHARACTERISTICS OF PSYCHOLOGICAL RESEARCH

In psychological researches experimental methods are widely used. Therefore, nature of majority of psychological researches is highly scientific. Psychological researches have successfully led to control and manipulation of the variables associated with widely used generic and comparative methods. Psychologists have developed such effective experimental designs that they have helped to isolate effect of other variables from independent variables.

In psychological researches, rigorous scientific norms and statistical methods are applied in collection, organisation, description and analysis of the data. By turning psychological facts into quantitative form, the nature of most of the psychological researches remains method oriented [scientific].

1.6 GOALS AND OBJECTIVES OF PSYCHOLOGICAL RESEARCH

Every science has goals. In physics, the goals are concerned with learning how the physical world works. In astronomy, the goals are to chart the universe and understand both how it came to be and what it is becoming.

The goals of psychologist conducting basic research are to describe, explain, and predict and control behaviour.

The applied psychologist has a fifth goal also, that is application of psychological techniques and principles to improve the quality of human life. Most applied psychologists are able to conduct their own basic research, scientifically studying particular problem in order to solve them. The process of accomplishing one goal and moving on to the next is ideally a natural, flowing, experience, energized, by the psychologist's interest in the question being studied.

1.6.1 Description: What is Happening?

The first step in understanding anything is to give it a name. Description involves observing a behaviour and noting everything about it, as for example, what is happening, where it happens, to whom it happens, and under what circumstances it happens.

For example, a teacher might notice that a young girl in second grade classroom is not behaving properly. She's not turning in her homework, her grades are slipping badly, and she seems to have a very negative attitude toward school. The teacher here describes the student's behaviour, and this description of what she is doing gives a starting place for the next goal : why is she doing it?

1.6.2 Explanation: Why is it Happening?

To find out why the girl is not behaving properly, the teacher would most likely ask the school counselor to administer some tests. Her parents might be asked to take her to a pediatrician to make sure that there is no physical illness, such as an allergy. They might also take her to a psychologist to be assessed. In other words, the teacher and others are looking for an explanation for the young girl's behaviour.

Finding explanation for behaviour is a very important step in the process of forming theories of behaviour. A theory is a general explanation of a set of observations or facts.

The goal of description provides the observations, and the goal of explanation helps to build the theory.

If all the tests seem to indicate that the young girl has a learning problem, such as dyslexia (an inability to read at expected levels for a particular age and degree of intelligence), the next step would be trying to predict what is likely to happen if the situation stays the same.

1.6.3 Prediction: When Will it Happen Again?

Determining what will happen in the future is a prediction. In the example, the psychologist or counselor would predict (based on previous research into similar situations), that this little girl will probably continue to do poorly in her schoolwork and may never be able to reach her full learning potential.

Clearly, something needs to be done to change this prediction, and that is the point of the last of the four goals of psychology: changing or modifying behaviour.

1.6.4 Control : How can it be Changed ?

Control, or the modification of some behaviour, has been somewhat controversial in the past. Some people hear the word control and think it is brainwashing, but that is not the focus of this goal. The goal is to change a behaviour from an undesirable one (such as failing in school) to a desirable one (such as academic success). Such efforts also include attempts at improving the quality of life.

In the example of the young girl, there are certain learning strategies that can be used to help a child (or an adult) who has dyslexia . She can be helped to improve her reading skills.(Aylward etal,2003;Shaywitz,1996). The psychologist and educators would work together to find a training strategy that works best for this particular girl.

1.6.5 Application

Improving the quality of life

Psychological research are often conducted to solve various problems faced by the society at different levels such as individual, organisation, or community. Psychological applications to solve problems in diverse settings, such as in a classroom in a school, or in an industry, or in a hospital, or even in a military establishment, demand professional help. Applications in the health sector are remarkable. Because of these efforts quality of life becomes a major concern for psychologists.

Not all psychological investigations will try to meet all five of these goals. In some cases, the main focus might be on description and prediction, as it would be for a personality theorist who wants to know what people are like (description) and what they might do in certain situation (prediction).

