INTRODUCTION TO PSYCHOLOGY
## SYLLABI-BOOK MAPPING TABLE
### Introduction to Psychology

<table>
<thead>
<tr>
<th>Syllabi</th>
<th>Mapping in Book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BLOCK 1: PERSPECTIVES IN PSYCHOLOGY</strong></td>
<td></td>
</tr>
<tr>
<td>UNIT 1: Introduction</td>
<td>Unit 1: Psychology: An Overview</td>
</tr>
<tr>
<td>Psychology Nature Scope - Origin of psychology, Definition, Psychology as a Science, Specialties within Psychology, Psychology and other Disciplines Perspectives in Psychology</td>
<td>(Pages 1-15)</td>
</tr>
<tr>
<td>UNIT 2: Biology of Behaviour</td>
<td>Unit 2: Biology of Behaviour</td>
</tr>
<tr>
<td>Perspectives in Psychology: Psychodynamic - behavioural Humanistic - Bio-Psychological Evolutionary Socio-cultural cognitive</td>
<td>(Pages 16-24)</td>
</tr>
<tr>
<td>UNIT 3: Work of Psychologists</td>
<td>Unit 3: Work of Psychologists</td>
</tr>
<tr>
<td>Typical behaviour Patterns Brain ad Behaviour Neurons and synapses A guide to the nervous system Association context Behaviour and experience test and right hemisphere functions</td>
<td>(Pages 25-36)</td>
</tr>
</tbody>
</table>

| **BLOCK 2: ASSESSMENT, PERCEPTION AND BEHAVIOUR** | |
| UNIT 4: Methods of Assessment In Psychology | Unit 4: Methods of Assessment in Psychology I |
| Goals of Psychological Enquiry, Introspective method Observation method Experimental method and correlation method | (Pages 37-55) |
| UNIT 5: Methods of Assessment In Psychology | Unit 5: Methods of Assessment in Psychology II |
| Case Study Method, Clinical Method, Genetic Method, Interview Method, Survey Method, Rating Scales, Checklists, Questionnaires, Psychological Tests, Cross-cultural Method. | (Pages 56-72) |
| UNIT 6: Sensory Process and perception | Unit 6: Sensory Process and Perception |
| Sensory channels sensory processes vision learning smell taste skin sense from sensory process the perception process: Attending from perception visual depth perception constancy movement perception individual differences | (Pages 73-90) |
| UNIT 7: Foundations of Behaviour | Unit 7: Foundations of Behaviour |
| (Nervous system The neuron the neural impulse the central nervous system the brain location of the brain functions Peripheral nervous system The endocrine system Impart of the functions of endocrine glands and summary 9RefSKMangal) | (Pages 91-105) |

<p>| <strong>BLOCK 3: BIOLOGICAL BASIS OF BEHAVIOUR AND CONSCIOUSNESS</strong> | |
| UNIT 8: Heredity and environment behaviour | Unit 8: Heredity and Environment Behaviour |
| Biological bases behaviour (heredity) nature environment behaviour (environment), Hormones on behaviour Genetics and behaviour sociological bass of behaviour Environment Behaviour Natural internal behaviour (Physical or material environment) and behaviour Man made environment subjective environment How these two affect behaviour Heredity Vs Environment | (Pages 106-116) |
| UNIT 9: Principle of learning | Unit 9: Principles of Learning |
| Classical Conditioning Instrumental conditioning cognitive Learning and learning some things are easier to learn than others | (Pages 117-148) |
| UNIT 10: States of consciousness | Unit 10: States of Consciousness |
| Nature of Consciousness Brain and consciousness nature of Consciousness normal waking consciousness directed consciousness Flowing consciousness divide consciousness Fantasy and Day dreaming Sleep stages of sleep rnorland Non REM Sleep dreams The content of dreams functions and meaning of dreams circadian Rhythms | (Pages 149-157) |</p>
<table>
<thead>
<tr>
<th>UNIT 11: Nature of consciousness</th>
<th>Unit 11: Nature of Consciousness (Pages 158-175)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered states of consciousness characteristics of Altered states consciousness Hypothesis, Depersonalization and near death experiences Meditation Altering consciousness with drugs</td>
<td></td>
</tr>
</tbody>
</table>

### BLOCK-4: PROCESS OF INFORMATION AND APTITUDE

<table>
<thead>
<tr>
<th>UNIT 12: Attention in psychology</th>
<th>Unit 12: Attention in Psychology (Pages 176-196)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention definition types of attention Overt and covert attention factors influencing attention neural correlates of attention characteristics of attention Assessment of attention, determinants of Attention</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT 13: Perception in psychology</th>
<th>Unit 13: Perception in Psychology (Pages 187-200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of perceptual organization constancies in perception size shape form space movement etc depth perception psychologists life span changes in perception extra sensory perception (ESP) illusion Plasticity of perception</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT 14: Aptitudes</th>
<th>Unit 14: Aptitudes (Pages 201-230)</th>
</tr>
</thead>
<tbody>
<tr>
<td>meaning and nature of aptitudes - Aptitude ability and achievement - Intelligence - aptitude and Interest measurement of aptitudes and Utility of Aptitudes – Aptitudes tests (ref Sk Mangal)</td>
<td></td>
</tr>
</tbody>
</table>
INTRODUCTION

BLOCK I: PERSPECTIVES IN PSYCHOLOGY

UNIT 1  PSYCHOLOGY: AN OVERVIEW  1-15

1.0 Introduction
1.1 Objectives
1.2 Nature, Scope and Relationship with other Disciplines
   1.2.1 Definition of Psychology
   1.2.2 Nature of Psychology
   1.2.3 Psychology as a Science
   1.2.4 Scope of Contemporary Psychology and its Specialities
   1.2.5 Fields of Psychology
   1.2.6 Psychology and Other Disciplines
   1.2.7 Applications and Perspectives of Psychology
1.3 Answers to Check Your Progress Questions
1.4 Summary
1.5 Key Words
1.6 Self Assessment Questions and Exercises
1.7 Further Readings

UNIT 2  BIOLOGY OF BEHAVIOUR  16-24

2.0 Introduction
2.1 Objectives
2.2 Behavioural, Humanistic, Biological and Cognitive Approaches
2.3 Psychodynamic, Evolutionary and Socio-cultural Perspectives
   2.3.1 Evolutionary
   2.3.2 Psychodynamics
   2.3.3 Socio-cultural
2.4 Answers to Check Your Progress Questions
2.5 Summary
2.6 Key Words
2.7 Self Assessment Questions and Exercises
2.8 Further Readings

UNIT 3  WORK OF PSYCHOLOGISTS  25-36

3.0 Introduction
3.1 Objectives
3.2 Typical Behaviour Patterns and the Nervous System
   3.2.1 The Brain and The Nervous System: A Guide
   3.2.2 Central Nervous System
   3.2.3 The Lobe of Cerebral Cortex
   3.2.4 Peripheral Nervous System
3.3 Answers to Check Your Progress Questions
3.4 Summary
3.5 Key Words
3.6 Self Assessment Questions and Exercises
3.7 Further Readings

BLOCK II: ASSESSMENT, PERCEPTION AND BEHAVIOUR

UNIT 4 METHODS OF ASSESSMENT IN PSYCHOLOGY-I 37-55
4.0 Introduction
4.1 Objectives
4.2 Introspective Method
  4.2.1 Merits of Introspection
  4.2.2 Limitations of Introspection
4.3 Observation Method
  4.3.1 Limitations of Observation
  4.3.2 Suggestions for Improvement
4.4 Experimental Method: An Overview
  4.4.1 Merits of Experimental Method
  4.4.2 Weaknesses of Experimental Method
4.5 Correlation Method
  4.5.1 Goals of Psychological Enquiry
4.6 Answers to Check Your Progress Questions
4.7 Summary
4.8 Key Words
4.9 Self Assessment Questions and Exercises
4.10 Further Readings

UNIT 5 METHODS OF ASSESSMENT IN PSYCHOLOGY-II 56-72
5.0 Introduction
5.1 Objectives
5.2 Case Study Method
  5.3 Clinical Method
    5.3.1 Genetic Method
5.4 Interview Method
5.5 Survey Method
    5.5.1 Possible Sources of Errors
5.6 Rating Scales
5.7 Checklists/Questionnaires and Psychological Tests
5.8 Cross-cultural Method
5.9 Answers to Check Your Progress Questions
5.10 Summary
5.11 Key Words
5.12 Self Assessment Questions and Exercises
5.13 Further Readings

UNIT 6 SENSORY PROCESS AND PERCEPTION 73-90
6.0 Introduction
6.1 Objectives
6.2 Sensory Channels and Processes
  6.2.1 Sensation: An Overview
  6.2.2 Structure of the Eye: Vision
  6.2.3 How We See
  6.2.4 How We Hear
  6.2.5 Thresholds
6.26 Subliminal Perception
6.27 Perception
6.28 Characteristics of Perception
6.3 Answers to Check Your Progress Questions
6.4 Summary
6.5 Key Words
6.6 Self Assessment Questions and Exercises
6.7 Further Readings

UNIT 7 FOUNDATIONS OF BEHAVIOUR

7.0 Introduction
7.1 Objectives
7.2 The Central and Peripheral Nervous System
7.3 Impact of the Functions of Endoergic Glands and Summary
7.3.1 Endocrine Glands and their Hormones
7.4 Answers to Check Your Progress Questions
7.5 Summary
7.6 Key Words
7.7 Self Assessment Questions and Exercises
7.8 Further Readings

BLOCK III: BIOLOGICAL BASIS OF BEHAVIOUR AND CONSCIOUSNESS

UNIT 8 HEREDITY AND ENVIRONMENT BEHAVIOUR

8.0 Introduction
8.1 Objectives
8.2 Biological Basis of Behaviour: Heridity vs. Environment
8.2.1 Behaviour Genetics
8.2.2 Experiment with Twin Study
8.2.3 Evolutionary Perspective
8.2.4 Biological and Cultural Root
8.2.5 Socio-Cultural Shaping of Behaviour
8.3 Answers to Check Your Progress Questions
8.4 Summary
8.5 Key Words
8.6 Self Assessment Questions and Exercises
8.7 Further Readings

UNIT 9 PRINCIPLES OF LEARNING

9.0 Introduction
9.1 Objectives
9.2 Factors Influencing Learning and Memory
9.2.1 Learner-Related Factors
9.2.2 Environmental Factors
9.2.3 Resources Available and the Environmental Settings
9.2.4 Transfer of Learning
9.2.5 Learning Curve
9.2.6 Memory
9.2.7 Process of Memory
9.2.8 Models of Memory
9.2.9 Types of Memory
UNIT 10  STATES OF CONSCIOUSNESS  
10.0 Introduction
10.1 Objectives
10.2 Nature of Consciousness: Brain and Consciousness
   10.2.1 Historical Development of the Study of Consciousness
   10.2.2 Normal Waking Consciousness
10.3 Fantasy and Daydreaming
   10.3.1 Sigmund Freud and Daydreams
10.4 Stages of Sleep: Rem and Non-Rem
   10.4.1 Circadian Rhythm
   10.4.2 What are Biological Clocks?
10.5 Answers to Check Your Progress Questions
10.6 Summary
10.7 Key Words
10.8 Self Assessment Questions and Exercises
10.9 Further Readings

UNIT 11  NATURE OF CONSCIOUSNESS  
11.0 Introduction
11.1 Objectives
11.2 Altered States of Consciousness
   11.2.1 Sleep and Dream
   11.2.2 Unconscious Thought
   11.2.3 Sleep: A Biological Rhythm
   11.2.4 Importance of Sleep
   11.2.5 Effects of Chronic Sleep Deprivation
   11.2.6 Stages of Sleep
   11.2.7 Sleep Disorders
   11.2.8 Dreams and Freud’s Theory
   11.2.9 Hypnosis and Meditation
   11.2.10 Bio-Feedback
11.3 Altering Consciousness with Drugs
   11.3.1 Altered States: Psychoactive Drugs
11.3.2 Physical Dependence
11.3.3 Psychological Dependence
11.3.4 Stimulants and the Users
11.4 Answers to Check Your Progress Questions
11.5 Summary
11.6 Key Words
11.7 Self Assessment Questions and Exercises
11.8 Further Readings

BLOCK IV: PROCESS OF INFORMATION AND APTITUDE

UNIT 12 ATTENTION IN PSYCHOLOGY 176-186
12.0 Introduction
12.1 Objectives
12.2 Attention: Types, Factors and Characteristics
12.2.1 Types of Attention: Overt and Covert
12.2.2 Factors Influencing Attention
12.2.3 Characteristics of Attention
12.2.4 Spotlight of Attention
12.2.5 Assessment and Determinants of Attention
12.3 Answers to Check Your Progress Questions
12.4 Summary
12.5 Key Words
12.6 Self Assessment Questions and Exercises
12.7 Further Readings

UNIT 13 PERCEPTION IN PSYCHOLOGY 187-200
13.0 Introduction
13.1 Objectives
13.2 Perception
13.2.1 Perceptual Illusion
13.2.2 Determinants of Perception
13.2.3 Extra Sensory Perception (ESP)
13.3 Answers to Check Your Progress Questions
13.4 Summary
13.5 Key Words
13.6 Self Assessment Questions and Exercises
13.7 Further Readings

UNIT 14 APTITUDES 201-230
14.0 Introduction
14.1 Objectives
14.2 Intelligence Testing
14.2.1 Group Test of Intelligence
14.2.2 Performance Tests of Intelligence
14.3 Measuring Aptitude and Interest
14.3.1 Tests of Interest
14.4 Answers to Check Your Progress Questions
14.5 Summary
14.6 Key Words
14.7 Self Assessment Questions and Exercises
14.8 Further Readings
INTRODUCTION

Understanding human mind and behaviour has always been one of the most intriguing subject matters for scholars of all times. The emotional constructs of human mind are extremely elusive and require an all-encompassing approach to study them. Psychology is such a field that integrates research from all other scientific fields, broadly categorized as social sciences, natural sciences and humanities, to form a most comprehensive approach to understand human mind. Psychology deals with mental functions and behaviour of humans and animals. It has contributed greatly to the society as a whole.

The present wealth of psychological knowledge is applied to various human activities such as family, education, health, etc. There are various schools of thought in psychology, each proposing a model that can explain all, or most, human behaviours. Various approaches to study mental processes lead to various sub-fields of psychology, such as biological psychology, clinical psychology, cognitive psychology, etc.

The book, Introduction to Psychology acquaints you with the concepts and scope of contemporary psychology so as to equip you with the knowledge that will go a long way in resolving your day-to-day professional as well as personal issues.

The book follows the SIM format or the self-instructional mode wherein each Unit begins with an Introduction to the topic followed by an outline of the Objectives. The detailed content is then presented in a simple and organized manner, interspersed with Check Your Progress questions to test the understanding of the students. A Summary along with a list of Key Terms and a set of Self-Assessment Questions and Exercises is also provided at the end of each unit for effective recapitulation.
BLOCK - I

PERSPECTIVES IN PSYCHOLOGY

UNIT 1  PSYCHOLOGY: AN OVERVIEW

Structure
1.0 Introduction
1.1 Objectives
1.2 Nature, Scope and Relationship with other Disciplines
   1.2.1 Definition of Psychology
   1.2.2 Nature of Psychology
   1.2.3 Psychology as a Science
   1.2.4 Scope of Contemporary Psychology and its Specialities
   1.2.5 Fields of Psychology
   1.2.6 Psychology and Other Disciplines
   1.2.7 Applications and Perspectives of Psychology
1.3 Answers to Check Your Progress Questions
1.4 Summary
1.5 Key Words
1.6 Self Assessment Questions and Exercises
1.7 Further Readings

1.0 INTRODUCTION

Psychology is commonly used as the study of the mind. Many authors today define psychology as the scientific study of behaviour and mental processes. As a subject it is concerned with the understanding of the human mind and its activities. It is a widely held belief that psychologists can read the minds of others and understand what is going on in their minds. However, scientists in the field of psychology, however, do not accept this definition. Today scientific psychology is generally defined as the science of behaviour which is employed in a very inclusive and comprehensive sense. There are many psychologists who express that psychology should concern itself with the actual行为 of organisms, both human and animals, because behaviour is something concrete, factual and observable, unlike the mind. Yet another group of psychologists hold the view that the term ‘behaviour’ should include not only observable behavior but also the unobservable inner activities and processes.

It is now an accepted reality that the nature of the subject psychology is quite scientific. This fact has been properly recognized by the eminent psychologists and thinkers. They are trying to prove why the subject psychology should be called as science. The field of applications of the subject psychology is expansive. Both normal, abnormal belonging to different walk of human life all are studied in
the subject psychology. That’s why and for the sake of specialized study, the
subject matter of psychology has been grouped into different branches. Also there
are various approaches to the study of the subject of psychology.

This unit aims at enumerating the nature and scope of the subject of
psychology in a comprehensive way and elaborates how psychology possessed
several characteristics of science and other disciplines.

1.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the meaning of psychology
- Enumerate the nature of psychology
- Explain the subject as a science
- Understand the scope of psychology
- Enumerate the various branches of psychology
- Get an insight into the relationship of psychology with other sciences
- Explain the importance and applications of psychology

1.2 NATURE, SCOPE AND RELATIONSHIP WITH
OTHER DISCIPLINES

Let us begin by defining and discussing the nature of psychology.

1.2.1 Definition of Psychology

For the behaviourist John. B. Watson, psychology is that division of natural science
which has human behaviour—the doing and saying, both learned and unlearned—as its subject matter.

William James— ‘Psychology is the science of mental life, both of its
phenomenon and of their conditions…. The phenomenon are such things as we
call feelings desires, cognitions, reasoning, decision and the like.’

Kenneth Clark and George Miller— ‘Psychology is usually defined as
the scientific study of behaviour. Its subject matter includes behavioural processes
that are observable such as gestures, speech and physiological changes and
processes that can only be inferred such as thoughts and dreams.’

R.S Woodworth— ‘Psychology is the scientific study of the activities of
the individual in relation to his environment.’

R.H. Thouless— ‘Psychology is the positive science of experience and
behaviour.’

Jalota— ‘Psychology is defined as the study of mental processes as
experienced in bodily behaviour or observed in direct behaviour.’
Gardner Murphy—'Psychology is the science that studies the responses which living individuals make to their environment.'

1.2.2 Nature of Psychology

The major problems of our world relate to human behaviour. Psychologists are basically concerned with studying and attempting to understand human behaviour. Psychology is relatively recent science and has evolved from philosophy and biology. In reality, modern psychology deals specifically with physiology (chemistry of brain, neurology, and genetics) and the behaviour of the biological organism (stimulus-response) connection.

1.2.3 Psychology as a Science

Several attempts have been made to analyse and understand human mind and behaviour. The first theory that was put forward to explain human nature was an effort to understand man's consciousness as an inner spirit. Later thinkers like Aristotle and Plato talked about psyche or soul as the centre of experience. Philosophers were interested in studying human experience and behaviour. John Locke believed that human knowledge is acquired during life and is not inherited or based on innate ideas. It is often believed by people that Psychology is nothing but the use of common sense.

It is a common belief that psychologists can read the minds of people but scientists do not accept this fact. The scientific definition of psychology states that it is the science of behaviour. The earlier definitions of psychology stated that it is a study of mind which is a very abstract word and cannot be scientifically studied. Behaviour is factual and concrete in nature and can be easily measured. The late 19th century marks the start of psychology as a scientific discipline.

In 1879 Wilhelm Wundt founded the first laboratory to conduct various psychological experiments in Leipzig Germany. His main motive was to show that for every physical activity there is a mental activity. He was of the opinion that psychologists should find about feelings, insight, and sentiments.

Wilhelm Wundt and William James are considered as the fathers of psychology. Psychology is considered a scientific discipline because psychologists use scientific methods to describe behaviours and explain why these behaviours occur. They also strive to conduct research which can be used for predicting and even changing human behaviour.

Psychology has certain characteristics which make it a science. These characteristics are:

1. **Psychology uses scientific methods**: Psychologists conduct experiments in strictly controlled conditions. Psychological laboratories are used to observe any phenomenon to establish cause and effect relationship.

2. **Psychology is factual**: It is not based on values but facts. Psychological information is based on observations and experiments.
3. **Psychology is verifiable:** Most of the psychological principles can be verified by researchers by using scientific methods.

4. **Cause effect relationship:** It is a characteristic of science to establish cause-effect relationship and derive universal principles for generalization. Psychology also tries to develop cause and effect relationship between different variables under study and then formulate theories based on the findings.

5. **Laws of psychology are universal:** The laws of psychology are considered to be universal in their application. These laws are applicable to all organisms at all times and under similar conditions.

6. **Psychology can predict human behaviour:** By discovering the cause effect relationship psychologist can predict human behaviour. Many psychological tests are conducted to predict the behaviour.

1.2.4 **Scope of Contemporary Psychology and its Specialities**

Psychology has mainly been interpreted as ‘the study of behaviour’ from last many centuries, but scholars are interested in knowing what are the various fields which psychologists like to explore. Some of these areas are as follows:

1. **Physiological psychologists**

Physiological psychology is that science which studies the biological bases of behaviour. Physiological psychologist wants to explore the relationship between body processes and behaviour for example what is the effect of certain drugs on memory? This means that the physiological psychologist undertakes the study of the biological factors (as opposed to economic, social, or cultural factors) which cause or contribute to behaviour.

2. **Developmental psychologists**

Developmental psychologists can study human growth, they lay stress on factors that shape human behaviour from birth to old age. Psychologists try to study how development occurs when there is a gradual accumulation of knowledge. Language acquisition and emotional development are also topics which are covered by developmental psychologists.

The developmental psychologists are also interested in studying a particular stage of life like infancy or adolescence.

3. **Experimental psychologists**

Experimental psychologists use experimental method to study behaviour. Experimental psychology involves the collection of reliable and quantifiable behavioural data.

Often empirical tests are conducted under controlled conditions in order to study a particular psychological phenomenon or to test hypotheses concerning that phenomenon.
The subjects for such experiments can be human beings, animals and birds.

4. Clinical and counselling psychologists
Clinical and counselling psychologists deal with diagnosis and treatment of mental and emotional problems like drug addiction, juvenile delinquency and criminal behaviour.

Clinical psychologists work in mental hospitals and clinics in close association with psychiatrists to diagnose and treat mental problems.

A counsellor generally addresses problems like giving advice on career matters to students and solving family conflicts.

5. Industrial psychologists
Industrial psychologists are broadly concerned with human factors in industry. They try to improve quality of work life by addressing issues like justice, at workplace balancing roles at work and at home.

Industrial psychologists generally assist employers in finding the best person for a job, evaluating job performance, and training employees.

6. Personality and social psychologists
Social psychologists are concerned with the behaviour of people in groups. Personality and social psychology emphasizes to concentrate on basic questions regarding people and their sensations, perceptions and attitude.

Social psychologists use scientific methods to analyse social interactions and how thoughts, feelings, and behaviours of individuals are influenced by other people. They work on topics like intergroup conflict, aggressive tendencies, and propaganda. They also conduct opinion polls, surveys and other type of market research.

7. School and Educational psychologists
These days most of the schools offer students the facilities of a trained educational psychologist because the adolescents come across many types of emotional and career problems during this phase of their life.

Educational psychologists conduct various types of personality, aptitude and intelligence tests on school students which help them in solving the individual problems which students face.

1.2.5 Fields of Psychology
Let us discuss the different fields of psychology.

1. General psychology
This branch of psychology deals with theories and principles related to the behaviour of normal human beings. General Psychology studies different aspects of mind as perception, cognition, emotion, and behaviour.
2. Abnormal psychology
The subject matter of this branch of psychology is the study of various forms of abnormal behaviour and its treatment through various psychological techniques. Abnormal psychology is scientific study of many psychological disorders. These disorders affect people in the manner in which they feel, think, speak, and behave.

3. Child psychology
This branch of psychology studies the growth and development of a child from birth to adolescence. It studies the behaviour of children with special needs. Child psychologists deal with knowledge on development of child which includes physical, mental and emotional growth. Anxiety disorders, attention deficit disorder that includes creativity, giftedness, temperament diversity, allergies and nutrition are some of the other areas of interest for a child psychologist.

4. Animal psychology
In this branch of psychology the animal behaviour is studied under controlled conditions. Some common examples of such behaviour is experiments conducted by Pavlov to test learning and experiments conducted by Skinner on rats. By conducting such experiments many types of inferences can be drawn and generalizations can be made.

5. Environmental psychology
This branch of psychology refers to role of environment on behaviour. The psychologists lays emphasis on modifying and restructuring environment for social well-being. Thus an environmental psychologist tries to solve personal and social problems by working on environmental barriers.

6. Sports psychology
This branch of psychology studies the behaviour of players and sport persons. The psychologists also studies the activities, experiences, situations and the environment which is present in the world of sports. The main aim of sports psychologists is to improve the performance of players by minimizing the psychological effects of injury and poor performance and by managing their emotions. Training is given to improve their mental and physical health.

7. Aerospace psychology
Aerospace psychology deals with the behaviour of astronauts who go in space. They face problems related to new environment because of which there are many physiological and psychological problems. Aerospace psychologists try to design training programs for the astronauts so that they can adapt to their behaviour according to the new environmental settings and are in sound mental health.

8. Military psychology
This branch of psychology is related to the behaviour of soldiers working in the armed forces. The main area of concern for the military psychologists is how the
9. Consumer psychology
This branch of psychology deals with the behaviour of consumers in their present economic situation and social status. The area of interest is to find out the needs of the customers and their expectations from the product. This information is required by shopkeepers and sales persons. This branch of psychology is designed to benefit the sales persons in context of how the customers should be approached, influenced or motivated to buy a particular brand of the product.

10. Psychometrics
This branch of psychology is concerned with the construction of psychological tests for measuring and analysing different aspects of behaviour. The psychologists construct various psychological tests like adjustment scales, aptitude tests, personality inventories and intelligence tests for the assessment of various dimensions of behaviour. Various statistical tools are needed in construction and analysis so these statistical methods are also a part of this branch of psychology.

11. Folk psychology
It is the branch of psychology which aims to study the culture, art, religion, superstitions and other such aspects. This branch of psychology is gaining more prominence in the developed countries.

12. Organizational and managerial psychology
This branch of psychology studies the behaviour of human resources in the organization. By studying this branch psychologists can help the managers working in the organizations in maintaining their zeal and enthusiasm for exercising their duties properly and cooperatively by seeking proper satisfaction and adjustment in their work environment. Important areas in this branch are organizational culture, motivation, job satisfaction etc.

1.2.6 Psychology and Other Disciplines
Let us analyse the relationship of psychology with other disciplines.

1. Psychology and Economics
According to Marshal, “Economics is a study of mankind in the ordinary business of life. It studies that part of the individual and social action which is most closely connected with the attainment and use of material requisites of well-being.”

Economics is the study of man’s activities devoted to obtaining the material means for satisfaction of his wants. Thus it can easily be concluded from the above definitions that economics studies some activities of human beings on the other hand psychology also studies human activities. The difference is in the approach. Economics studies the economic functions of man but psychology is only concerned with the social interactions of man.
There is a mutual relationship of economic conditions and social interactions. It is a fact that economic conditions do influence social interactions and social interactions also influence economic circumstances and conditions.

Many economic problems have a psychological aspect, for example problems of strikes, lockouts, advertisements and propaganda, working conditions can be solved by psychological interventions.

Principles of demand and supply and law of marginal utility are also related to human interactions which form an important part of psychology.

2. Psychology and Political Science
Political science studies political institutions, working of government laws etc. Social psychology studies the behaviour of individuals in society. Political science studies the laws formed for the people living in the society. The laws cannot be made without understanding the psychology of people.

Political institutions exert pressure and influence social behaviour of the individuals. Thus psychology and political science are closely related.

3. Psychology and Sociology
Sociology is scientific study of society. Sociology studies man in the context of society and as a part of it. According to Maelver sociology gives aid to psychology. In order to understand group behaviour in sociology it is important to study individual behaviour.

4. Psychology and Biology
Behaviour is related to man’s interaction with environment. Darwin’s theory of evolution is based on biological theories. Behaviour is related to external as well as internal feelings. The human and animal behaviour cannot be explained without the help of biological principles. Watson who is considered the founder of behaviourism laid stress on animal psychology and he also tried to explain human behaviour in terms of stimulus response relationship.

5. Psychology and Philosophy
History of psychology reveals that psychology was considered the study of mind. Mind is a philosophical term. Mental concepts like deep sleep, dreams are all a part of philosophical discussions but its logical explanations are based on the psychological theories given by Freud.

1.2.7 Applications and Perspectives of Psychology

1. Education
Psychology has a very important role to play in the field of education. Psychologists work in schools and universities to guide students in their educational and vocational problems. They also work to solve problems of adjustment. Conducting aptitude, intelligence and personality tests is a part of their counselling sessions.
The psychologists working in schools also help teachers in developing skills in solving classroom problems and develop and improve teaching methods to increase class effectiveness.

Some students are unique and require special teaching assistance. Psychologists also help in designing programs for such special children.

2. **Criminology**

Forensic Psychology—deal, with a lot of practices mostly including medical evaluations of defendants, statements given to judges and courtroom testimony. Rehabilitation of criminals also involve psychologists.

3. **Therapy**

Psychology has been proved to be very useful in treatment of diseases. The cause of many diseases is psychological and hence requires psychological treatment. It has been found by many studies that 10% of the American population at one time or another suffer from some mental problem.

It is commonly said that every human being at some point of time requires the guidance of a clinical psychologist.

Psychologists conduct many type of therapeutic sessions on the patients suffering from psychological problems like neurosis, anxiety, phobia. This branch of psychology is called as Abnormal Psychology.

4. **Trade**

One important area related to industry is advertisement. Psychology has made selling an art. Psychologist understand the interest and perception of customers and helps in creating the advertisements while keeping in mind the needs of buyers.

5. **Recruitment**

Psychology has helped the organizations in finding out suitable men for different kinds of work. Psychologists are also a part of interview boards to judge the different aspects of the personality of the candidates appearing for the interview.

6. **Self-understanding**

Psychology helps in understanding self—the more you know, and find out about yourself, your personality and your faults the more are the chances of self-improvement. Self-understanding is the way to self-control and thus a person becomes more self-confident. Understanding hidden self, unconscious part of personality, Freud’s analysis of dreams is another important contribution of psychologists in this direction.

7. **Politics**

Psychology has been widely used in political science. It has become very important for the politicians to understand the psychology of public to remain in power. Leadership is also very crucial discipline of psychology. Various theories and practices of leaders are discussed in psychology.
8. Communication

Psychology not only helps in improving communication skills but also improves relationship by understanding others. Psychology also emphasizes the importance of nonverbal communication by understanding gestures, posture and body language to communicate better.

9. Military Science

Psychology helps in selection, training, promotion and classification of military personnel. Psychology also helps in knowing the current level of mental status. It also tries to bring modifications and corrections in the environmental situations and work conditions of the defence personnel after analysing the needs.

Psychology also helps in the time of war by designing techniques to keep the morale of the soldiers high.

Psychologists also tries to make the defence personnel capable of handling the stress.

10. World Peace and Brotherhood

The reasons for war, conflict and fights is that the people fail to understand the behaviour of other people. Psychology helps in understanding the different aspects of behaviour and analyse the causes of different types of peculiar behaviour and the situations that lead to this behaviour. Psychological techniques can also be helpful in building mutual trust and a feeling of brotherhood.

Check Your Progress

1. What do you mean by psychology?
2. List some characteristics which make psychology a science.
3. Write about the behavioural approach to psychology.
4. Enumerate the methods adopted by experimental psychologists.
5. List the applications of psychology.

1.3 Answers to Check Your Progress Questions

1. For the behaviourist John. B. Watson, psychology is that division of natural science which has human behaviour—the doing and saying, both learned and unlearned—as its subject matter.

William James defines it this way: ‘Psychology is the science of mental life, both of its phenomenon and of their conditions…. The phenomenon are such things as we call feelings, desires, cognitions, reasoning, decision and the like.’ For Kenneth Clark and George Miller, ‘Psychology is usually defined as the scientific study of behaviour. Its subject matter includes
behavioural processes that are observable such as gestures, speech and physiological changes and processes that can only be inferred such as thoughts and dreams.

2. Psychology has certain characteristics which make it a science. These characteristics are:
   
i. Psychology uses scientific methods: Psychologists conduct experiments in strictly controlled conditions. Psychological laboratories are used to observe any phenomenon to establish cause and effect relationship.

   ii. Psychology is factual: It is not based on values but facts. Psychological information is based on observations and experiments.

   iii. Psychology is verifiable: Most of the psychological principles can be verified by researchers by using scientific methods.

   iv. Cause effect relationship: It is a characteristic of science to establish cause-effect relationship and derive universal principles for generalization. Psychology also tries to develop cause and effect relationship between different variables under study and then formulate theories based on the findings.

   v. Laws of psychology are universal: The laws of psychology are considered to be universal in their application. These laws are applicable to all organisms at all times under similar conditions.

   vi. Psychology can predict human behaviour: By discovering the cause effect relationship psychologist can predict human behaviour. Many psychological tests are conducted to predict the behaviour.

3. The behavioural approach to psychology is based on the works of John B. Watson in the early 1900s, whose initial interest had been animal experimentation in which the traditional approaches of the early psychologists through consciousness, introspection and the unconscious were of no practical value. What the animal experimenters could observe was primarily behaviour. To the behaviourists this was the greatest virtue because it was objective and eliminated the subjectivity of the studies of consciousness, introspective report and the free association from the unconscious. This technique of studying animal behaviour was transferred to human behaviour. The behavioural psychologists assume that you can understand human by observing their behaviour rather than by studying the internal working of their brain.

4. Experimental psychologists use experimental method to study behaviour. Experimental psychology involves the collection of reliable and quantifiable behavioural data. Often empirical tests are conducted under controlled conditions in order to study a particular psychological phenomenon or to test hypotheses concerning that phenomenon. The subjects for such experiments can be human beings, animals and birds.
5. Psychology plays a very important role in various fields of life. These are as follows:

i. Education: Psychology has a very important role to play in the field of education. Psychologists work in schools and universities to guide students in their educational and vocational problems. The psychologists working in schools also help teachers in developing skills in solving classroom problems and develop and improve teaching methods to increase class effectiveness. Psychologists also help in designing programs for special children.

ii. Criminology: Forensic Psychology deals with a lot of practices mostly including medical evaluations of defendants, statements given to judges and courtroom testimony.

iii. Therapy: Psychology has been proved to be very useful in treatment of diseases. The cause of many diseases is psychological and hence requires psychological treatment. Psychologists conduct many type of therapeutic sessions on the patients suffering from psychological problems like neurosis, anxiety, phobia. This branch of psychology is called as Abnormal Psychology.

iv. Trade: One important area related to industry is advertisement. Psychology has made selling an art. Psychologist understand the interest and perception of customers and helps in creating the advertisements while keeping in mind the needs of buyers.

v. Recruitment: Psychology has helped the organizations in finding out suitable men for different kinds of work.

vi. Self-understanding: Psychology helps in understanding self—the more you know, and find out about yourself, your personality and your faults the more are the chances of self-improvement.

vii. Politics: It has become very important for the politicians to understand the psychology of public to remain in power.

viii. Communication: Psychology not only helps in improving communication skills but also improves relationship by understanding others.

ix. Military science: Psychology helps in selection, training, promotion and classification of military personnel. It also helps in the time of war by designing techniques to keep the morale of the soldiers high. Psychologists also tries to make the defence personnel capable of handling the stress.

1.4 SUMMARY

- For the behaviourist John. B. Watson, psychology is that division of natural science which has human behaviour—the doing and saying, both learned and unlearned-as its subject matter.
The major problems of our world relate to human behaviour. Psychologists are basically concerned with studying and attempting to understand human behaviour. Psychology is relatively recent science and has evolved from philosophy and biology.

It is a common belief that psychologists can read the minds of people but scientists do not accept this fact. The scientific definition of psychology states that it is the science of behaviour. The earlier definitions of psychology stated that it is a study of mind which is a very abstract word and cannot be scientifically studied.

Wilhelm Wundt and William James are considered as the fathers of psychology. Psychology is considered a scientific discipline because psychologists use scientific methods to describe behaviours and explain why these behaviours occur. They also strive to conduct research which can be used for predicting and even changing human behaviour.

The behavioural approach to psychology is based on the works of John B. Watson in the early 1900s, whose initial interest had been animal experimentation in which the traditional approaches of the early psychologists through consciousness, introspection and the unconscious were of no practical value.

The founder of psychoanalytic theory was Sigmund Freud. Sigmund Freud is considered as the father of modern psychology. Freud was from the medical field, he was a psychiatrist and a neurologist who was only interested in understanding the mental disorders. Freud was not very keen to study issues like perception, sensation, thinking and intelligence. He developed psychoanalysis which is considered to be the first systematic approach to therapy.