Some psychologists are interested in both description and explanation, as is the case with experimental psychologists who design research to find explanations for observed (described) behaviour. Therapists, of course, would be more interested in control, although the other four goals would be important in getting to that goal.

Self Assessment Questions

- 1) Scientific knowledge is not based on empirical evidences. (True/False).
- 2) Psychologists should not maintain objectivity by avoiding biases. (True/False).

- 3) Psychological researches should be replicable (True/False).
- 4) When there is no gap in results of several investigations in the same field, problem exists. (True/False).
- 5) A tentative testable proposition of the relationship between two or more variable is called hypothesis. (True/False).

1.7 PROBLEM

1.7.1 Nature and Meaning

A scientific inquiry starts when a researcher has already collected some information/knowledge and that knowledge indicates that there is something we do not know. It may be that we simply do not have enough information to answer a question, or it may be that the knowledge that we have is in such state of distorted form that it cannot be adequately related to the question. Here a problem arises.

The formulation of a problem is especially important, as it guides us in our inquiry. According to Townsend (1953) ‘a problem is a question proposed for solution’.

According to Kerlinger (1964) ‘A problem is interrogative sentence of statement that asks: What relation exists between two or more variables’.

According to McGuigan (1964) ‘A solvable problem is one that poses a question that can be answered with the use of man’s normal capacities’.

1.7.2 Characteristics of a Scientific Problem

After analysing above written definitions of a problem statement, it can be said there are certain characteristics of a problem statement:

- i) A problem statement is written clearly and unambiguously, usually in question form. A few examples of problem statement are given below:
 - What is the relationship between IQ and class-room achievement?
 - What is the relationship between anxiety and adjustment among school going children?
 - Do students learn more from a lecture method than from discussion method?
- ii) A problem expresses the relationship between two or more than two variables. This kind of problem permits the investigator to manipulate two or more than two variables to examine the effects upon the other variables. For example: Do teacher reinforcement cause improvement in student performance? In this example, one variable is teacher reinforcement and the other variable is student performance. It illustrates the problem found in a scientific study because the problem statement explores the effect of teacher’s reinforcements on student performance. The conditions for a problem statement are:
 - The problem should be testable by empirical methods
 - A problem statement should be solvable.
 - The data of a scientific problem should be quantitative.
 - The variable relating to the problem should be clear and definite.

1.7.3 Ways in which a Problem is Manifested

A problem is said to exist when we know enough that there is something we do not know really. There are atleast three ways in which a problem is said to be manifested:

Gap in knowledge: A problem is manifested when there is a noticeable gap or absence of information. Suppose a community or group intends to provide psychotherapeutic services, two questions arise, viz., (i) What kind of psychotherapy they should offer and (ii) Which one of the different forms of therapeutic methods is most effective for a given type of mental disease.

In this example, there exists a noticeable gap in the knowledge, and hence the collection of necessary data and their explanation are needed for filling the gap in knowledge.

Contradictory results: When several investigations done in the same field are not consistent and therefore, at times, contradictory, a problem is to find out a new answer and settle the controversy.

Explaining a Fact: Another way in which we become aware of a problem is when we are in possession of a 'fact', and we ask ourselves, "Why is this so?" When the facts in any field are found in terms of unexplained information, a problem is said to exist.

1.7.4 Identifying A Research Problem

The identification of a research problem may be accomplished in a variety of ways (i) observations of every day life,

- thinking or brainstorming sessions
- theoretical predictions and explanations,
- technological developments which make new research possible
- problems suggested in the research literature; or any combination of these methods.

1.7.5 Considerations in Selecting a Research Problem

When selecting a research problem/topic there are a number of considerations to keep in mind these considerations are **interest, magnitude, measurement and clarity about the concept, level of expertise, relevance, availability of data and ethical issues**. If you select a problem without considering these issues it could become extremely difficult to sustain the required motivation and interest, and hence its completion as well as the amount of time taken could be affected.