Psychology has mainly been interpreted as ‘the study of behaviour’ from last many centuries, but scholars are interested in knowing what are the various fields which psychologists like to explore.

Experimental psychologists use experimental method to study behaviour. Experimental psychology involves the collection of reliable and quantifiable behavioural data. Often empirical tests are conducted under controlled conditions in order to study a particular psychological phenomenon or to test hypotheses concerning that phenomenon.

Social psychologists use scientific methods to analyse social interactions and how thoughts, feelings, and behaviours of individuals are influenced by other people. They work on topics like intergroup conflict, aggressive tendencies, and propaganda. They also conduct opinion polls, surveys and other type of market research.

The subject matter of this branch of psychology is the study of various forms of abnormal behaviour and its treatment through various psychological
techniques. Abnormal psychology is scientific study of many psychological disorders. These disorders affect people in the manner in which they feel, think, speak, and behave.

- The psychologists also studies the activities, experiences, situations and the environment which is present in the world of sports. The main aim of sports psychologists is to improve the performance of players by minimizing the psychological effects of injury and poor performance and by managing their emotions. Training is given to improve their mental and physical health.

- Political science studies political institutions, working of government laws etc. Social psychology studies the behaviour of individuals in society. Political science studies the laws formed for the people living in the society. The laws cannot be made without understanding the psychology of people.

- Psychology has been proved to be very useful in treatment of diseases. The cause of many diseases is psychological and hence requires psychological treatment. It has been found by many studies that 10% of the American population at one time or another suffer from some mental problem. It is commonly said that every human being at some point of time requires the guidance of a clinical psychologist.

- The reasons for war, conflict and fights is that the people fail to understand the behaviour of other people. Psychology helps in understanding the different aspects of behaviour and analyse the causes of different types of peculiar behaviour and the situations that lead to this behaviour. Psychological techniques can also be helpful in building mutual trust and a feeling of brotherhood.

### 1.5 KEY WORDS

- **Genetics**: It is the study of genes, genetic variation, and heredity in living organisms. It is generally considered a field of biology, but intersects frequently with many other life sciences.

- **Cognitive approach**: Cognition refers to those processes which transforms the stimulus input in different ways, encodes it stores it and then retrieves it later when needed. Cognitive approach stresses on the fact that the brain actively processes the information it receives and transforms it into different forms.

- **Abnormal psychology**: This is the scientific study of many psychological disorders.

- **Psychometrics**: This branch of psychology is concerned with the construction of psychological tests for measuring and analysing different aspects of behaviour. The psychologists construct various psychological tests like adjustment scales, aptitude tests, personality inventories and intelligence tests for the assessment of various dimensions of behaviour.
1.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions
1. Enumerate the definition of psychology by Kenneth Clark and George Miller.
2. Write a short note on the nature of psychology.
3. Write a brief note on the cognitive approach to study the subject matter of psychology.
4. Analyse in brief the role played by Experimental psychologists.
5. Enumerate the various fields of psychology.
6. Write a note on the relationship between Psychology and Biology.
7. What role does psychology play in the field of education?

Long Answer Questions
1. Discuss the scientific interpretation of psychology.
2. Analyse the humanistic approach to the study of psychology.
3. Write a comprehensive note on psychoanalytic theory of Sigmund Freud.
4. Enumerate the scope of contemporary psychology.
5. Analyse the role of Industrial psychologists.
6. Elaborate the significance of Child psychology.
7. Discuss the relationship of psychology with other sciences.

1.7 FURTHER READINGS

UNIT 2  BIOLOGY OF BEHAVIOUR

2.0  INTRODUCTION

In addition to five approaches to the study of the subject matter of psychology, important perspectives like evolutionary, psychodynamic and socio-cultural play a key role in understanding the biology of behaviour. Evolutionary perspective of psychology seeks to bring in ways of expanding connection between individuals and the natural world. This helps people develop sustainable lifestyles and avoid alienation from nature. The main concept of evolutionary psychology is that while today the human mind is shaped by the modern social world, it is adapted to the natural environment in which it evolved. Evolutionary psychologists differs from many cognitive psychologists on the premise that the relevant internal mechanisms are adaptations. According to this psychological perspective, traits developed in the past are passed down in the process of evolution. Adaptations developed from the need of survival or propagation evolve into traits that shape our behaviour.

The concept of psychodynamics proposed by Sigmund Freud is another important perspective of psychology. Freud suggested that psychological processes are actually the flows of psychological energy in the brain. This perspective studies how psychological processes drive our feelings and behaviour. Catherine A. Sanderson defines the socio-cultural perspective as a perspective describing people’s behaviour and mental processes as shaped in part by their social and/or cultural contact, including race, gender, and nationality. This perspective of psychology believes that our behaviour is influenced by the society, our culture, and our environment.

This unit aims at enumerating the various perspectives in the study of psychology in a comprehensive way and elaborates how these play a key role in understanding the biology of behaviour.
2.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand various approaches to the study of psychology
- Explain the psychoanalytic theory of Freud
- Enumerate the problems of consciousness
- Analyse the evolutionary perspective of psychology
- Understand the concept of psychodynamics in psychology
- Explain the socio-cultural perspective in people’s behaviour.

2.2 BEHAVIOURAL, HUMANISTIC, BIOLOGICAL AND COGNITIVE APPROACHES

There are five approaches to study the subject matter of psychology:

- Biological approach
- Behavioural approach
- Cognitive approach
- Humanistic approach
- Psychoanalytical approach

1. Biological Approach

The biological approach to study human behaviour tries to relate the actions of human beings with the events taking place within the brain and nervous system. All psychological events are represented in the nervous system in close association with other body parts. This approach emphasizes the relationship between mind and body and the influence of heredity on behaviour, these interactions act both ways, mind can affect body and body can affect mind.

Biological approaches emphasize the role of heredity in various psychological disorders. It assumes that if parents are suffering from some disorder then there are chances that the children also get affected by it. Psychologists do believe that these disorders can be because of combination of a number of factors which can be social, psychological and biological.

2. Behavioural Approach

The behavioural approach to psychology is based on the works of John B. Watson in the early 1900s, whose initial interest had been animal experimentation in which the traditional approaches of the early psychologists through consciousness, introspection and the unconscious were of no practical value. What the animal experimenters could observe was primarily behaviour. To the behaviourists this was the greatest virtue because it was objective and eliminated the subjectivity of
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the studies of consciousness, introspective report and the free association from
the unconscious. This technique of studying animal behaviour was transferred to
human behaviour. The behavioural psychologists assume that you can understand
human by observing their behaviour rather than by studying the internal working of
their brain. According to this behavioural approach the cause of human behaviour
is the reaction to some stimulus present in the environment.

It is the environmental factor rather than genetic or biological differences
that makes us behave differently. According to the behaviourists the stimulus–
response theory is the basis of understanding the process of conditioning. An
individual learns a particular response to a stimulus and becomes conditioned to it.
This is how learning takes place in humans.

3. Cognitive Approach
Cognition refers to those processes which transforms the stimulus input in different
ways, encodes it stores it and then retrieves it later when needed.

Cognitive approach stresses on the fact that the brain actively processes
the information it receives and transforms it into different forms.

Cognitive psychologists explain the process of human behaviour on the basis
of the assumption that behaviour is controlled by our own thought process, as
opposed to genetic factors. Thus each individual processes the information in a
different manner and behaves differently.

Development of language, Problem solving, reasoning, heuristics and
algorithms (step by step solution to solve the problems) are all part of cognitive
psychology.

Different moods also have great impact on individuals’ reactions in different
circumstances.

4. Humanistic Approach
Carl Rogers was the founder of Humanistic Approach.

This approach answers that every individual has freedom of creating his/her
own future, a huge capacity for attaining growth at personal level, a huge amount
of intrinsic worth, and a lot of potential for self-fulfilment. Every individual has a
fundamental need to grow and attain the state of self-actualization.

Maslow has also discussed the humanistic approach in which the holistic
view of the individual is elaborated.

Humanistic view places importance on improving interpersonal relationships
and providing conditions that promote the development of a man’s potential for
constructive and cooperative actions.

Humanistic psychologists emphasize the individual approach therapy.
According to this school of thought an individual can improve his mental state by
his own efforts. They can recognize their own potential and abilities.
5. Psychoanalytical Approach

The advances in medical psychology and the theories of hypnosis prompted the development of psychoanalysis.

The founder of psychoanalytic theory was Sigmund Freud. Sigmund Freud is considered as the father of modern psychology. Freud was from the medical field, he was a psychiatrist and a neurologist who was only interested in understanding the mental disorders. Freud was not very keen to study issues like perception, sensation, thinking and intelligence. He developed psychoanalysis which is considered to be the first systematic approach to therapy. Freud believed that mind had three sections – the conscious, the pre-conscious and the unconscious. Freud concentrated on problems of consciousness. He interpreted that the primary source of mental conflicts and disorders was the unconscious. In order to study the unconscious he founded the technique of psychoanalysis. This theory of psychoanalysis is based on stream of thoughts and dream analysis. He believed that 90% of human mind is the unconscious mind. He made three parts of personality – Id, Ego, Superego. Among these, Id follows pleasure and so is thought to be governed by pleasure principle. Ego is the rational part of Id and is determined by the reality principle. Superego is related to morals and ethics.

Freud was of the view that every action of a man has a cause which is most often some unconscious motive. Unconscious processes are those thoughts and wishes about which the person is unaware but which influences his behaviour.

Check Your Progress

1. List the various approaches to the study of psychology.
2. What do you understand by cognitive approach to psychology?
3. Why is Sigmund Freud known as the father of modern psychology?
4. Define Id, Ego and Superego.

2.3 PSYCHODYNAMIC, EVOLUTIONARY AND SOCIO-CULTURAL PERSPECTIVES

Let us discuss the evolutionary, psychodynamic and socio-cultural perspectives of psychology.

2.3.1 Evolutionary

The evolutionary perspective of psychology focuses on the relation between evolution and psychology. According to this perspective, mental processes exist because they enable evolution and help survival. This approach also considers the evolutionary changes that have led to changes in behavioural patterns. It studies the natural and sexual selection of behaviours.
According to this psychological perspective, traits developed in the past are passed down in the process of evolution. Adaptations developed from the need of survival or propagation evolve into traits that shape our behaviour.

### Notes

#### 2.3.2 Psychodynamics

Psychodynamics is another important perspective of psychology. Sigmund Freud proposed the concept of psychodynamics. He suggested that psychological processes are actually the flows of psychological energy in the brain. This perspective studies how psychological processes drive our feelings and behaviour. It focuses on the conscious and the unconscious parts of the human mind. Our mental forces could be emotional forces or those from interactions between the emotional and motivational forces acting at the subconscious level.

#### 2.3.3 Socio-cultural

Catherine A. Sanderson defines the socio-cultural perspective as a perspective describing people’s behaviour and mental processes as shaped in part by their social and/or cultural contact, including race, gender, and nationality. This perspective of psychology believes that our behaviour is influenced by the society, our culture, and our environment.

According to social psychologists, behaviour has a social and cultural context, and these factors play a major role in shaping one’s perceptions and behaviour. This approach to psychology tries to find how social norms affect behaviour and how social groups such as race, religion, or gender can influence the way we behave. A cross-cultural perspective studies how behaviour changes across cultures.

### Check Your Progress

5. What is the evolutionary perspective of psychology?
6. What do you understand by Psychodynamics in the study of psychology?
7. List the role of socio-cultural perspective in describing people’s behaviour.
8. What is the role of social norms in shaping one’s perception?

### 2.4 Answers to Check Your Progress Questions

1. There are five approaches to study the subject matter of psychology:
   i. Biological approach
   ii. Behavioural approach
   iii. Cognitive approach
iv. Humanistic approach
v. Psychoanalytical approach

2. Cognition refers to those processes which transforms the stimulus input in different ways, encodes it stores it and then retrieves it later when needed. Cognitive approach stresses on the fact that the brain actively processes the information it receives and transforms it into different forms. Cognitive psychologists explain the process of human behaviour on the basis of the assumption that behaviour is controlled by our own thought process, as opposed to genetic factors. Thus each individual processes the information in a different manner and behaves differently.

3. The founder of psychoanalytic theory was Sigmund Freud. Sigmund Freud is considered as the father of modern psychology. Freud was from the medical field, he was a psychiatrist and a neurologist who was only interested in understanding the mental disorders. Freud was not very keen to study issues like perception, sensation, thinking and intelligence. He developed psychoanalysis which is considered to be the first systematic approach to therapy.

4. Sigmund Freud made three parts of personality – Id, Ego, Superego. Among these, Id follows pleasure and so is thought to be governed by pleasure principle. Ego is the rational part of Id and is determined by the reality principle. Superego is related to morals and ethics. Freud was of the view that every action of a man has a cause which is most often some unconscious motive. Unconscious processes are those thoughts and wishes about which the person is unaware but which influences his behaviour.

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8. According to social psychologists, behaviour has a social and cultural context, and these factors play a major role in shaping one’s perceptions and
behave. This approach to psychology tries to find how social norms affect
behaviour and how social groups such as race, religion, or gender can
influence the way we behave. A cross-cultural perspective studies how
behaviour changes across cultures.

2.5 SUMMARY

- Biological approaches emphasize the role of heredity in various psychological
disorders. It assumes that if parents are suffering from some disorder then
there are chances that the children also get affected by it. Psychologists do
believe that these disorders can be because of combination of a number of
factors which can be social, psychological and biological.

- According to the behaviourist approach the cause of human behaviour is
the reaction to some stimulus present in the environment.

- It is the environmental factor rather than genetic or biological differences
that makes us behave differently. According to the behaviourists the stimulus–
response theory is the basis of understanding the process of conditioning.
An individual learns a particular response to a stimulus and becomes
conditioned to it. This is how learning takes place in humans.

- Cognitive psychologists explain the process of human behaviour on the
basis of the assumption that behaviour is controlled by one's own thought
process, as opposed to genetic factors. Thus each individual processes the
information in a different manner and behaves differently.

- Carl Rogers was the founder of Humanistic Approach. This approach
answers that every individual has freedom of creating his/her own future, a
huge capacity for attaining growth at personal level, a huge amount of intrinsic
worth, and a lot of potential for self-fulfilment.

- Humanistic psychologists emphasize the individual approach therapy.
According to this school of thought an individual can improve his mental
state by his own efforts. They can recognize their own potential and abilities.

- The advances in medical psychology and the theories of hypnosis prompted
the development of psychoanalysis.

- Freud was not very keen to study issues like perception, sensation, thinking
and intelligence. He developed psychoanalysis which is considered to be
the first systematic approach to therapy.

- Freud was of the view that every action of a man has a cause which is most
often some unconscious motive. Unconscious processes are those thoughts
and wishes about which the person is unaware but which influences his
behaviour.

- The evolutionary perspective of psychology focuses on the relation between
evolution and psychology. According to this perspective, mental processes
exist because they enable evolution and help survival. This approach also considers the evolutionary changes that have led to changes in behavioural patterns. It studies the natural and sexual selection of behaviours.

• Psychodynamics is another important perspective of psychology. Sigmund Freud proposed the concept of psychodynamics. He suggested that psychological processes are actually the flows of psychological energy in the brain. This perspective studies how psychological processes drive our feelings and behaviour. It focuses on the conscious and the unconscious parts of the human mind.

• According to social psychologists, behaviour has a social and cultural context, and these factors play a major role in shaping one’s perceptions and behaviour. This approach to psychology tries to find how social norms affect behaviour and how social groups such as race, religion, or gender can influence the way we behave. A cross-cultural perspective studies how behaviour changes across cultures.

2.6 KEY WORDS

• Behaviourist: A person who advocates or practices behaviourism, a school of psychology that confines itself to the study of observable and quantifiable aspects of behaviour.

• Theory of hypnosis: Scientists and clinicians have proposed mechanisms to explain the phenomenon associated with hypnosis.

• Theory of psychoanalysis: This is based on stream of thoughts and dream analysis.

• Evolutionary psychology: This is a theoretical approach to psychology that attempts to explain useful mental and psychological traits.

• Psychodynamics: Also known as psychodynamic psychology is an approach to psychology that emphasizes systematic study of the psychological forces that underlie human behaviour, feelings, and emotions and how they might relate to early experience.

2.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Enumerate the significance of biological approach to the study of psychology.
2. Who pioneered the works that led to behaviourist approach?
3. State the role of behaviourists in the study of psychology.
4. Write a brief note on humanistic approach in the study of psychology.
5. Analyse in brief the development of psychoanalysis.
6. Enumerate Freud’s view on unconscious processes.
7. Write a note on the evolutionary perspective of psychology.
8. What role does psychodynamics play?

Long Answer Questions
1. Discuss the various approaches to the study of psychology.
2. Analyse Sigmund Freud’s contribution to modern psychology.
3. Write a comprehensive note on the technique of psychoanalysis.
4. Enumerate the role of psychodynamics in the field of psychology.
5. Discuss in detail on the evolutionary perspective of psychology.
6. Elaborate with relevant references how social norms affect behaviour.

2.8 FURTHER READINGS


UNIT 3  WORK OF PSYCHOLOGISTS

Structure
3.0  Introduction
3.1  Objectives
3.2  Typical Behaviour Patterns and the Nervous System
   3.2.1  The Brain and The Nervous System: A Guide
   3.2.2  Central Nervous System
   3.2.3  The Lobe of Cerebral Cortex
   3.2.4  Peripheral Nervous System
3.3  Answers to Check Your Progress Questions
3.4  Summary
3.5  Key Words
3.6  Self Assessment Questions and Exercises
3.7  Further Readings

3.0  INTRODUCTION

The nervous system is a complex collection of nerves and specialized cells. Nervous system is made up of extensive network of cells that are interconnected and transmit signals between different parts of the body. The brain itself is composed of billions of nerves cells. Interconnected nerves cells relay information through the nervous system in a very orderly fashion to the highest level of the brain. Brain and the nervous system receive and transmit sensory input, integrate the information received from environment and direct the body’s motor activities. Neurons are the nerve cells that actually process information. Glial cell provide support and nutritional benefits to neurons. They are specialized to handle different information processing functions. Each of Neurochemical messengers plays a specific role and function in specific pathway.

More than 99 per cent of cells in the body are located in the central nervous system (CNS). Brain consists of three major regions of the brain—the hind brain, mid brain and forebrain. The system in midbrain consists of small group of neurons that use the neurotransmitters serotonin, dopamine, and norepinephrine. The cerebral cortex, divided into two halves, is the highest region of the fore brain. Highest mental functions, such as thinking and planning take place in cerebral cortex. The cortex consists of a thick layer of dimly packed neurones.

Peripheral nervous system consists of the group of neurones which transmit information between the CNS and rest of the body. The system senses and acts upon the external world. It consists of both sensory and motor neurons. Sensory neuron transmits incoming signals to the CNS.
This unit aims at enumerating the composition and function of nervous system in an a comprehensive way and analyses how it works to control the life sustaining functions of the body as well as thoughts, emotions and behaviour.

### 3.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the composition of nervous system
- Know the characteristics that allow it to direct our behaviour
- Explain the types of cells in the nervous system
- Analyse the function of neurons
- Understand the central nervous system (CNS)
- Enumerate the major regions of the brain
- Analyse the lobes in the cerebral cortex
- Understand the functioning and composition of peripheral nervous system

### 3.2 TYPICAL BEHAVIOUR PATTERNS AND THE NERVOUS SYSTEM

Let us discuss the brain and the nervous system first.

#### 3.2.1 The Brain and The Nervous System: A Guide

- **Nervous system**: It is an extensive of billions network of specialized cells that are interconnected and carry information to and from all parts of the body. Four extraordinary characteristics allow the nervous system to direct our behaviour, which are as follows:

  1. **Complexity**: The brain itself is composed of billions of nerves cells. The orchestration of all these cells allows people to sing, dance, write, talk and think.

  2. **Integration**: The brain does a wonderful job of putting information together, such as sound, sight, touch, taste and environment. Each nerve cell communicates on average with 10,000 others, making up miles and miles of collection (F.E. Bloom, C.A. Nelson and A. Lazerson, 2001; M.H. Johnson, 2003). Interconnected nerves cells relay information through the nervous system in a very orderly fashion to the highest level of the brain (C. Blair, 2002).

  3. **Adaptability**: Our brain and nervous systems together help in adapting to the world. Although nerve cells reside in certain brain regions, they are not fixed and immutable structures. They have a hereditary, biological
foundation, but they are constantly adapting to changes in the body and the environment (Wilson, 2003).

4. **Electrochemical transmission:** Brain and nervous system function essentially as an information processing system, powered by electrical impulse and chemical messengers, when people speak to each other, they use word. Brain and the nervous system receive and transmit sensory input, integrate the information received from environment and direct the body’s motor activities. Information flows into the brain through sensory input, becomes integrated within the brain and then moves out of the brain to be connected with motor output (S.M. Enger and R.K. Ross, 2003).

Figure 3.1 shows the division of nervous system into central and peripheral nervous system (PNS).

![Nervous System Diagram]

**Fig. 3.1 The Nervous System**

Decision-making in the nervous system occurs in specialized pathways and the network that carried different functions. Sensory nerves carry information to the brain. Then sensory pathways communicate information about external and bodily environment from sensory receptors into and throughout the brain.

There are two types of cells in the nervous system i.e. neurone and glial cells. Neurons are the nerve cells that actually process information. Glial cell provide support and nutritional benefits to neurons (Greg Lemke, 2001; T.D. Raabe and others, 2004).

- **Neurons:** Not all neurons are alike. They are specialized to handle different information processing functions that are as follows:
  
i. **Motor neuron:** Motor neurons carry the brain’s output. Thus, motor pathways communicate information from the brain to the hands, feet, and other areas of the body.
ii. **Neural network**: It is the central nervous system (CNS) and network of nerve cell that integrate sensory input and motor output (Kimoto and Okada, 2004; Mingolla, 2002).

Every neuron has the following three main parts:

1. **The cell body**: It contains the nucleus which directs the manufacture of substance for the growth and maintenance of neuron.

2. **Dendrites**: They receive and orient information towards the cell body. The dendrites are attached to the cell body or soma, which is the part of the cell that contains nucleus and keep the entire cell alive and functioning.

3. **The axon**: It is a fibre attached to the soma, and its job is to carry messages out other cells.

Neurons are very thin cellular membranes that are much like the surface of a bubble. It has a semi-permeable membrane which contains tiny holes, channels that allow only certain substance to pass into and out of the neuron. Myelin Sheath, a layer of fat cell, encases and insulates most axon. By insulating axon, myelin sheath speeds up the transmission of nerve impulses (Mattson, 2002; Paus and others 2001).

iii. **The neural impulse**: A neuron sends information through its axon in the form of brief impulse, or waves of electricity. The term action potential is used to describe the wave of positive electrical change that sweeps down. It is abided by the all or none principle.

iv. **The synapses**: The nerve impulse reaches the synaptic knob, triggering the release of neurotransmitter from the synaptic vesicles, the molecules of neurotransmitter cross the synaptic gap to fit into the receptor sites that fit the shape of the molecule.

v. **Axon**: Branches out into numerous fibres that store substances called neurotransmitters transmit, or carry, information across the synaptic gap to the next neuron.

vi. **Neurochemical messengers**: There are many neurotransmitters. Each play a specific role and function in specific pathway. Following are the most important and have major effect on our behaviour:

   a. **Acetylcholine (ACH)**: Found throughout the central and peripheral nervous systems.

   b. **GABA (Gamma Amino Butyric Acid)**: It is found throughout the CNS. It is important as it keeps neuron from firing.

   c. **Nor epinephrine**: It inhibits the firing of neurons in the CNS, but it excites the heart muscle.

   d. **Dopamine**: It helps to control voluntary movement. It also affects sleep, mood, attention and learning. (A. Razmy, A.E. Lang, C.M. Shapiro, 2004)
e. **Serotonin**: It primarily inhibits and regulates sleep, mood, attention and learning.

f. **Endorphins**: They are natural opiates that mainly stimulate the firing of neurons (Speten and others, 2002).

g. **Neural networks**: They work together to integrate incoming information and coordinate outgoing information.

### 3.2.2 Central Nervous System

The central nervous system (CNS) is composed of the brain and the spinal cord. Both the brain and spinal cord are composed of neurons and glial cells that control the life-sustaining functions of the body as well as thoughts, emotions and behavior. More than 99 per cent of cells in the body are located in the CNS. Brain consists of three major regions of the brain—the hindbrain, midbrain and forebrain. Another important part is the spinal cord.

- **Hind brain**: It is located at the lowest portion of the brain. Three main parts of the hind brain are the medulla, cerebellum and pons.
  1. **Medulla**: It is located at the top of the spinal column. It helps in controlling our breathing and regulates reflexes that allow us to maintain an upright posture.
  2. **Cerebellum**: The cerebellum extends from the rear of the hind brain, just above the medulla. It plays an important role in motor coordinations.
  3. **Pons**: It is a bridge in the hind brain that consists of several cluster of fibre involved in sleep and arousal.

- **Midbrain**: It is located between the hindbrain and forebrain in which many nerve fibre systems ascend and descend to connect the higher and lower portion of the brain. Midbrains relay information between the brain, eyes and ears. Parkinson disease, a deterioration of movement that produces rigidity and tremors, is due to the damage of the bottom of the midbrain.

The important system in the midbrain are reticular formation, a diffuse collection of neuron involved in waking or turning to attend to a sudden noise (Sasaki, Yoshimura and Naito, 2004; Soja and others, 2001). The system consists of small group of neurons that use the neurotransmitters serotonin, dopamine, and norepinephrine. Although these groups contain relatively few cells, they send their axon to a remarkable variety of brain regions, perhaps explaining their involvement in high level, integrative functions (David Shier, Jackie Butler and Ricki Lewis, 1999).

- **Brain stem**: A region including much of the hind brain (it does not include the cerebellum) and the mid brain and is so called because it looks like a stem (N.R. Carlson, 2001).

  The brain stem evolved more than 500 million years ago (Rita Carter, 1998). Clumps of cells in the brain stem determine alertness and
regulate basic survival function, such as breathing, heartbeat and blood pressure.

- **Forebrain:** The human hindbrain and midbrain are similar to other animals, it is the forebrain structure that mainly differentiate the human brain. It consists of the following:
  
  i. **Limbic system:** It is a loosely connected network of structures under the cerebral cortex which is important in both memory and emotion. It has two principal structures, viz., the amygdala and hippocampus. The amygdala is individual in the discrimination of objects that is necessary for the organism’s survival. It has special role in the storage of memory (D. Bannerman and other, 2002; P. Ryan and C. Cohen, 2004)
  
  ii. **Thalamus:** The thalamus is in the forebrain at the top of the brain stem in the central case of the brain. It functions as a relay station to sort input and direct it to different areas of the cerebral cortex. It also has ties with the reticular formation.
  
  iii. **Basal ganglia:** It is a large cluster of neurons under the cerebral cortex that control and coordinate voluntary movements.
  
  iv. **Hypothalamus:** It is the forebrain structure involved in regulating, drinking, eating and sex. It directs the endocrine system through the pituitary gland, and monitors stress, emotion and reward. The left and right hemispheres resemble the halves of walnut. Each hemisphere processes information about the opposite side of the body. Certain areas of the hypothalamus are electrically stimulated, for example, a feeling of pleasure. Researchers agree that the hypothalamus is involved in pleasurable feeling, but limbic system and bundle of fibres in the forebrain are also important in the link between brain and pleasure.

The cerebral cortex, divided into two halves, is the highest region of the forebrain. Highest mental functions, such as thinking and planning take place in cerebral cortex. The cortex consists of a thick layer of dimly packed neurones. It has a large area that is to be fitted into the skull cavity and therefore it has a large number of turns and twists. The twists and turns make the structure look like hills and valleys, called gyri (Singular gyrus) and sulci (singular sulcus)

### 3.2.3 The Lobe of Cerebral Cortex

The cerebral cortex is divided into four lobes—frontal, occipital, parietal and temporal. The four lobes are defined as follows:

- **Occipital lobe:** It is present at the back of the head and responds to visual stimuli. Different areas of the two occipital lobes are connected to process, like information as colour, shape and motion. A stroke in occipital lobe can cause blindness.
b. Temporal lobe: The portion of the cerebral cortex just above the ears. It is involved in hearing, language processing and memory.

c. Frontal lobe: The portion of the cerebral cortex behind the forehead is involved in the cortex of voluntary muscles, intelligence and personality.

d. Parietal lobe: It is located at the top and towards the rear of each hemisphere. It is involved in registering spatial location, attention and motor control.

- Spinal cord: The CNS is made up of the brain and the spinal cord. Spinal cord is a long bundle of neurons that serve two vital functions for the nervous system. The outer section is composed mainly of axon and nerves that appear white, whereas the inner section is mainly composed of cell bodies of neurons that appear grey. The purpose of the outer section is to carry message from the brain down to the body. It has the shape of a pipe.

3.2.4 Peripheral Nervous System

This system consists of the group of neurons which transmit information between the CNS and rest of the body. The system senses and acts upon the external world. It consists of both sensory and motor neurons. Sensory neuron transmits incoming signals to the CNS. These signals originate in the receptor cells and are located in the sense organs like eyes and ears. Motor neurons that are found inside the spinal cord transmit outgoing signals from the spinal cord. The peripheral nervous system has two major divisions that are as follows:

(i) Somatic nervous system: It consists of sensory nerves, which convey information from the skin and muscles to the CNS about pain and temperature, and motor nerves directs muscles for different functions.

(ii) Autonomic nervous system: It takes messages to and from the body’s internal organs, monitoring such processes as breathing, heart rate and digestion. The autonomies nervous system is divided into two parts. These are as follows:

- a. Sympathetic division: The sympathetic division of the autonomic nervous system is located on the middle of the spinal column—running from near the top of the ribcage to the waist area. It allows people to deal with all kind of stressful events.

- b. Parasympathetic division: The neurons of this division are located at the top and bottom of the spinal column on either side of the sympathetic division neurons. It is responsible for most of the day-to-day bodily functions. It is responsible for involuntary functions like, beating of the heart, breathing and normal functioning of the digestive system.
3.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Nervous system is an extensive of billions network of specialized cells that are interconnected and carry information to and from all parts of the body.

2. Four extraordinary characteristics allow the nervous system to direct our behaviour, which are as follows:
   i. Complexity: The brain itself is composed of billions of nerves cells. The orchestration of all these cells allows people to sing, dance, write, talk and think.
   ii. Integration: The brain does a wonderful job of putting information together, such as sound, sight, touch, taste and environment. Each nerve cell communicates on average with 10,000 others, making up miles and miles of collection. Interconnected nerves cells relay information through the nervous system in a very orderly fashion to the highest level of the brain.
   iii. Adaptability: Our brain and nervous systems together help in adapting to the world. Although nerve cells reside in certain brain regions, they are not fixed and immutable structures. They have a hereditary biological foundation, but they are constantly adapting to changes in the body and the environment.
   iv. Electrochemical transmission: Brain and nervous system function essentially as an information processing system, powered by electrical impulse and chemical messengers, when people speak to each other, they use word. Brain and the nervous system receive and transmit sensory input, integrate the information received from environment and direct the body’s motor activities.
3. Not all neurons are alike. They are specialized to handle different information processing functions that are as follows:
   i. Motor neuron: Motor neurons carry the brain’s output. Thus, motor pathways communicate information from the brain to the hands, feet, and other areas of the body.
   ii. Neural network: It is the central nervous system (CNS) and network of nerve cells that integrate sensory input and motor output.

4. There are many neurotransmitters. Each play a specific role and function in specific pathway. Following are the most important and have major effect on our behaviour:
   a. Acetylcholine (ACH): Found throughout the central and peripheral nervous systems.
   b. GABA (Gamma-Aminobutyric Acid): It is found throughout the CNS. It is important as it keeps neuron from firing.
   c. Nor epinephrine: It inhibits the firing of neurons in the CNS, but it excites the heart muscle.
   d. Dopamine: It helps to control voluntary movement. It also affects sleep, mood, attention and learning.
   e. Serotonin: It primarily inhibits and regulates sleep, mood, attention and learning.
   f. Endorphins: They are natural opiates that mainly stimulate the firing of neurons.
   g. Neural networks: They work together to integrate incoming information and coordinate outgoing information.

5. The central nervous system (CNS) is composed of the brain and the spinal cord both the brain and spinal cord are composed of neurons and glial cells that control the life sustaining functions of the body as well as thoughts, emotions and behaviour. More than 99 per cent of cells in the body are located in the CNS. Brain consists of three major regions of the brain—the hind brain, mid brain and forebrain. Another important part is the spinal cord.

6. It is located between the hindbrain and forebrain in which many nerve fibre systems ascend and descend to connect the higher and lower portion of the brain. Midbrains relay information between the brain, eyes and ears. Parkinson disease, a deterioration of movement that produces rigidity and tremors, is due to the damage of the bottom of the midbrain. The important system in the midbrain are reticular formation, a diffuse collection of neuron involved in walking or turning to attend to a sudden noise.

7. The human hindbrain and midbrain are similar to other animals, it is the forebrain structure that mainly differentiate the human brain.
8. This system consists of the group of neurones which transmit information between the CNS and rest of the body. The system senses and acts upon the external world. It consists of both sensory and motor neurons. Sensory neuron transmits incoming signals to the CNS. These signals originate in the receptor cells and are located in the sense organs like eyes and ears. Motor neurons that are found inside the spinal cord transmit outgoing signals from the spinal cord.

3.4 SUMMARY

- Nervous system is an extensive of billions network of specialized cells that are interconnected and carry information to and from all parts of the body.
- There are two types of cells in the nervous system i.e. neurone and glial cells. Neurons are the nerve cells that actually process information. Glial cell provide support and nutritional benefits to neurons
- Neurons are very thin cellular membranes that are much like the surface of a bubble. It has a semi-permeable membrane which contains tiny holes, channels that allow only certain substance to pass into and out of the neurone. Myelin Sheath, a layer of fat cell, encases and insulates most axon. By insulating axon, myelin sheath speeds up the transmission of nerve impulses.
- The central nervous system (CNS) is composed of the brain and the spinal cord both the brain and spinal cord are composed of neurons and glial cells that control the life sustaining functions of the body as well as thoughts, emotions and behaviour. More than 99 per cent of cells in the body are located in the CNS.
- Midbrain is located between the hindbrain and forebrain in which many nerve fibre systems ascend and descend to connect the higher and lower portion of the brain. Midbrains relay information between the brain, eyes and ears. Parkinson disease, a deterioration of movement that produces rigidity and tremors, is due to the damage of the bottom of the midbrain.
- Brain stem is a region including much of the hind brain (it does not include the cerebellum) and the mid brain and is so called because it looks like a stem. The brain stem evolved more than 500 million years ago. Clumps of cells in the brain stem determine alertness and regulate basic survival function, such as breathing, heartbeat and blood pressure.
- Certain areas of the hypothalamus are electrically stimulated, for example, a feeling of pleasure. Researchers agree that the hypothalamus is involved in pleasurable feeling, but limbic system and bundle of fibres in the forebrain are also important in the link between brain and pleasure.
- The cerebral cortex is divided into four lobes—frontal, occipital, parietal and temporal.
● Spinal cord is a long bundle of neurons that serves two vital functions for the nervous system. The outer section is composed mainly of axon and nerves that appear white, whereas the inner section is mainly composed of cell bodies of neurons that appear grey. The purpose of the outer section is to carry message from the brain down to the body. It has the shape of a pipe.
● Peripheral nervous system consists of the group of neurones which transmit information between the CNS and rest of the body. The system senses and acts upon the external world. It consists of both sensory and motor neurones. Sensory neuron transmits incoming signals to the CNS. These signals originate in the receptor cells and are located in the sense organs like eyes and ears.
● Autonomic nervous system takes messages to and from the body’s internal organs, monitoring such processes as breathing, heart rate and digestion.

3.5 KEY WORDS

● The axon: It is a fibre attached to the soma, and its job is to carry messages out other cells.
● Endorphins: They are natural opiates that mainly stimulate the firing of neurones.
● Cerebellum: The cerebellum extends from the rear of the hind brain, just above the medulla.
● Limbic system: It is a loosely connected network of structures under the cerebral cortex which is important in both memory and emotion. It has two principal structures, viz., the amygdala and hippocampus.
● Cerebral cortex: The outer layer of the cerebrum composed of folded grey matter and playing an important role in consciousness.
● Lobes: The cerebellum is comprised of small lobes and receives information from the balance system of the inner ear, sensory nerves, and the auditory and visual systems.
● Somatic nervous system: It consists of sensory nerves, which convey information from the skin and muscles to the CNS about pain and temperature, and motor nerves directs muscles for different functions.

3.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions
2. State the electrochemical transmission process in nervous system.
3. State the role of neurons to handle different information processing functions.
4. Write a brief note on neurochemical messengers.
5. Analyse in brief the composition of central nervous system (CNS).
6. Enumerate thalamus’ function in the brain.
7. Write a note on the role of occipital lobe.
8. What role does autonomous nervous system play?