1.7.6 The Importance of Formulating a Research Problem

The formulation of a research problem is the first and most important step of the research process. It is like the identification of a destination before undertaking a journey. As in the absence of a destination, it is impossible to identify the shortest route, so also in the absence of a clear research problem, a clear and economical plan is impossible.

A research problem is like the foundation of a building. The type and design of the building is dependent upon the foundation. If the foundation is well designed and strong you can expect the building to be also strong and well designed. In the case of research, the research problem serves as the foundation of a research study. If it is well formulated, you can expect a good study to follow.

According to Kerlinger(1986), if one wants to solve a problem, one must generally

know what the problem is. It can be said that a large part of the problem lies in knowing what one is trying to do.

You must have a clear idea with regard to what it is that you want to find out **about** and not what you think you must find.

A research problem may take a number of forms, from the very simple to the very complex. The way you formulate a problem determines almost every step that follows, that is (i) the type of study design that can be used, (ii) the type of sampling strategy that can be employed, (iii) the research instrument that can be used or developed (iv) and the type of analysis that can be undertaken.

The formulation to a problem is like the ‘input’ into a study, and the ‘output’ – the quality of the contents of the research report and the validity of the associations or causation established – is entirely dependent upon it. Hence the famous saying about computers – ‘garbage in, garbage out’ – is equally applicable to a research problem.

Self Assessment Questions

- 1) Operational definition of a concept is not necessary in scientific research. (True/False)
- 2) The first goal of psychological research is to provide explanation. (True/False)
- 3) The variable in which change is desired is called independent variable. (True/False).
- 4) The variable manipulated by the experimenter is called dependent variable (True/False).
- 5) The variable that intervenes between the Dependent and Independent variable is Intervening variable. (True/False).

1.8 HYPOTHESIS

In conducting research, the second important consideration after the formulation of a research problem is the construction of hypothesis. As you know any scientific inquiry starts with the statement of a solvable problem, when the problem has been stated, a tentative solution in the form of testable proposition is offered by the researcher. The testable proposition and potential answer are termed a hypothesis

Therefore a hypothesis is nothing but a suggested, testable and proposed answer to a problem.

By stating a specific hypothesis, the researcher narrows the focus of the data collection effort and is able to design a data collection procedure which is aimed at testing the plausibility of the hypothesis as a possible statement of the relationship between the terms of the research problem.

1.8.1 Definition of Hypothesis

Several experts have defined hypothesis more or less in the same way. According to Kerlinger (1973), a hypothesis is a conjectural statement of the relation between two or more variables.

According to Mcquigan (1970) hypothesis is a testable statement having the potential relationship between two or more variables. In other words, the hypothesis in one way is advanced as a potential solution to problem.

On the basis of these definitions two criteria for good hypothesis and hypothesis statement can be suggested:

- i) Hypotheses are statements about the relation between variables.
- ii) Hypotheses carry clear implication for testing the stated relations.

These criteria mean that hypothesis contains two or more variables which are measurable or potentially measurable and hypothesis exhibits either a general or specific relationship between the variables.

1.8.2 Characteristics of a Hypothesis

There are a number of considerations one should keep in mind when constructing a hypothesis, as they are important for valid verification.

Hypothesis should be simple, specific and conceptually clear. There is no place of ambiguity in the construction of a hypothesis it should be 'unidimensional' i.e. it should test only one relationship at a time. For example; the average scores in maths subjects of the male students in the class is higher than the female students.

Suicides rates vary inversely with the social cohesion (Black & Champion 1976).

A Hypothesis thus should be capable of verification: methods and techniques must be available for data collection.

A hypothesis should be operationisable. This means that it can be expressed in terms that can be measured. If it cannot be measured and tested and, hence, no conclusions can be drawn.

A Hypothesis should be related to the existing body of knowledge.

A hypothesis has equal chances of confirmation and rejection.

A hypothesis should be parsimonious. (economical)

A hypothesis should be method oriented.

In the construction of hypotheses the student must observe the above mentioned rules. Forming acceptable hypotheses is not difficult if the problem giving rise to the hypotheses has been carefully stated and defined.

The form of a hypothesis can be a declarative statement containing a suggested answers to the problem, and which obeys the formal conditions of hypothesis.

Following are two examples of problems and their respective hypothesis.

Problem 1: Does practice with the preferred hand improve the proficiency of the nonpreferred hand in the mirror drawing experiment ?

Hypothesis: Practice with the preferred hand significantly improves the proficiency of the nonpreferred hand in the mirror drawing experiment.

Problem 2: Are male rats more active than the same strain of female rats during a 6-day period spent in an activity cage ?

Hypothesis: Male rats are not significantly more active than the same strain of female rats during a 6-day period spent in an activity cage.

1.8.3 Functions of Hypothesis

A hypothesis serves the following functions:

- i) The formulation of a hypothesis provides a study with focus.
- ii) It tells you what specific aspects of a research problem to investigate
- iii) It tells what data to collect and what not to collect
- iv) The construction of a hypothesis enhances objectivity in a study.

The process of testing a hypothesis goes through 3 phases as given below (Kumar, 2002 : Research methodology))

Phase I: Formulate your hunch or assumption

Phase II: Collect the required data

Phase III: Analyse data to draw conclusion about the hunch – true or false.

A hypothesis may enable you to add to the formulation of theory. It enables you to specifically conclude what is true or what is false.

Self Assessment Questions

Multiple Choice Questions

- 1) A psychologist is interested in what a particular person might do in a stressful situation. This psychologist is most interested in the goal of:
a) description b) explanation
c) prediction d) control
- 2) The first step in studying animal behaviour is to observe animals and record everything they do, when they do it, and what is going on around them when they do it. This meets the goal of:
a) description b) explanation
c) prediction d) control
- 3) Experimental psychologists, who design experiments to determine the causes of behaviour, would be most interested in the goal of
a) description b) explanation
c) prediction d) control
- 4) Psychologists who give potential employees tests that determine what kind of job those employees might best fit are interested in the goal of
a) description b) explanation
c) prediction d) control
- 5) A researcher designs an experiment to test the effects of playing video games on memory. What would be the dependent variable?
a) scores on a memory test
b) playing video games

- c) number of hours spent playing video games
 - d) the type of video game played
- 6) In that same experiment, the experimental group would not play the video games but take the memory test, while the control group would not take the memory test while the control group would play the video games. (What would be the dependent variable?)
- a) scores on a memory test
 - b) playing video games
 - c) number of hours spent playing video games
 - d) the type of video game played
- 7) In a _____ study, neither the experimenter knows nor the participant knows who is in the control group and who is in the experimental group.
- a) placebo b) single blind
 - c) double – blind d) triple blind
- 8) Double – blind studies are to control
- a) the placebo effect
 - b) the experimenter effect
 - c). extrinsic motivation
 - d) the experimenter effect
- 9) In a psychologist's classic experiment of the effects of reward on creativity, what was the dependent variable?
- a) the special instructions to each group
 - b) the collage party
 - c) the ratings of creativity from the experts for each child's collage
 - d) the size of the collages.
- 10) In an experiment, the variable which is varied is called the ____ variable, while the behaviour which is studied, is called the ____ variable
- a) Independent, dependent
 - b) Dependent, independent
 - c) Control, observed
 - d) Stimulus, response

1.9 VARIABLES

After the statement of problem under investigation and the formulation of hypothesis, the researcher is now prepared to design an experiment for the specific purpose of testing whether his/her hypothesis is accepted or rejected.

During the planning of research design empirical study of different factors of related phenomena is required. Therefore, the nature of antecedent and consequent factors related to phenomena or events is very important to understand conceptual clarity and quantitative accuracy. These factors are known as variables in scientific research.

1.9.1 Meaning of Variable

A variable, as the name implies, is something which varies. This is the simplest and the broadest way of defining a variable.

Webster says that a variable is “a thing that is changeable” or “a quantity that may have a number of different values.”