**Long Answer Questions**

1. Discuss the main characteristics that allow the nervous system to direct our behaviour.
2. Analyse the function of neurons.
3. Write a comprehensive note on the central nervous system (CNS).
4. Enumerate the role of hypothalamus.
5. Discuss in detail the function of four lobes in the cerebral cortex.
6. Elaborate in detail the composition of peripheral nervous system.

### 3.7 FURTHER READINGS


UNIT 4 METHODS OF ASSESSMENT IN PSYCHOLOGY-I

Structure
4.0 Introduction
4.1 Objectives
4.2 Introspective Method
   4.2.1 Merits of Introspection
   4.2.2 Limitations of Introspection
4.3 Observation Method
   4.3.1 Limitations of Observation
   4.3.2 Suggestions for Improvement
4.4 Experimental Method: An Overview
   4.4.1 Merits of Experimental Method
   4.4.2 Weaknesses of Experimental Method
4.5 Correlation Method
4.5.1 Goals of Psychological Enquiry
4.6 Answers to Check Your Progress Questions
4.7 Summary
4.8 Key Words
4.9 Self Assessment Questions and Exercises
4.10 Further Readings

4.0 INTRODUCTION

While analysing the various methods of assessment in psychology, it is incumbent to look into merits and limitations of those methods. Introspective, observation, experimental and correlation methods are universally applied in psychology to assess the processes. Introspection may also be called as looking within oneself to experience one’s own mental state. This method was developed by structuralists in psychology who defined psychology as the study of conscious experiences of the individual. William James, emphasizing the importance of introspection as a method of collecting data, said, "Introspective observation is what we have to rely on first and foremost and always. The word introspection needs hardly to be defined—it means, of course, looking into our own minds and reporting what we discover there. Everyone agrees that we there discover states of consciousness. So far as I know, the existence of such states has never been doubted by any critic, however skeptical in other respects he may have been.” However, Gestalt
psychologists have raised a very valid objection against introspection that it analyses experience into images, sensation and feelings.

With the development of psychology as an objective science of behaviour, the method of introspection was replaced by careful observation of human and animal behaviour to collect data by research workers. But subjectivity of interpretation is a limitation of observation. The observer may interpret his sensations of external stimulus on the basis of his past experiences. At the same time, one should note that observation is not a haphazard activity. It is a systematic and scientific method which requires skills, competencies, aptitude, and proper training for observers. Then one of the major contributions of behaviourism is the development of experimental method to understand, control and predict behaviour. The experimental method is considered to be method par excellence for use in certain areas of educational psychology. It is the most precise, planned, systematic and controlled observation. However, the experimental method sets its own limit by setting the experimental situation to study behaviour. Last but not the least is correlation method. If an increase in one variable tends to be associated with an increase in the other then this is known as a positive correlation.

This unit aims at enumerating the various methods of assessment in psychology in a comprehensive way and analyses how these methods work.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the meaning of introspection
- Enumerate the efficacy of introspective method
- Explain the limitations of introspective method
- Discuss the observation method
- Understand the types of observation method
- Discuss ways to eradicate errors in observation method
- Analyse the significance of experimental method
- Understand correlation method

4.2 INTROSPECTIVE METHOD

Historically, introspection is the oldest method which was formerly used in philosophy, and then in psychology to collect data about the conscious experiences of the subject. Introspection means self-observation. It may also be called as looking within oneself to experience one’s own mental state. This method was developed by structuralists in psychology who defined psychology as the study of conscious experiences of the individual. For them it was a process of examining
one’s own mental process of thought, feelings and motives. The individual introspects, observes, analyses and reports his own feelings. Let us explain the process with the help of an example. Suppose you are angry and in this state of anger you introspect your own mental feelings and examine what is going on in the mental process in the state of anger.

4.2.1 Merits of Introspection

1. William James, emphasizing the importance of introspection as a method of collecting data, said, “Introspective observation is what we have to rely on first and foremost and always. The word introspection needs hardly to be defined—it means, of course, looking into our own minds and reporting what we discover there. Everyone agrees that we there discover states of consciousness. So far as I know, the existence of such states has never been doubted by any critic, however skeptical in other respects he may have been.” Thus we see that introspection is an important method of collecting data that has been used from the beginning of psychology as a separate subject.

2. This is the easiest method and is readily available to the individual. An individual can at any time introspect about his mental state without involving the use of any apparatus and without incurring any expenditure.

3. According to Stout, in introspection we are concerned with the nature of experience itself and with the laws of mental process. The observer in introspection is directed towards the answering of questions of theoretical importance for the advancement of our systematic knowledge of the laws and conditions of mental process.

4. Introspection has its historical importance. It generated research which resulted gradually in the development of more objective methods. Introspection is still used in all experimental studies.

4.2.2 Limitations of Introspection

1. The most serious objection against introspection is that human beings are not static like inanimate objects such as stone or chairs, etc. Our mental process is under constant change. So, when one attempts to introspect, the state of mental process disappears and it becomes a retrospect. It is difficult to introspect perpetually changing psychological experiences.

2. The subject of experience is divided into two halves in the process of introspection. The mind is directed inward towards its own workings and is required to attend to them. The attention is divided into two parts. One is the mental operation itself which is to be observed and the other is the object to which this mental operation is directed. To expect any individual to attend the workings of his own mind during a mental process, especially in a complex or emotional state such as anger or fear, is a mistaken idea.
Ross, commenting on the limitation of introspection, said, “The observer and the observed are the same, the mind is both the field and the instrument of observation.”

3. The data collected by introspection is highly subjective. There is no way to prove the reliability of the data. It is practically impossible to explore the mental process of others. There is no independent way of checking the contents of another person’s mind.

4. There are conflicting reports, as regards the findings collected from different introspectionists on the same experience under the same conditions.

5. Influence of preconceptions is always there in introspection. It has the danger of being biased and rendered unreliable even in adults, when they are at such a level of mental development that they would unconsciously put in personal knowledge in introspection. The reporter can deliberately lie and hide the facts to mislead the experimenter.

6. Introspection cannot be applied to children, animal and abnormal people. It requires highly trained and skilled workers to introspect.

7. Gestalt psychologists have raised a very valid objection against introspection that it analyses experience into images, sensation and feelings. It does not yield adequate representation of the unitary experience in its totality which, if reported strictly in terms of these elements, would not convey a clear idea of the experience to another person. It is an elementalist approach to study human thought process.

8. Qualitative estimates are hard enough to handle, but when it comes to subjective data for the purpose of analysis and statistical treatment, the types of scales available are severely restricted and it is doubtful whether any genuine measurement for the verification of introspective reports is possible at all.

9. Kart, a famous philosopher, pointed out a major methodological barrier in introspection that it was not possible to accept conscious experience as the subject matter of psychology and at the same time to accept introspection as its proper method. For him the difficulty was that introspection could not introspect the introspective activity, that is, be the subject, action, and object all at the same time.

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<th>Check Your Progress</th>
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<tr>
<td>1. What do you mean by introspective method?</td>
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<td>2. List some of the merits of introspective methods.</td>
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<td>3. What are the limitations of introspective method?</td>
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4.3 **Observation Method**

With the development of psychology as an objective science of behaviour, the method of introspection was replaced by careful observation of human and animal behaviour to collect data by research workers. Observation literally means looking outside oneself. It is one of the important and basic method for collecting data in almost all types of research studies. It produces one of the basic elements of science—facts which are collected by observing overt behaviour of the organism in order to locate underlying problem and to study developmental trends of different types. The overt behaviour is the manifestation of covert conditions within the organism. The study of overt behaviour gives indirectly the clue to the mental condition of the organism. The development of systematic observation as a method of collecting data generated interest in developmental psychology and many studies on developmental characteristics of children were conducted which made great contribution to the field of child psychology. Observation may be of different types, direct and indirect, natural and artificial, scheduled and unscheduled, participant and non-participant. We will describe only two types of observations here:

1. **Natural observation**: In natural observation we observe the specific behavioural characteristics of children or adults in natural settings. Subjects do not become conscious of the fact that their behaviour is being observed by someone. The teacher can observe the behaviour of his students on the playground or in any other social situation when students may not be conscious of his presence. In child clinic, one-way screen is used to observe the behaviour of deviant children. The observer can observe the behaviour of children but they cannot see the observer.

2. **Participant observation**: It is the kind of observation in which the observer becomes the part of the group which he wants to observe. He establishes perfect rapport with the group of children or adolescents so that they may not become conscious of his presence and may not hide their actual behaviour.

Observational studies are particularly very important and yield significant results on developmental characteristics of children. No doubt, observation is a scientific technique of collecting data whose results can be verified and relied upon to locate behavioural problems of different types but it suffers from the following limitations.

4.3.1 **Limitations of Observation**

1. Observation is useful only for collecting data about overt behaviour which is manifested in a number of activities. This overt behaviour does not provide reliable information regarding the internal mental process. We can only guess about the mental state of the individual on the basis of overt behaviour which may or may not be true. It becomes very difficult to draw any conclusion in case of adults who can hide their actual behaviour in the
presence of the observer. In such cases observation fails and yields no tangible results which may throw light on the actual behaviour of the subjects.

2. Subjectivity of interpretation is another limitation of observation. The observer may interpret his sensations of external stimulus on the basis of his past experiences. He may be biased in his interpretation by his likings, dislikings and values, etc. His observation may be influenced by his perception of the situation when he makes inferences on the basis of scanty sensory cues. It also suffers from impressionism, prejudice and distraction, etc. It has also been found in some studies that strong personal interests tend to make the researcher see only those things which he wants to see.

3. The method of observation leaves the matter of accounting for the facts “How and why” side of interpretation of data.

4. Observation is subjected to two kinds of errors, sampling error and observer’s error. The first error occurs because of inadequacies of selecting the situation to be observed. Observer’s error may be due to the knowledge and background of the situation to be observed. Sometimes, the observer is not familiar with the total situation and hence he may commit errors.

4.3.2 Suggestions for Improvement

In recent years improvements have been made in the method of observation to make it a more objective and reliable instrument of collecting data for research purposes. Following suggestions are given in order to eliminate types of errors:

1. Use of mechanical devices: Generally observers do not record their observations immediately on the spot. It is a wrong practice. The observations should be immediately recorded. They should not be left on memory for future because there is every possibility of their being contaminated by personal prejudices and biases of the observers. Sometimes important incidents are left out by failure of recall. The use of mechanical devices such as movie camera or tape recorder may be made to improve the reliability of observation. Use of a system of notation or shorthand may be used for recording purposes.

2. Definite objectives: The investigator must in advance specify in clear and definite terms the objectives of the observation. A detailed analysis should be made of behavioural characteristics which are to be observed.

3. Schedule: The investigators must decide the time and hour of observation and the schedule should be honestly followed. A detailed schedule in the form of questions or statements should be prepared in advance to note down the observations. The method of recording observation should be made clear. It will be more reliable and objective data if numerical value is assigned to various aspects of behaviour. Detailed instructions should be spelt out to minimize variations in recording observations by different investigators.
4. **Training:** Observation is not a haphazard activity. It is a systematic and scientific method which requires skills, competencies, aptitude, and proper training for observers. The investigator before starting observation, must acquire the broad background in the field of his problem. He should train himself to counteract his emotional and intellectual biases in order to report accurate observation. For this purpose he may get rigorous training on similar problems. He should develop keenness and alertness to identify minor incidents in observation. He should make comprehensive and complete notes of all pertinent incidents.

5. **Preciseness:** He should make his observation in precise, concrete and unambiguous form. His description should mean the same thing to other investigators which they mean to him. It will be more reliable if the investigator describes his data quantitatively because numerical measures are more precise than word descriptions which make possible further treatment of the problem by statistical analysis.

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**Check Your Progress**

4. Enumerate the role and function of observation method.

5. List the types of observation.

6. Enumerate some of the limitations of observation method.

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### 4.4 EXPERIMENTAL METHOD: AN OVERVIEW

Now we will discuss the most important method of scientific enquiry: experimental method which has been developed in psychology by the continuous efforts of psychologists to make an objective and scientific study of human behaviour. One of the major contributions of behaviourism is the development of experimental method to understand, control and predict behaviour. The experimental method is considered to be an approach excellence for use in certain areas of educational psychology. It is the most precise, planned, systematic and controlled observation. According to some psychologists, only experiments make possible controlled observation, variation of factors, perfect quantification and rigorous objective checking of hypotheses. The experimental method uses a systematic procedure called experimental design. The term experimental design has two different meanings. One is that experimental design represents the six basic steps referred above which are generally followed in an experiment. The second meaning of experimental design is more restrictive. It is a procedure for assigning subjects to experimental conditions and selecting an appropriate statistical procedure. Experimental design provides important guidelines to the researcher to carry out his research systematically. On the soundness of the design depends findings of the research study. The layout of a design depends on the type of the problem the
investigator wants to investigate. Readers should know that no one design solves all the problems of a research study.

There are many problems in educational psychology on which research cannot be conducted in laboratory set-up. Such problems are studied in actual classroom situations. A variety of experimental designs have been developed by researchers in recent years. To acquaint the readers with the basic structure of experimental design we will give an example of laboratory experiment and then few experimental designs which can be used in actual classroom situations, will be briefly mentioned.

1. Laboratory Experiment

Some problems can be conveniently studied in the laboratory where the experimenter can control all variables except the one under study. The experiments can be conducted on individuals or a group of subjects. Thorndike’s experiments on cats, Ebbinghaus’ experiments on memory, mirror drawing, attention, perception and learning are all examples of laboratory experiments. A sample of laboratory experiment is given below:

1. **Name.** Maneesh  Age. 10 years.  Sex. Male.
2. **Date.** 6.2.83.  **Time.** 10 a.m.
3. **Physical and mental condition.** Normal.
4. **Problem.** To study the problem of bilateral transfer of training.
5. **Apparatus and material.** Mirror drawing experiment apparatus, stopwatch, paper, pencil and stylus.

**Instruction.** Detailed instructions are given to the subject to perform the task.

6. **Experimental design and data**

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<td>2.</td>
<td>-do-</td>
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<td>3.</td>
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<td>4.</td>
<td>-do-</td>
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<tr>
<td>6.</td>
<td>-do-</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Trial</th>
<th>Time</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Left hand</td>
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<td></td>
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<tr>
<td>2.</td>
<td>-do-</td>
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<td></td>
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<tr>
<td>3.</td>
<td>-do-</td>
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<td></td>
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<tr>
<td>4.</td>
<td>-do-</td>
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<tr>
<td>5.</td>
<td>-do-</td>
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<td></td>
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<tr>
<td>6.</td>
<td>-do-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. **Analysing the results.** The investigator analyses the data obtained from the subject.

8. **Conclusions.** The investigator on the basis of his analysis of data draws certain conclusions.

---

**2. Experimental Designs Outside the Laboratory**

Experimental designs can be divided on the basis of two important factors: the control procedure and the number of groups involved in an experiment. The type of control employed in an experiment plays an important role in determining the reliability and validity of the conclusions drawn from the experiment. The number of groups involved in an experiment is important to determine the control procedure and the type of research problems an investigation may answer. The number of groups may vary from one, two, three to an infinite number of groups depending on the type of problem and nature of control procedure employed by the experimenter. Following are the samples of experimental designs:

**A. One Group Design**

1. *One group post-test design:* This type of design is the simplest one. It is commonly called pre-experimental design. In such type of experiment no formal comparison is possible, for there is no second group with which comparison can be made. Let us illustrate with an example: suppose a teacher treats 10 students who are addicted to smoking in a period of three months. At the end of the period six students give up smoking. Such type of designs do not control any of the sources of invalidity.

2. *One group pre-test-post-test design:* This is also a simple design and is considered to be a rather poor design though better than one group post-test design. In this design the experimenter first tests a group on some aspects of behaviour and then gives special treatment (X) to the same group. He tests the performance of the group after the special treatment. He statistically analyses the data and calculates the difference between the pre-test and post-test scores of the group.

   The paradigm of the design is as follows:

   \[
   \text{Pre-test} \quad \text{Independent variable} \quad \text{Post-test} \\
   T_1 \quad X \quad T_2
   \]

   *Example:* Suppose in the beginning of the semester, we administer test of educational psychology to students of M.Ed. and then we teach them the subject throughout the semester. At the end of the semester we administer post-test (T2), and find out the difference between the scores on the initial and final tests.

**B. Two Group Designs**

Researches in education and psychology have often been criticised of being loosely controlled. In recent years more rigorous designs have been evolved by using statistics to make researches more scientific and objective.
Generally researchers use two parallel group techniques to see the effects of an independent variable on some dependent variable. Two groups are equated on the basis of significant variable. One group is called experimental and the other is called control group. The experimental group is subjected to a certain experience or to a specific treatment whereas the control group is not given any type of special treatment. After providing special treatment to the experimental group, both the groups are administered the same final test. The scores are statistically compared and conclusions are drawn as regards the effect of special treatment on the experimental group.

1. **Pre-test-post-test design**: In this design both experimental and control group are administered pre-test and then the experimental group is given special treatment (X) whereas the control group is not given any type of treatment. After the special treatment post-test is administered to both the groups. The paradigm is as follows:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group</th>
<th>Pre-test</th>
<th>Treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experimental</td>
<td>$T_1E$</td>
<td>X</td>
<td>$T_2E$</td>
</tr>
<tr>
<td>2.</td>
<td>Control</td>
<td>$T_1C$</td>
<td>No training</td>
<td>$T_2C$</td>
</tr>
</tbody>
</table>

2. **Randomized control-group pre-test post-test design**: The researcher in this design follows the procedure as given here:

(i) He selects a subject by random method.

(ii) Assigns subjects to group and X (Treatment) to groups by random method.

(iii) Tests the Ss on the dependent variable.

(iv) Keeps all conditions the same for both the groups except for exposing the experimental Ss but not the control group to the independent variable for a specific time.

(v) Test the ‘Ss’ on the dependent variable.

(vi) Finds the difference between the two.

(vii) Compares the results to see whether the application of X (treatment) caused a change in the experimental group.

(viii) Applies an appropriate statistical procedure.

3. **Matched two group design**: A matched two group design is a modification of the totally randomized two group design described above. In this design, both groups are matched in terms of some variable. The experimenter feels he would influence the dependent variable. Suppose we want to test the retention of two types of words closely associated and disassociated. We believe that I.Q. will influence how well a person can retain words, so we match the two groups on I.Q. Let us be more concrete to understand this point. Suppose there are ten subjects with I.Q. as follows:
<table>
<thead>
<tr>
<th>Subjects</th>
<th>I.Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>110</td>
</tr>
<tr>
<td>2.</td>
<td>110</td>
</tr>
<tr>
<td>3.</td>
<td>90</td>
</tr>
<tr>
<td>4.</td>
<td>90</td>
</tr>
<tr>
<td>5.</td>
<td>80</td>
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<tr>
<td>6.</td>
<td>80</td>
</tr>
<tr>
<td>7.</td>
<td>80</td>
</tr>
<tr>
<td>8.</td>
<td>80</td>
</tr>
<tr>
<td>9.</td>
<td>70</td>
</tr>
<tr>
<td>10.</td>
<td>70</td>
</tr>
</tbody>
</table>

In order to divide the ten subjects into two matched groups of 5 subjects each, we first divide the ten subjects into five pairs by going down the list making 1 and 2, 3 and 4 and so on. We then randomly assign one of each pair to either group A or B by flipping a coin.

**C. Multigroup Design with One Independent Variable (ANOVA)**

Two group paradigms are most common in education and psychology but events in nature do not always conveniently order into two groups. Sometimes the investigator has to compare the effect of different values of some variable or has to see the effect of several alternative variables on more than two groups. The procedure for carrying out one way analysis of variance (ANOVA) is the same as for two group designs. The distinguishing feature between the two types of investigation is the type of statistical analysis used.

**D. Factorial Design**

Factorial design is employed where more than one independent variables are involved in the investigation. Factorial designs may involve several factors which are symbolically represented in the following way:

<table>
<thead>
<tr>
<th>Design</th>
<th>Symbolic</th>
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</thead>
<tbody>
<tr>
<td>Two factors</td>
<td>A × B</td>
</tr>
<tr>
<td>Three factors</td>
<td>A × B × C</td>
</tr>
<tr>
<td>Four factors</td>
<td>A × B × C × D</td>
</tr>
<tr>
<td>N factors</td>
<td>A × B × C × D × N</td>
</tr>
</tbody>
</table>

**E. Small N Design**

We have briefly mentioned various experimental designs which are termed as large N group designs. In all large N group designs, the number of subject is large who are divided into two groups. The large N group design is not always applicable in classroom situation. In many instances, the psychologist or teacher is faced with
4.4.1 Merits of Experimental Method

1. Experimental method is the most systematic procedure of solving problems. It provides reliable information. Research is conducted under rigorously controlled conditions. The major advantage is the ability of the experimenter to control the application and withdrawal of independent variables.

2. The findings of experimental method are verifiable by other investigators under identical conditions in which the initial experiment was conducted.

3. It provides objective and precise information about the problems.

4. Use of computers in data analysis in recent years has opened new frontiers of possibilities for the study of complex problems.

5. It advances our stock of knowledge of cause-effect relationship in the behaviour of students and provides guidelines to solve teaching-learning problems.

6. It tests the traditional beliefs and throws new light on the problems and opens avenues for future progress.

7. It provides innovative ideas for further experimentation.

8. The experimenter can apply controlled procedure more precisely in laboratory experimentation. The experimenter can record the dependent variables more precisely.

4.4.2 Weaknesses of Experimental Method

1. The main objection raised against experimental method is that an experiment is an observation of an artificially determined pattern of behaviour as Thorndike’s cat experiments or Skinner’s rat experiments. Thus, we can say that the experimental method sets its own limit by setting the experimental situation to study behaviour.

2. Experimental data do not provide insight into the total behaviour of the subject. We know that behaviour is, for all practical purposes, an interaction between the organism and its environment. Obviously there is more than one way for such interaction to take place. G.S. Klein criticising the experimental method remarked that the appearance of significant relations was often prevented by the rigorous experimental procedure of keeping variables constant. Instead of grasping the process as whole the experimentalists often omit important factors by their tendency to eliminate and isolate experimental variables or to keep them constant.

3. Another limitation of experimental method in educational psychology stems from the fact that experiments cannot handle too well the patterns of covert situations in which large N is not possible, for example delinquency, problem of discipline, etc. With the introduction of statistics in psychology, it is possible to conduct scientific research on small N group.
behaviour of children in laboratory. Overt violent types of actions (riots) do not fit into a laboratory setting and moreover experimental method cannot accurately test the entire gamut of human drives and feelings.

4. Psychologists have criticized the fact that mostly the experiments have been conducted on rats, cats and dogs. Principles have been deduced on the basis of experiments on animals. How far it is justifiable to generalize those principles and laws for human beings has not yet been conclusively decided.

5. The experimental method is time-consuming and costly. Every teacher cannot be expected to conduct experiments as it requires specialized knowledge and skills.

6. All problems of educational psychology cannot be studied by experimental method. No doubt the method of research employs the scientific procedure of acquiring knowledge but due to complexity and tremendous variability of human mind and human phenomena, experiments in social sciences are not possible in the same sense as they are in physical sciences where we can repeat experiments a number of times under controlled and practically identical conditions.

7. In recent years psychologists and religious leaders have raised ethical questions in connection with administration of some psychological tests which encroach upon the privacy of the subjects. Certain situations may not be created because they are not socially acceptable as it is not possible to purchase human infants and raise them in extreme deprivation.

8. The Gestalt psychologists criticise the experimental method because of its quantification aspect. They criticise the inappropriate, imprecise and faulty apparatus of psychologists. It is not possible to construct tools that will make accurate and sufficiently discriminating measurements of individual differences.

9. In many cases investigators cannot manipulate human beings and cannot adjust class schedules to meet the requirements of the research designs that are most theoretically desirable.

10. Social scientists cannot generalise their findings to all human beings. Experiments only produce statements of probability. Certainty cannot be achieved through experimentation.

### 4.5 CORRELATION METHOD

Correlation means association - more precisely it is a measure of the extent to which two variables are related. If an increase in one variable tends to be associated with an increase in the other then this is known as a positive correlation. An example would be height and weight. Taller people tend to be heavier.
If an increase in one variable tends to be associated with a decrease in the other then this is known as a negative correlation. An example would be height above sea level and temperature. As you climb the mountain (increase in height) it gets colder (decrease in temperature).

When there is no relationship between two variables this is known as a zero correlation. For example there is no relationship between the amount of tea drunk and level of intelligence.

4.5.1 Goals of Psychological Enquiry

Briefly speaking, psychological enquiry has four goals. These are:

- **To Describe**: One of the first goals of psychology is simply to describe behaviour.
- **To Explain**: Psychologists are also interested in explaining behaviour in addition to merely describing it.
- **To Predict**: Another primary goal of psychology is to make predictions about how we think and act. Once we understand more about what happens and why it happens, we can use that information to make predictions about when, why, and how it might happen again in the future.
- **To Change**: Finally, and perhaps most importantly, psychology strives to change, influence, or control behaviour to make constructive and lasting changes in people’s lives.

**Check Your Progress**

1. What does correlation method stand for?
2. What is the significance of experimental method?

4.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Historically, introspection is the oldest method which was formerly used in philosophy, and then in psychology to collect data about the conscious experiences of the subject. Introspection means self-observation. It may also be called as looking within oneself to experience one’s own mental state. This method was developed by structuralists in psychology who defined psychology as the study of conscious experiences of the individual.

2. Some of the merits of introspection method are:
   a. Introspection is an important method of collecting data that has been used from the beginning of psychology as a separate subject.
   b. This is the easiest method and is readily available to the individual. An
individual can at any time introspect about his mental state without involving the use of any apparatus and without incurring any expenditure.

c. According to Stout, in introspection we are concerned with the nature of experience itself and with the laws of mental process. The observer in introspection is directed towards the answering of questions of theoretical importance for the advancement of our systematic knowledge of the laws and conditions of mental process.

d. Introspection has its historical importance. It generated research which resulted gradually in the development of more objective methods.

3. Some limitations of introspection method are as follows:
   - The most serious objection against introspection is that human beings are not static like inanimate objects such as stone or chairs, etc. Our mental process is under constant change. So, when one attempts to introspect, the state of mental process disappears and it becomes a retrospect.
   - The subject of experience is divided into two halves in the process of introspection. The mind is directed inward towards its own workings and is required to attend to them. Ross, commenting on the limitation of introspection, said, “The observer and the observed are the same, the mind is both the field and the instrument of observation.”
   - The data collected by introspection is highly subjective. There is no way to prove the reliability of the data.

4. With the development of psychology as an objective science of behaviour, the method of introspection was replaced by careful observation of human and animal behaviour to collect data by research workers. Observation literally means looking outside oneself. It is one of the important and basic method for collecting data in almost all types of research studies. It produces one of the basic elements of science—facts which are collected by observing overt behaviour of the organism in order to locate underlying problem and to study developmental trends of different types.

5. The two types of observations here:
   - **natural observation:** In natural observation we observe the specific behavioural characteristics of children or adults in natural settings. The observer can observe the behaviour of children but they cannot see the observer.
   - **participant observation:** It is the kind of observation in which the observer becomes the part of the group which he wants to observe. He establishes perfect rapport with the group of children or adolescents so that they may not become conscious of his presence and may not hide their actual behaviour.
6. Some of the limitations of observation method are:
   - Observation is useful only for collecting data about overt behaviour which is manifested in a number of activities. This overt behaviour does not provide reliable information regarding the internal mental process.
   - Subjectivity of interpretation is another limitation of observation. The observer may interpret his sensations of external stimulus on the basis of his past experiences. He may be biased in his interpretation by his likes, dislikes and values, etc. It also suffers from impressionism, prejudice and distraction, etc. It has also been found in some studies that strong personal interests tend to make the researcher see only those things which he wants to see.
   - The method of observation leaves the matter of accounting for the facts “How and why” side of interpretation of data.
   - Observation is subjected to two kinds of errors, sampling error and observer’s error. The first error occurs because of inadequacies of selecting the situation to be observed. Observer’s error may be due to the knowledge and background of the situation to be observed.

7. Experimental method has been developed in psychology by the continuous efforts of psychologists to make an objective and scientific study of human behaviour. One of the major contributions of behaviourism is the development of experimental method to understand, control and predict behaviour. The experimental method is considered to be method par excellence for use in certain areas of educational psychology. It is the most precise, planned, systematic and controlled observation. According to some psychologists, only experiments make possible controlled observation, variation of factors, perfect quantification and rigorous objective checking of hypotheses.

8. Correlation means association - more precisely it is a measure of the extent to which two variables are related. If an increase in one variable tends to be associated with an increase in the other then this is known as a positive correlation. An example would be height and weight. Taller people tend to be heavier.

4.7 SUMMARY

- Introspection is an important method of collecting data that has been used from the beginning of psychology as a separate subject. This is the easiest method and is readily available to the individual.
- Influence of preconceptions is always there in introspection. It has the danger of being biased and rendered unreliable even in adults, when they are at
such a level of mental development that they would unconsciously put in personal knowledge in introspection.

- With the development of psychology as an objective science of behaviour, the method of introspection was replaced by careful observation of human and animal behaviour to collect data by research workers. Observation literally means looking outside oneself.

- Observational studies are particularly very important and yield significant results on developmental characteristics of children. No doubt, observation is a scientific technique of collecting data whose results can be verified and relied upon to locate behavioural problems of different types but it suffers from some limitations.

- In recent years improvements have been made in the method of observation to make it a more objective and reliable instrument of collecting data for research purposes.

- Observation is not a haphazard activity. It is a systematic and scientific method which requires skills, competencies, aptitude, and proper training for observers. The investigator before starting observation, must acquire the broad background in the field of his problem.

- Experimental method has been developed in psychology by the continuous efforts of psychologists to make an objective and scientific study of human behaviour. One of the major contributions of behaviourism is the development of experimental method to understand, control and predict behaviour. The experimental method is considered to be method par excellence for use in certain areas of educational psychology.

- There are many problems in educational psychology on which research cannot be conducted in laboratory set-up. Such problems are studied in actual classroom situations. A variety of experimental designs have been developed by researchers in recent years.

- Experimental designs can be divided on the basis of two important factors: the control procedure and the number of groups involved in an experiment. The type of control employed in an experiment plays an important role in determining the reliability and validity of the conclusions drawn from the experiment.

- Experimental method is the most systematic procedure of solving problems. It provides reliable information. Research is conducted under rigorously controlled conditions. The major advantage is the ability of the experimenter to control the application and withdrawal of independent variables.

- The Gestalt psychologists criticise the experimental method because of its quantification aspect. They criticise the inappropriate, imprecise and faulty apparatus of psychologists. It is not possible to construct tools that will
make accurate and sufficiently discriminating measurements of individual differences.

- If an increase in one variable tends to be associated with a decrease in the other then this is known as a negative correlation. An example would be height above sea level and temperature. As you climb the mountain (increase in height) it gets colder (decrease in temperature).

### 4.8 KEY WORDS

- **Ebbinghaus’ experiments**: Hermann Ebbinghaus was a German psychologist who pioneered the experimental study of memory, and is known for his discovery of the forgetting curve and the spacing effect.
- **Gestalt psychology**: Founded in the 20th century, it provided the foundation for the modern study of perception. Gestalt theory emphasizes that the whole of anything is greater than its parts. The word Gestalt is used in modern German to mean the way a thing has been “placed,” or “put together.”

### 4.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

#### Short Answer Questions

1. Enumerate the efficacy of introspective method.
2. What was Gestalt psychologists’ objection on introspective method?
3. State the significance of participant observation in observation method.
4. Write a brief note on affecting improvement in the method of observation.
5. What is experimental design in experimental method?
6. State the limitations of experimental method in educational psychology.
7. Write a note on the role of correlation method.

#### Long Answer Questions

1. Discuss the main characteristics introspective method.
2. Analyse some serious objections against introspection.
3. Write a comprehensive note on the study of overt behaviour.
4. Enumerate the role of natural observation to gauge the behaviour of students.
5. Discuss in detail the application of laboratory experiment for studying some problems.
6. Elaborate in detail the limitation of experimental method in educational psychology.
7. Discuss correlation method with the relevant references.

4.10 FURTHER READINGS

UNIT 5 METHODS OF ASSESSMENT IN PSYCHOLOGY-II

Structure
5.0 Introduction
5.1 Objectives
5.2 Case Study Method
5.3 Clinical Method
5.3.1 Genetic Method
5.4 Interview Method
5.5 Survey Method
5.5.1 Possible Sources of Errors
5.6 Rating Scales
5.7 Checklists/Questionnaires and Psychological Tests
5.8 Cross-cultural Method
5.9 Answers to Check Your Progress Questions
5.10 Summary
5.11 Key Words
5.12 Self Assessment Questions and Exercises
5.13 Further Readings

5.0 INTRODUCTION

Collecting detailed information on the behaviour problems is an integral part in making assessment in psychology. In the case history method the environmental and heredity factors which effect the personality of the subject under study are minutely analysed. However, the case history method requires experienced handling by experts. The main objective of clinical method is to study individual case or cases of group to detect and diagnose their specific problems and to suggest therapeutic measures to rehabilitate them in their environment. To collect complete data pertaining to a case it utilizes various techniques to compile relevant information which has some direct or indirect bearing on the specific problems of the case.

Although there are various sources of information in preparing a clinical case study, there are limitations of clinical case study. Both longitudinal and cross-sectional approach are used in developmental case study. The field of genetic psychology may apply to the living world as a whole, to the human species, or to the individual human being.

One important method to collect information about the various factors about personality by face to face contact with the subject whose personality is being
assessed. It gives an opportunity for mutual exchange of ideas and information between the subject and the interviewer. There are three broad categories of survey method which share the common feature of carrying out their observations on samples of individuals which are regarded as representative of the larger population to which they belong. However, there is a possibility of committing errors in this method.

The rating scales is yet another personality assessment technique. In rating scales the subjects are given an item and then they are asked to select from a number of choices. The rating scale has multiple choices which represent degrees of a particular characteristic. Then there is the role of questionnaires which are used to gain information about traits like introversion, extroversion, sociability, etc. The advantage of the questionnaire method is that it can be simultaneously used on a number of subjects.

This unit aims at analysing the various methods of assessment in psychology a comprehensive way and analyses how these methods works.

5.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand various methods of assessment in psychology
- Explain the role of case study method
- Enumerate sources of information in preparing a clinical case study
- Discuss the various approaches in developmental case study
- Explain the genetic method
- Analyse the broad categories of survey
- Understand the role of rating scales
- Analyse the use of questionnaires and checklists
- Enumerate cross-cultural method

5.2 CASE STUDY METHOD

In the case history method the facts about the life of the individual whose personality is to be studied are collected. In the case history method the environmental and heredity factors which effect the personality of the subject under study are minutely analysed. This method is used for studying abnormal people because the information about all the facts helps in analysing the factors which are responsible for abnormal behaviour. The case history method requires experienced handling by experts.
5.3 CLINICAL METHOD

The clinical method is primarily used to collect detailed information on the behaviour problems of maladjusted and deviant cases. The maladjustment may be in the form of anti-social behaviour, emotional disturbances or in the area of learning and backwardness in school subjects. The main objective of clinical method is to study individual case or cases of group to detect and diagnose their specific problems and to suggest therapeutic measures to rehabilitate them in their environment. To collect complete data pertaining to a case it utilizes various techniques to compile relevant information which has some direct or indirect bearing on the specific problems of the case. The case is studied intensively in temporal sequence from birth of the individual to the present manifestation of the behavioural problems in overt activities. The objective of the clinician is to delve deep into the unconscious of the individual to pinpointedly locate the underlying causes of maladjustment and to suggest remedial measures. The complete and detailed study of a case may involve the use of observation, interview, medical examination and use of various tests of intelligence, personality, aptitude and interest, etc. The clinician collects the material about the case in totality. Past and present experiences, conditions in home, school and society are given due importance. Information from all sources is pooled together in a sequential order to prepare a comprehensive case history and locate the causes of maladjustment. Clinicians generally use two different procedures to develop a case study which are described in brief as follows:

A. The Clinical Case Study or Case History

This method is specifically followed in learning difficulties, emotional disturbances, delinquency and other behaviour problems. This technique has been borrowed from medical science in social science. The psychologist or the teacher collects detailed information on the problems of a maladjusted or deviant case and analyses and interprets the data to find out the causes of the problem. The complete information of past history and present condition is collected. The developmental history is reconstructed from the memories of the case (individual), his family and friends. The preparation of a case study is not the work of a single individual but the combined venture of social worker, teacher, parents, medical man and psychologist. In preparing a clinical case study the information is collected from the following sources:

1. Preliminary information: Name, age, sex, parents’ age, education, occupation, income, number of children, social status.
2. Past history: Condition of mother during pregnancy, any incident-child’s development after birth-physical, mental, emotional, social-illness, relation between parents and other members of the family, achievement of the child, parents’ death, birth order, etc.
3. Present condition: The information may be collected under the following heads:
   (i) Physical. Results of medical examination of any diseases.
   (ii) Mental. I.Q., special abilities, general intelligence.
   (iii) Social. Home environment, friends and their types, social environment in school, home and neighbourhood.
   (iv) Emotional. Anxiety, fear, temperament, attitude, etc.
   (v) Interest. Personal, social, vocational and special aptitude.
   (vi) School achievement. Position in school, failure, special achievement, etc.