True, a variable is something that has at least two values, however, it is also important that the values of the variable be observable. Thus, if what is being studied is a variable, it has more than one value and each value can be observed. For example, the outcome of throwing a die is a variable. That variable has six possible values (each side of the die has from one to six dots on it), each of which can be observed.

In psychology, the variables of interest are often behaviours or the causes of behaviours. Many psychologists have adopted a theoretical viewpoint or model called the S-O-R model to explain all behaviour.

The symbols S, O, and R represent different categories of variables.

S is the symbol of stimuli, and the category may be referred to in general as stimulus variables. A stimulus variable is some form of energy in the environment. Such as light, to which the organism is sensitive.

O is the symbol for organismic variables – the changeable physiological and psychological characteristics of the organisms being observed. Examples of such variables are anxiety level, age and heart rate.

Finally, R is the symbol for response and, in general, response variables, which refer to some behaviour or action of the organism. Saying “yes,” running and pressing a lever are examples of responses variables.

However, a behavioural scientist attempts to define a variable more precisely and specifically. Kerlinger (1964) has defined variable as a property that takes on different values.

According to D’amato (1970) variables may be defined as those attributes of objects, events, things and beings, which can be measured. In other words variables are the characteristics or condition that can be manipulated controlled or observed by the experimenter. Sex, IQ, level of aspiration, anxiety, coping strategies, socio-economic status, and achievement etc. are examples of variables commonly employed in psychological research.

Some of the variables used in behaviour researches are true dichotomies i.e. male female, alive dead, employed unemployed. Some variable are polytomies – for example religion preference – Hindu, Muslim, Jain, Christians and Sikhs etc. However, most variable are theoretically capable of taking on continuous variable.

1.9.2 Classification of Variables

A variable can be classified in a number of ways. The classifications have been done from looking at variables in three different ways:

- i) The causal relationship
- ii) The design of the study
- iii) The unit of measurement

Table showing Classification of variables is given below

Variables		Independent Variables	Type S Type E
		Dependent Variables	
		Extraneous variables	
	Causal relationship		
	Causal relationship	Intervening variables	
	Designed study	Active variable	
	Designed study	Attribute variables	
	Unit of measurement	Qualitative variables	
	Unit of measurement	Quantitative variable	Continuous variables
			Discrete variables

1.9.2.1 From the Viewpoint of Causation

- i) Change variables, which are responsible for bringing about change in a phenomenon;
- ii) Outcome variables, which are the effects of a change variables.
- iii) Variable which affect the link between cause-and-effect variables;
- iv) Connection or linking variables, which in certain situations are necessary to complete the relationship between cause and effect variables. (Shown in the table below)

	Connecting or linking variables (4)	
Cause		Effect
Change variables (1)		Outcome variables (2)
	Variables that affect the relationship (3)	

In psychological research change variables are called independent variables. Outcomes/ effect variables are called dependent variables, the unmeasured variables affecting the cause-and-effect relationship are called extraneous variables and the variables that link a cause and effect relationship are called intervening variables. Hence:

Independent variables : An independent variable is that factor manipulated by the experimenter in his attempt to ascertain its relationship to an observed phenomenon.

Dependent upon the mode of manipulation some experts have tried to divide the independent variable into type - E independent variable in Type - S independent variable (D'Amato, 1970).

Type E independent variable is one of which is directly or experimentally manipulated by the experimenter and type S independent variable is one which is manipulated through

the process of selection only. For example the experimenter wants to study the effect of noise upon the task performance in an industry. Here the Independent variable (IV) is the noise and the dependent variable (DV) is the task performance. He may manipulate the noise by dividing into the three categories – continuous noise, intermittent noise and no noise and examine its effect upon the task performance. Here the noise is being directly manipulated by the experimenter and hence, it constitutes the example of Type-E independent variable.

Suppose, the experimenter is interested in answering the question : Is the rate of production dependent upon the age of the workers? Age is here the independent variable.