   We have given above a tentative list of various sources from which information may be collected to prepare a case history. The sources of information can vary in individual cases depending upon the type of behaviour problems of the case. Briefly we can summarize that case study method helps to understand the root causes of maladjustment and is a very valuable method in suggesting remedial measures for the rehabilitation of maladjusted cases.

**Limitations of Clinical Case Study**

1. In the preparation of a case study, the clinician collects descriptive account of the individual from his past lift and present experiences. The accounts given by the individual, parents and friends may or may not be true since all the disadvantages of crude observation and anecdotal report are involved. The information is not verifiable and is highly subjective. In India, parents, particularly illiterate, hide the defects and problems of their children and exaggerate their qualities if there is any. Information supplied by them may hardly be relied upon to reach some definite conclusions. The veracity of the subject, his memory, embellishments of vivid details and so on can influence the case history.

2. Complex behaviours are observed under complex conditions, some of them in the past, and in spite of his clinical insight the observer has no guarantee from his procedure that the events and the uniformities observed are relevant and crucial ones. Some striking aspect of the case may distract his attention away from others that may be more critical but less spectacular and there is nothing inherent in the method to prevent this error.

3. The third limitation involves the question of theoretical interpretation of the data. The clinician sets the stage for his investigation according to the theoretical position he espouses (Freudian vs Rogerian) and often has to make his interpretation after the event of observing. Since his observation is likely to be coloured by his theoretical preference, so, too are the conclusions.

4. The procedure is largely intuitive and impressionistic. Interpretations may depend on the aspects of the case that make a bigger impact on the observer.
as positive instances. There is nothing about the method to minimize the common sources of errors.

B. Developmental Case Study

In developmental case study or genetic method, as it is usually called, two approaches are generally followed to collect the data:

1. Longitudinal approach: In this approach we select a sample of children (from birth to maturity or of any specific age level) and observe their developmental characteristics continually from year to year. Ideally it would necessitate observation for 24 hours a day, year in and year out, but in practice this is not possible for the clinician to devote so much time to record observation. Developmental studies on animals have been conducted but their results cannot be generalized for human beings. Continuous developmental studies are time-consuming; so psychologists record substantial segments or sampling of behaviour throughout the principal developmental periods of the child. Tests are applied and assessment is made at regular intervals. This technique can be used to study physical, mental, language, interest, emotional, and social developmental characteristics of children.

2. Cross-sectional approach: The second approach is cross-sectional in which we select sample from different age levels to study specific aspects of development. For example, we can study reading interests, play activities or emotional and social characteristics of children of different ages. Both approaches have their advantages and disadvantages.

5.3.1 Genetic Method

The field of genetic psychology is the study of the formation and transformation of the psyche. It may apply to the living world as a whole, to the human species, or to the individual human being. When applied to the entire living world, one of the basic problems of genetic psychology is to discover or to define the origins of mental life - for to accept the thesis of an initial and continuous coexistence of mental life and life in general is impossible. The psyche's contribution to the living organism's behaviour is what enables it to transcend the limiting conditions of the immediate moment by introducing new factors-including the record or trace of earlier experiences. Thus the faculty which retains experience has sometimes been looked upon as the starting point in the development of the psyche. However, the modification of living matter or of its reactions by its own past is a phenomenon of biological plasticity so common that it cannot be said to be of a psychical nature per se. This phenomenon may occur at levels no higher than those of ordinary adaptation, routine, passive behaviour and fixed capacity with no intrinsic potential for development. The mental faculty of memory must be a more complex one; it must be able to be enriched by evocative associations that lend a greater power of discrimination in the face of varied situations.
5.4 INTERVIEW METHOD

Interview method is collecting information about the various factors about personality by face to face contact with the subject whose personality is being assessed. It gives an opportunity for mutual exchange of ideas and information between the subject and the interviewer. The interviewer tries to have an appointment with the person who is to be assessed.

The interview can either be structured or unstructured. The structured interview is that when the interviewer clearly plans the questions that have to be asked. The limitations of this method of collecting information is that it may have the subjective bias of the interviewer. It is also very time consuming. The advantage of this method is all the questions are answered by the subject.

5.5 SURVEY METHOD

Differential method is used to study individual differences among students. Studies in the field of educational psychology make extensive use of the statistical survey which is based on the sampling by direct observation. This method makes use of various techniques of collecting data such as tests, questionnaire, observation, interview and use of statistics in analysing the data.

There are three broad categories of survey method which share the common feature of carrying out their observations on samples of individuals which are regarded as representative of the larger population to which they belong. The three categories are as follows:

1. The field study: A field experiment may be defined as a scientific investigation carried out in the field which involves the direct manipulation of some independent variables. The field study is conducted in natural classroom teaching-learning situations spread over a wide area. Developing programmed material can be cited here as an example. The programmed material at its initial stage is tested on an individual and a small group of
NOTES

2. **Developmental survey:** The developmental survey and developmental clinical case-study though appear to be alike but they differ in their purpose. Clinical method (case study) does it for the individual whereas developmental survey studies do it for the typical patterns of change in the growth and decline of behaviour over a specific period of life-span of a group or whole population. Developmental surveys may be longitudinal or cross-sectional. We can study the development of intelligence in culturally disadvantaged children from birth to five years using either longitudinal or cross-sectional methods of study.

3. **Differential survey:** O’Neil refers two examples of differential surveys which he describes as: “Those concerned with establishing typical differences between individuals and between classes of individuals.” The study conducted by Klineberg into differences in intelligence between racial and national groups in Europe comes under differential survey.

5.5.1 **Possible Sources of Errors**

1. **Sample error:** Sometimes samples are not true representatives of the population. When the samples are biased, the results of the sample measured would not be true for the whole population.

2. **Inadequacy of test content:** The sample of items and behaviour may also be inadequate. This is particularly true of mental and personality tests. If the psychometric criteria of a reliable measuring instrument are not fulfilled, reliable results can scarcely be expected.

3. **Non-cooperation of subjects:** The most significant source of error is lack of co-operation of the subjects. Sometimes answers to the questions are not honestly given.

**Check Your Progress**

6. Enumerate the role of survey method.
7. List the broad categories of survey method.

**5.6 RATING SCALES**

The other personality assessment technique is rating scales. In rating scales the subjects are given an item and then they are asked to select from a number of choices. The rating scale has multiple choices which represent degrees of a particular characteristic.
The individuals do self-reporting. A manager, for example, might be asked to rate his supervisors on the degree to which the behaviour of each reflects leadership capacity, shyness, or creativity. Peers might rate each other along dimensions such as friendliness, trustworthiness and social skills.

For example, if we want to rate the members of a group on the basis of leadership qualities. We can have divisions of this quality into degrees such as very good, good, average, poor, very poor, etc. If these divisions are arranged in equal intervals from high to low or from low to high, it will be termed as rating scale. Rating can be on five or seven point scale. The individuals are rated on this scale according to the degree of leadership they possess. The rating scales may have some type of subjective bias. An individual may be rated on the basis of first impression than his actual potentials.

An example of a five point scale is

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Good</td>
<td>Average</td>
<td>Below average</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Another example is to find social adaptability for this different measures are taken like On 5 it fully at ease in group that means excellent on social adaptability, on 4 it is usually at ease that is above average in social adaptability, average score of 3 means just able to adjust in a group, the score of 2 is below average and means not at ease, score of 1 is poor which means unable to adjust to a group.

**Fig. 5.1 Rating Scale for Social Adaptability**

The rater, in a rating scale, has to have a complete knowledge of all members of the group so that he can make more or less accurate comparative judgements. The rater then constructs the rating scale in such a way that he can make a fair valuation of the subject that indicates possession of different degrees of a particular trait.

Numbers from 3 to 1, 5 to 1, 7 to 1, or 10 to 1, are used to indicate these degrees. Further, the rater assigns a descriptive phrases below all numerical value.

More frequently, a 5-point scale (5 to 1) is adopted since it facilitates a considerable discrimination between the rates in a group. This scale is relatively simple to administer and rate. The 3-point scale is turns out to be quite rough since it does not allow accurate rating whereas a scale that has points in excess of 5 demands fine discrimination. Usually making an accurate and fine discrimination of this degree becomes difficult for the rater.
The value of the appraisal of a respondent's traits by qualified raters is dependent on the unambiguity and certainty of statement of the items listed. This is important because many times the items are too ambiguous or too comprehensive.

Rating scales includes qualitative description of limited aspects of an individual's traits. It is not always easy to ensure objective rating. On encouraging the rater to rate an individual objectively, honestly, accurately and strictly in relation to other members of the group to which the individual belongs, it can be ascertained to some degree. A rating scale includes rating an individual on the traits which others (especially the raters) are in the know of.

To put it in simple terms, as a technique of personality assessment, the rating scale must be used for traits that are distinctly social.

The following precautions need to be taken so that rating scales are reliable:

1. Rating should be done by qualified and trained raters under controlled conditions.
2. The rater should ensure trait acquaintance. In that he/she should not restrict the observation to merely knowing the ratee but should observe the ratee under situations related to the trait to be rated.
3. For ruling out the raters' individual bias, an average of ratings by two or more observers should be adopted.
4. To ensure that the rater is clear about his task, the instructions to the raters must be precise and the definitions of the traits must be clearly stated on the rating scale.
5. The 'halo effect' associated with the rater should be done away with.
6. The rater should try and overcome the 'generosity error'. Simply put, the rater should not assign an average rating to the ratee even though he finds the latter to be poor, or conversely, if the rater is impressed by the ratee, the former need not give the latter an excellent if he/she really doesn't deserve it.

The rating scale suffers from many drawbacks and weaknesses, which cannot be completely eradicated. Therefore, psychologists suggest that the use of the rating scale should be done to supplement other techniques rather than using them as an independent tool.

**Check Your Progress**

8. Explain the function of rating scales.
9. List some of precautions which we need to take to make rating scales reliable.

**5.7 CHECKLISTS/QUESTIONNAIRES AND PSYCHOLOGICAL TESTS**

Questionnaire is widely used to collect the information about the personality of a person. According to Goode and Hatt, 'in general the word questionnaire refers
to a device for securing answers to questions by using a form which the respondent fills in himself.

It is a list of selected questions which have to be answered as yes or no or not sure or cannot say. Questionnaires are used to gain information about traits like introversion, extroversion, sociability etc. The advantage of the questionnaire method is that it can be simultaneously used on a number of subjects. It is less time consuming and less costly method for collecting information.

The Woodworth personal data sheet is relied upon as a prominent questionnaire. It was used extensively in processing world War-I recruits. It is a set of questions relating to symptoms assumed important by psychiatrists for diagnosing enuresis, daydreaming, etc. This tool was appreciated for its effectiveness in detecting maladjusted soldiers. Moreover, adequate individual interviews were found totally impracticable in war time therefore this tool was all the more appreciated. Among the traits examined more often were neurotic introversion-extroversion and dominance. Items were selected on the basis of the measurement of each trait. 'Do you worry for neurotic tendency' 'Do you lead a group for dominance', and so on. The subject was asked to record the answer that was the most nearly correct in his case.

However, answering a question simply with a 'yes' or a 'no' may not always be easy; it is, more often than not, difficult. This difficulty is obviated to some extent by the method adopted in the Bernreuter personality inventory in which the subject is given three choices: Yes, No and Sometimes.

Do you often feel just miserable? Yes/No
Do you usually prefer to work with others? Yes/No.
Such questions are asked.
Where the subject is unable to decide, he has to tick the third choice.

Psychological Tests

Psychological tests are designed to be 'an objective and standardized measure of a sample of behaviour'. Some of these tests are discussed below.

In the Pressey X-O test, the aim of the study is hidden from the subject. The test consists of 25 questions. Each question further has five words or phrases. The subject is required to strike off certain words (Crow and Crow, 1964).

Two sample items are given here:

1. Cross out everything you think is wrong: begging, smoking, flirting, spitting and giggling.

2. Cross out everything you like or are interested in: fortune-telling, boating, beaches, mountains and vaudeville.

The subject's answers or the way he or she reacts to these words helps make definite conclusions regarding his or her traits.
Another test is the Allport and Allport A-S reaction study that aims at measuring the extent of an individual's ascendance or submission. The questions in this test appear as follows:

Have you ever turned your face away from something to avoid seeing it?
Frequently/occasionally/never.

One of the given three answers is to be ticked.

The Downey will-temperament test takes handwriting as a determining factor. It is a type of performance test. In this test, the subject needs to tell about his customary modes of behaviour by the manner in which he responds to the instructions provided. For example, the subject may be asked to write 'United States of America' on a given line, few inches long. Conclusion is based on the following factors: the number of letters that extend beyond the line, or the letters or words omitted. These factors are studied to determine a specific personality trait. Further, individual is made to write a sentence at his own normal speed and then at a faster rate. The difference between the two speeds shows freedom from inhibitions. The subject's ability to change writing speed as per requirement indicates how flexible he is. His ability to write several words on a line measuring about an inch long indicates his ability to control and manage his instincts.

This test is appreciated as being innovative but complex. Scoring is also difficult. No one quality like hand-writing can show personality trends adequately and hence the inadequacy of this test (Crow and Crow, 1964, p. 202).

In most of the questionnaires, the individuals may be aware of the desired response and give it, however, the given response may not conform to the subject's behaviour in real life situations. For instance, a probe that is part of the Thurstone personality schedule is 'Are your feelings easily hurt?'

This can be called a good question if the individual answers it honestly. Not everyone wishes to reveal his emotional character to others. Further, many individuals are emotional about criticism but they do not accept the truth that they have this quality. On the contrary, they are keen on believing that unfavourable comments by others are unjust and are lies.

### 5.8 CROSS-CULTURAL METHOD

Cross-cultural psychology is a branch of psychology that looks at how cultural factors influence human behavior. While many aspects of human thought and behavior are universal, cultural differences can lead to often surprising differences in how people think, feel, and act. Some cultures, for example, might stress individualism and the importance of personal autonomy. Other cultures, however, may place a higher value on collectivism and cooperation among members of the group. Such differences can play a powerful role in many aspects of life.
Cross-cultural psychology is also emerging as an increasingly important topic as researchers strive to understand both the differences and similarities among people of various cultures throughout the world. The International Association of Cross-Cultural Psychology (IACCP) was established in 1972, and this branch of psychology has continued to grow and develop since that time. Today, increasing numbers of psychologists investigate how behavior differs among various cultures throughout the world.

### Check Your Progress

10. Enumerate the use of questionnaires.
11. What is the function of the Pressey X-O test?
12. What is the significance of cross-cultural psychology?

### 5.9 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The clinical method is primarily used to collect detailed information on the behaviour problems of maladjusted and deviant cases. The maladjustment may be in the form of anti-social behaviour, emotional disturbances or in the area of learning and backwardness in school subjects. The main objective of clinical method is to study individual case or cases of group to detect and diagnose their specific problems and to suggest therapeutic measures to rehabilitate them in their environment.

2. In preparing a clinical case study the information is collected from the following sources:
   - Preliminary information: Name, age, sex, parents’ age, education, occupation, income, number of children, social status.
   - Past history: Condition of mother during pregnancy, any incident-child’s development after birth-physical, mental, emotional, social-illness, relation between parents and other members of the family, achievement of the child, parents’ death, birth order, etc.
   - Present condition: The information may be collected under the following heads:
     - Physical: Results of medical examination of any diseases.
     - Mental: I.Q., special abilities, general intelligence.
     - Social: Home environment, friends and their types, social environment in school, home and neighbourhood.
     - Emotional: Anxiety, fear, temperament, attitude, etc.
     - Interest: Personal, social, vocational and special aptitude.
(vi) School achievement: Position in school, failure, special achievement, etc.

3. In developmental case study or genetic method, as it is usually called, two approaches are generally followed to collect the data:

- Longitudinal approach: In this approach we select a sample of children (from birth to maturity or of any specific age level) and observe their developmental characteristics continually from year to year. Tests are applied and assessment is made at regular intervals. This technique can be used to study physical, mental, language, interest, emotional, and social developmental characteristics of children.

- Cross-sectional approach: The second approach is cross-sectional in which we select sample from different age levels to study specific aspects of development. For example, we can study reading interests, play activities or emotional and social characteristics of children of different ages.

4. The field of genetic psychology is the study of the formation and transformation of the psyche. It may apply to the living world as a whole, to the human species, or to the individual human being. When applied to the entire living world, one of the basic problems of genetic psychology is to discover or to define the origins of mental life - for to accept the thesis of an initial and continuous coexistence of mental life and life in general is impossible.

5. Interview method is collecting information about the various factors about personality by face to face contact with the subject whose personality is being assessed. It gives an opportunity for mutual exchange of ideas and information between the subject and the interviewer.

6. Studies in the field of educational psychology make extensive use of the statistical survey which is based on the sampling by direct observation. This method makes use of various techniques of collecting data such as tests, questionnaire, observation, interview and use of statistics in analysing the data.

7. There are three broad categories of survey method which share the common feature of carrying out their observations on samples of individuals which are regarded as representative of the larger population to which they belong. The three categories are as follows:

- The field study: A field experiment may be defined as a scientific investigation carried out in the field which involves the direct manipulation of some independent variables. The field study is conducted in natural class-room teaching-learning situations spread over a wide area.

- Developmental survey: The developmental survey and developmental clinical case-study though appear to be alike but they differ in their
purpose. Clinical method (case study) does it for the individual whereas developmental survey studies do it for the typical patterns of change in the growth and decline of behaviour over a specific period of life-span of a group or whole population.

- Differential survey: The study conducted by Klineberg into differences in intelligence between racial and national groups in Europe comes under differential survey.

8. The other personality assessment technique is rating scales. In rating scales the subjects are given an item and then they are asked to select from a number of choices. The rating scale has multiple choices which represent degrees of a particular characteristic.