For investigating this problem, the experimenter will have to select groups of workers on the basis of their age in a way by which he can get an appropriate representation from different age groups ranging from say, 16 to 55 years. Subsequently, he will compare the rate of production obtained by each age group and finally, conclude whether or not age is a factor in enhancement of the performance.

Dependent variable: A dependent variable is that variable which appears, disappears, or, removed or varies when the experimenter manipulates and changes the independent variable.

A few examples of hypothesis with their independent variables indicated are given below:

Hypothesis 1 : As the number of trials increases errors decrease.

Independent variable : No. of the trials

Dependent variable : Errors committed by the subject.

Hypothesis 2 : Individuals were feeble minded have lower intelligence than do individuals whose parents were not feeble minded.

Independent variable : presence or absence of feeble mindedness in the parents.

Dependent variable : the amount of intelligence possessed by the individuals whose parents were feeble minded as compared to the intelligence of those whose parents were not feeble minded.

Extraneous variables: Several other factors operating in a real life situation may affect changes in the dependent variable. These factors, not measured in the study, may increase or decrease the magnitude or strength of the relationship between independent and dependent variables.

Intervening variables: Intervening variables sometimes called the confounding variable (Grinnell 1988; 203), links the independent and dependent variables. In certain situations the relationship between an independent and a dependent variable cannot be established without the intervention of another variable. The cause variable will have the assumed effect only in the presence of an intervening variable.

To explain these variables let us take some examples. Suppose you want to study the relationship between smoking and coronary heart disease. You assume that affecting this relationship, such as a number of cigarettes or the amount of tobacco smoked every day; the duration of smoking; the age of the smoker; dietary habits; and the amount of exercise undertaken by the individuals. All of these factors may affect the extent to which smoking might cause coronary heart disease. These variables may either increase or decrease the magnitude of the relationship.

In this example the extent of smoking is the independent variable, coronary heart disease is the dependent variable and all the variables that might affect this relationship, either positively or negatively, are extraneous variables.

These relationships are explained below in the table.

Table: Independent, dependent and extraneous variables in causal relationship

Smoking		Coronary Heart Disease
(Assumed cause)		(Assumed effect)
Independent		Dependent variable
	Affect the relationship	
	The age of the person	
	Extent of his or her smoking	
	Duration of smoking	
	The extent of daily exercise etc.	
	Extraneous variables	

1.9.2.2 From the Viewpoint of the Study Design

Active variables

A variable which is manipulated by the experimenter is the active variable. Examples of active variables are reward, punishment, methods of teaching etc.

Attribute variable

A variable which is not manipulated but measured by the experimenter is the attribute variable or organismic variable. Some of the examples of attribute variables are age, sex, intelligence, race, anxiety, etc.

1.9.2.3 From the Viewpoint of the Unit of Measurement

Qualitative and Quantitative variables

The quantitative variables refer to those variables which consist of categories that cannot be ordered in magnitude. We cannot make such a statement regarding the qualitative variables, e.g., “category X possesses higher (or lower) magnitude of the variable than category “Y”.

Sex, race and religion are examples of qualitative variables. The quantitative variables refer to those variables which are composed of categories that can be ordered in magnitude.

Intelligence age, levels of illumination, intensity of sound etc., are the examples of quantitative variables.

Continuous Variables and Discrete Variables

Quantitative variables are further divided into two categories, namely, continuous variables and discrete variables. A continuous variable is one which is capable of being

measured in any arbitrary degree of fineness or exactness. Age, height, intelligence, reaction time, etc., are some of the examples of a continuous variable.

The age of the person can be measured in years, month and days. Thus, all such variables which can be measured in the smallest degree of fineness, are examples of the continuous variable.

Discrete variables (also known as categorical variables) are those variables which are not capable of being measured in any arbitrary degree of fineness or exactness because the variables contain a clear gap. For example, the number of members in a family constitutes the example of a discrete variable.

1.10 LET US SUM UP

Psychological researches use the scientific method to test the ideas developed within the context of discovery and the context of justification. In the discovery phase of research, observation, belief and information lead to a new way of thinking about a phenomenon.

External and internal biases can distort the discovery phase because our conclusions are often subject to personal biases, observer biases, expectancy biases, and placebo biases.

Psychologists use scientific theories, testable hypothesis, and creative paradigms to unravel the mysteries of mind and behaviour.

In the justification phase, ideas are tested and either disconfirmed or proven.

Psychologists must maintain objectivity by keeping complete records, standardise procedures, make operational definitions, minimize biases and control errors. A reliable result is one that can be repeated in similar conditions by independent investigators.

The goals and objectives of psychological research are: (1) to describe objectively the behaviour of individuals. (2) To develop an understanding of the causes and consequences of the behaviour using explanations based on both the best available evidence and creative imagination. (3) To predict whether, when, how, and in what condition, a given behaviour form will occur; and (4) possibly to control a behaviour by making it start, stop, or vary in some predictable way (5) To improve the quality of individual lives and human society.

The formulation of research problem is the most important step in the research process. It is the foundation, in terms of design on which you build the whole study. Any defects in it will adversely affect the validity and reliability of the study.

Hypotheses, as testable propositions are important for bringing clarity, specificity and focus to a research study. Similarly knowledge of the different types of variable and the way they are measured plays a crucial role in research. They affect how the data can be analysed, what statistical tests can be applied to the data, what interpretation can be made. How the data can be presented and what conclusions can be drawn. A variable can be clarified from three perspectives that are not mutually exclusive; causal relationship, design of study and unit of measurement.

1.11 UNIT END QUESTIONS

- 1) What are the goals of psychological inquiry?
- 2) What are the main types of variables? Give examples of each type of variable.

- 3) What are the placebo and the experimenter effects?
- 4) How do single blind and double blind studies control the experimental effects?
- 5) How can you minimize research biases in psychological research?
- 6) What is role of theory in scientific research?
- 7) Differentiate between independent and dependent variable with suitable example.
- 8) What is difference between research problem and research hypothesis?
- 9) What is the role of discovery of justification in psychological research?
- 10) What is hypothesis? Write down functions of hypothesis.

1.12 GLOSSARY

Empirical Investigation	: Research that relies on sensory experience and observation as research data.
Context of Discovery	: Initial phase of research during which an investigator comes up with a new idea or a different way of thinking about phenomena.
Theory	: A body of interrelated principles used to explain or predict some psychological phenomenon.
Hypothesis	: A tentative and testable explanation of the relationship between two or more events or variables.
Paradigm	: A model of the functions and interrelationships of a process; a “way of thinking” about the world and how to study it.
Context of Justification	: Second phase of research, in which results are tested and prepared for useful communication with the scientific community.
Standardisation	: The use of uniform consistent procedures in all phases of data collection.
Operational Definition	: Definition of a concept in terms of how the concept is measured or what operations produce it.
Blind	: Uninformed about the purpose of a research study.
Double-blind Control	: A control strategy that employs both uninformed experimenters and uninformed subjects.
Placebo Control	: A control strategy where researchers compare those who received actual treatment with those who received only attention or a “dummy drug.”
Confounding Variables	: Factors that could be confused with the independent variable in a research study and thus distort the results.

- Problem** : An interrogative statement that asks: What relation exists between two or more variables?
- Variable** : something that can occur with different values and can be measured.
- Independent Variable** : a variable that represents the hypothesized “cause” that is precisely controlled by the experimenter and independent of what the participant does.
- Dependent Variable** : a variable that represents the hypothesized “effect” whose values ultimately depend on the values of independent variable.

SAQ ANSWERS:

1) F, 2)T, 3)F, 4)T, 5)T, 6)T, 7)F, 8)F, 9)T, 10) F, 11)T, 12)F, 13)F, 14)T, 15)F

MCQ ANSWERS:

1)c, 2)a, 3)b, 4)c, 5)a, 6)d, 7)c, 8)c, 9)c, 10)a.

1.13 SUGGESTED READINGS

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