9. The following precautions need to be taken so that rating scales are reliable:
   - Rating should be done by qualified and trained raters under controlled conditions.
   - The rater should ensure trait acquaintance. In that he/she should not restrict the observation to merely knowing the ratee but should observe the ratee under situations related to the trait to be rated.
   - For ruling out the raters' individual bias, an average of ratings by two or more observers should be adopted.
   - To ensure that the rater is clear about his task, the instructions to the raters must be precise and the definitions of the traits must be clearly stated on the rating scale.
   - The 'halo effect' associated with the rater should be done away with.
   - The rater should try and overcome the 'generosity error'. Simply put, the rater should not assign an average rating to the ratee even though he finds the latter to be poor, or conversely, if the rater is impressed by the ratee, the former need not give the latter an excellent without him/her really deserving it.

10. Questionnaires are used to gain information about traits like introversion, extroversion, sociability etc. The advantage of the questionnaire method is that it can be simultaneously used on a number of subjects. It is less time consuming and less costly method for collecting information.

11. In the Pressey X-O test, the aim of the study is hidden from the subject. The test consists of 25 questions. Each question further has five words or phrases. The subject is required to strike off certain words.

12. Cross-cultural psychology is also emerging as an increasingly important topic as researchers strive to understand both the differences and similarities among people of various cultures throughout the world. The International Association of Cross-Cultural Psychology (IACCP) was established in 1972, and this branch of psychology has continued to grow and develop since that time.
5.10 SUMMARY

- In the case history method the environmental and heredity factors which
  affect the personality of the subject under study are minutely analysed. This
  method is used for studying abnormal people because the information about
  all the facts helps in analysing the factors which are responsible for abnormal
  behaviour. The case history method requires experienced handling by
  experts.

- The objective of the clinician is to delve deep into the unconscious of the
  individual to pinpointedly locate the underlying causes of maladjustment
  and to suggest remedial measures. The clinician collects the material about
  the case in totality.

- The developmental history is reconstructed from the memories of the case
  (individual), his family and friends. The preparation of a case study is not
  the work of a single individual but the combined venture of social worker,
  teacher, parents, medical man and psychologist.

- Complex behaviours are observed under complex conditions, some of them
  in the past, and in spite of his clinical insight the observer has no guarantee
  from his procedure that the events and the uniformities observed are relevant
  and crucial ones.

- The field of genetic psychology is the study of the formation and
  transformation of the psyche. It may apply to the living world as a whole, to
  the human species, or to the individual human being.

- The interview can either be structured or unstructured. The structured
  interview is that when the interviewer clearly plans the questions that have
  to be asked. The limitations of this method of collecting information is that it
  may have the subjective bias of the interviewer. It is also very time consuming.

- Differential method is used to study individual differences among students.
  Studies in the field of educational psychology make extensive use of the
  statistical survey which is based on the sampling by direct observation. This
  method makes use of various techniques of collecting data such as tests,
  questionnaire, observation, interview and use of statistics in analysing the data.

- The other personality assessment technique is rating scales. In rating scales
  the subjects are given an item and then they are asked to select from a
  number of choices. The rating scale has multiple choices which represent
  degrees of a particular characteristic.

- Rating scales includes qualitative description of limited aspects of an
  individual's traits. It is not always easy to ensure objective rating. On
  encouraging the rater to rate an individual objectively, honestly, accurately
  and strictly in relation to other members of the group to which the individual
  belongs, it can be ascertained to some degree.
5.11 **KEY WORDS**

- **The Woodworth Personal Data Sheet**: It is commonly cited as the first personality test, developed by Robert S. Woodworth during World War I for the United States Army. It became widely used in psychological research and led to the development of many other personality tests.

- **The Bernreuter Personality Inventory**: This is a personality test developed by Robert G. Bernreuter in 1931 measuring general personality. It is sometimes cited as the first multi-scale personality questionnaire.

- **The Pressey X-O test**: It was a psychological test created in 1921 by Sidney L. Pressey. The test consisted of a list of words. A subject was instructed to cross out the words on this list that they felt had unpleasant meanings. It was meant to measure strength and content of emotional responses.

- **Downey Will-Temperament Tests**: The use of handwriting tasks to measure differences in temperament and/or personality.

5.12 **SELF-ASSESSMENT QUESTIONS AND EXERCISES**

**Short Answer Questions**

1. Enumerate the use of the case history method.
2. State the main objective of clinical method.
3. Give a brief insight into the technique in the clinical history case study.
4. Write a brief note on limitations of clinical case study.
5. What is cross-sectional approach in developmental case study?
6. Enumerate the limitation of interview method.
7. Write a note on the usage of Pressey X-O test.
8. State the role of cross-cultural psychology.

Long Answer Questions
1. Discuss the scope of the Clinical Case Study.
2. Analyse the various sources of information in preparing a clinical case study.
3. Write a comprehensive note on Developmental Case Study.
4. Enumerate the role of genetic method.
5. Discuss in detail the broad categories of survey.
6. Elaborate the functioning of rating scales.
7. Discuss the efficacy of the Downey will-temperament test.

5.13 FURTHER READINGS

UNIT 6 SENSORY PROCESS AND PERCEPTION

Structure
6.0 Introduction
6.1 Objectives
6.2 Sensory Channels and Processes
  6.2.1 Sensation: An Overview
  6.2.2 Structure of the Eye: Vision
  6.2.3 How We See
  6.2.4 How We Hear
  6.2.5 Thresholds
  6.2.6 Subliminal Perception
  6.2.7 Perception
  6.2.8 Characteristics of Perception
6.3 Answers to Check Your Progress Questions
6.4 Summary
6.5 Key Words
6.6 Self Assessment Questions and Exercises
6.7 Further Readings

6.0 INTRODUCTION

In psychology, measurement means converting the variables into quantitative values for interpreting the data collected. Psychologists often use correlation to establish relationships between variables. It is now scientifically acknowledged that our experience is drawn from our sense organs. We receive sensation from the eyes, ears, nose, tongue and the skin, which are our five sense organs. The sensations are divided into three types, organic sensation, motor sensation and special sensation. The sense organs collect the information from the stimulus around and send it to brain, the brain processes this information and tries to give it some meaning.

Every object which comes in front of the eye reflects special kind of light. The object brings about a chemical change in the eyes which is carried to a special part of the brain for information. Sensations includes the physical changes as well as changes in the mental processes. The light waves from the object enter into the eye through the pupil and pass through the lens. Many people are not able to see properly during the night. This condition is known as Night blindness. Such type of people suffer from a visual problem to adapt to the conditions of low illumination. They have acute problem with the rod cells in the eye.

The ear is a mechanical receptor of sensations. The ear can be divided into three parts, the external ear, the middle ear and the inner ear. The external ear is
that part of the ear which can be seen outside. A very thin membrane separates
the external ear from the middle ear. There are many theories about hearing. Piano
theory was developed by Helmholtz. He postulated that each element or hair cell
of the organ of corti responded to a specific vibration to which it is tuned much like
the string of a piano.

Perception is a process by which organisms select, organize and interpret
the stimulus in order to give meaning to the world around them. Perception is a
complex process because it is a combination of a number of sub processes. The
principles by which people organize isolated parts of a visual stimulus into groups
or whole objects are governed by laws of grouping.

This unit aims at discussing the sensory process and perception in psychology
in a comprehensive way and analyses how sensations work.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the measurement in psychology
- Analyse the meaning and significance of sensation
- Enumerate the parts of the structure of the eye
- Understand the hearing process
- Enumerate the various types of sensations: vision, taste, skin, smell, etc.
- Know the function of thresholds
- Understand perception and its sub-processes
- Analyse the main characteristics of perception

6.2 SENSORY CHANNELS AND PROCESSES

Measurement in psychology means converting the variables into quantitative values
for interpreting the data collected.

A researcher needs to plan his experiments as to know how he will collect
the data, treat the data and then discover the relationship between two types of
variables. One simple experimental design is when the researcher manipulates
independent variable and studies its effect on dependent variable.

Many statistical tools are used to understand the results of psychological
studies. Statistical analysis supports (or refutes) the researcher’s hypothesis; it can
also be used to determine if the findings are statistically significant. When results
are said to be statistically significant, it means that it is unlikely that these results are
due to chance. Sometimes psychologist use correlation to establish relationships
between variables. Whatever you experience is drawn from your sense organs. A
sense organ is also sometimes called as receptor. It is a specialized part of the body which is selectively sensitive to some types of changes in its environment and not to others. For example the eye is a receptor for sensation of light but it does not respond to sound. Similarly the person who cannot hear because of physical impairment will not respond to a loud sound.

According to Woodworth, ‘in general when you speak of sensation you are thinking of stimuli and investigating the relationship of the individual’s experience to various stimuli which reach his receptors and when you speak of perception you are thinking of objects how the individual’s experiences correspond with the objective facts.’

A stimulus is a mechanical, physical or chemical change that acts upon a sense organ. The reaction to the stimulus is called as response.

6.2.1 Sensation: An Overview

Sensations can be defined as the passive process of bringing information from the outside world into the body and to the brain. The process is passive in the sense that you do not have to be consciously engaging in a ‘sensing’ process. If a person is unable to organize or interpret the sensations then everything around will be jumbled.

So the sense organs collect the information from the stimulus around and send it to brain, the brain processes this information and tries to give it some meaning. There is not much difference between sensation and perception.

The process of detecting a stimulus, such as light waves (vision), sound waves (hearing), chemical molecules (smell and taste), heat or pressure (touch) is called as sensation. It is the first response of the organism to the stimuli. Different type of sensations have different traits. For example the motor, organic and spatial sensations have different characteristics which actually distinguishes them from each other. These different sensations have got different degree of strength and intensity. The intensity depends upon two factors the objective strength of the stimulus and the mental state of the individual.

We receive sensation from the eyes, ears, nose, tongue and the skin, which are our five sense organs. The sensation can be divided into three types, organic sensation, motor sensation and special sensation.

1. Organic sensations are those sensations which are because of internal organs. These sensations are not because of any external stimulation. Hunger is considered to be an organic sensation which occurs because of the contraction of walls of the stomach. Thus these type of sensations indicate that the internal condition of the body do not relate to the external stimulus present around us. Some type of organic sensations can be located, for example the burning sensation or cutting sensation, in which case the exact location of the sensation is known.
Sometimes one feels tired or restless or there is some amount of discomfort. In such conditions it becomes difficult to know the exact location of the sensation but it is assumed that the sensation is spread over the entire body.

2. **Special sensations** are those which are caused by the specific sense organs like eye, ear, nose, tongue and skin. These special sensations can be differentiated from each other. The source of the special sensations is external. They give information about the outside environment. It becomes easy to locate the special sensations but most of the times it becomes difficult to locate organic sensations. These special sensations are more intense in both the quality and the quantity than the motor or the organic sensations.

3. **Visual sensations** are only activated or stimulated because of the light waves. These type of sensations are experienced through the sense organ of eye. The visual sensations can further be classified into two types. These two types of visual sensations are sensation of brightness and sensation of colour. Colour sensation means identifying and differentiating four types of basic colours.

   A colour blind person does not identify these four basic colours which are blue, red, yellow and green.

   Every object which comes in front of the eye reflects special kind of light. The object brings about a chemical change in the eyes which is carried to a special part of the brain for information. Sensations includes the physical changes as well as changes in the mental processes.

**6.2.2 Structure of the Eye: Vision**

The structure of the eye includes the following:

i. **Cornea** – the cornea is a round and transparent area in the eye which allows light to pass into the eye. The amount of light is regulated by the pupil.

ii. **Lens** – the lens is a transparent structure in the eye that focuses light on the retina.

iii. **Retina** – the retina is another important part in the eye which is actually a inner membrane of the eye that receives information about light using rods and cones. The retina carries the information.

iv. **Fovea** – it is the most sensitive part of the eye in the daylight.

v. **Pupil** – pupil is the opening at the center of the iris which controls the amount of light entering the eye. It dilates and constricts. Constriction and dilation is controlled by the autonomic nervous system. The parasympathetic division of the brain controls the change in pupil size as a function of change in illumination.

vi. **Rods and Cones** – Rods are the visual receptors which help in the vision during the night. Rods are more than the cones. Rods are considered to be
6.2.3 How We See

The light waves from the object enter into the eye through the pupil and pass through the lens. The true receptor of the visual stimuli is the retina. The optic nerve is attached to the retina and serves as a medium for carrying the visual impulses to the nervous system. The retina has two kinds of receiving cells the rods and the cones. They are so named because of their shape. The cones are concentrated in the centre of the retina and the rod cells on the outer margin. The proportion of cone cells to rod cells decreases as you proceed from the centre to the outer edge of the retina. In the centre of the retina, there is a small depression which is referred to as fovea. This part is considered to be the point of greatest concentration and therefore the area of sharpest vision during the day light.

The rods are used for twilight vision or light of low intensity and can be used to make only the colourless discriminations. The cones are meant for day vision which are meant for low intensity and it also helps in viewing the colours.

i. Night vision and the Purkinje phenomenon

As discussed earlier for daylight vision humans rely on cone cells and for the night vision on rod cells. At twilight when day and night meet both the cone vision and rod vision function together. The eye adapts to discriminate colours as the day and night merge. At the first part of twilight one can still distinguish red, yellow green
and blue although they are not very bright. Then at a particular point of diminished light the colours start becoming bright. This change is called as Purkinje phenomenon.

**ii. Night blindness**

It is a common fact that many people are not able to see properly during the night. This condition is known as Night blindness. Such type of people suffer from a visual problem to adapt to the conditions of low illumination. They have acute problem with the rod cells in the eye. They have deficiency in the pigment layer of the retina which supplies a very important substance known as visual purple. This substance which is actually a chemical compound decomposes in the presence of light and recombines in darkness. Various types of chemical analyses have shown that the visual purple is dependent upon vitamin A for nutrition.

**iii. Blind spot and after images**

There is one point in the retina where there are neither cones nor rods. This spot is not sensitive to any light stimulation and is referred to as blind spot. This is the point where the optic nerve is attached to the retina. Another phenomenon related to visual sensation is known as after images. If a person keeps looking at a bright object and then it is suddenly removed then the person will continue to see images of the object. A person is apt to feel he is seeing things which are not there. Thus after image is the visual sensory experience which persists after the external stimulus has been removed. The longer the original stimulus, the stronger will be the after image. The explanation of after images is that the nerve impulses set up in the retina by a stimulus outlast the stimulus. This is because of the time gap between the period when the stimulus is removed and the time it takes to travel along the paths of the nervous system or conscious mental processes.

There can be two types of after images, positive after images and negative after images. In the positive after images the same kind of detail, brightness and colour of the original impression is experienced after the object is removed.

In the negative after images the colour or pattern which is complimentary to that of the original image is seen. The example of negative after image is, if you look at a pure black surface for some time then the negative after image will be white or grey.

**iv. Colour blindness**

The inability of some people to distinguish certain colours is called as colour blindness. The people who are colour blind cannot see red and green colour. They only see five colours. These five colours which colour blind people can actually see are yellow, blue, black, white and grey. All the green and red objects appear grey to them. The person who has a normal vision is referred to as trichromat because he can distinguish the three systems of colours light-dark, yellow-blue and red-green. An individual who cannot distinguish one of these systems is called as dichromat. A person who can only distinguish light and dark system is called as monochromat or totally colour blind.
It is believed that the colour blindness is because of some defect in the fovea.

v. Visual constancy: Visual depth perception
Perception is always oriented towards an object and not the sensory features which describe the object. When they receive things they are perceived as stable and permanent. So people start identifying things irrespective of the change in their colour, size or shape.

vi. Colour constancy: Constancy movement perception
The colour constancy refers to the tendency to see the colour of a familiar or known object as the same irrespective of the change in the actual light conditions. This means that the familiar objects retain their colour under a variety of lighting conditions. For example an individual having a white dog sees his dog as white whether in the bright sunlight, in very dim light or in yellow light. This person has in his memory the colour of his dog as white which contributes to colour constancy.

vii. Shape constancy
This refers to humans’ ability to see the shape of a familiar or known object as same irrespective of the change in the angle from which it is viewed.

viii. Auditory sensations are received through the ears. They are the reactions of the ear to the sound vibrations.

The ear is a mechanical receptor of sensations. The ear can be divided into three parts, the external ear, the middle ear and the inner ear. The external ear is that part of the ear which can be seen from outside. A very thin membrane separates the external ear from the middle ear.

The middle ear also has smaller parts which are known as the hammer, anvil and the stirrup. The middle ear is linked to the throat through the Eustachian tube. The inner ear is internal cavity of the ear.
6.2.4 How We Hear

Hearing occurs when sound acts as a stimulus to the auditory sense. Sound consists of alternative waves of condensation and rare fraction in the form of vibrations in the air. These are known as sound waves. Sound waves generally strike the tympanic membrane or eardrum. Just beside the eardrum is the middle ear which has three parts, hammer, anvil and stirrup. The inner ear connects with the middle ear by an oval shaped window into which is fitted the stirrup. The inner ear is filled with lymph fluids and contains a small snail like structure called the cochlea. This structure is very important for hearing. Just above the cochlea is a section called as the organ of corti which contains the minutely sensitive hair cells. These hair cells are considered to be the fundamental units of the auditory receptors like the cones or rods in vision.

There are many theories about hearing. Piano theory was developed by Helmholtz. He postulated that each element or hair cell of the organ of corti responded to a specific vibration to which it is tuned much like the string of a piano. Because of this fixed tuning different vibrations are distinguished as different sounds.

Other theory is called as wave pattern theory. According to this theory variable sounds qualities of pitch result from the combined action of many nerve fibres rather than any single element.

All the sound waves are not heard by the ear. The ear only responds to sound waves having a vibration frequency from 25 per second to 20,000 vibrations per second.

i. Taste sensations can be felt by the tongue. The tongue is equipped with taste cells grouped into taste buds and these are the receptors that receive the gustatory stimulus.

There are five basic taste sensations that can be distinguished by tongue alone. These are sweet, sour, bitter and salty plus the taste of metallic substances. There are different areas on the tongue for different types of tastes. Receptor cells for sweetness are concentrated near the tip of the tongue while those sensitive to bitter are towards the back. Sensitivity to sour occurs mostly along the sides of the tongue and salt seems to be uniform over the entire tongue. It is believed that if a person is having a bitter pill then he should place on the tip of the tongue so that it feels less bitter in comparison to when the pill is placed at the back of the tongue.

The taste receptors are microscopic hair cells within the taste buds. These taste receptors are situated in the papillae of the tongue, epiglottis and soft palate.

Taste is considered a chemical sense and requires a liquid solution for stimulation. Solids will not give any sensation of taste until the fluids of the mouth have dissolved them.
ii. **Olfactory sensations** are located in the nose. The nose detects the smell and sends it to the brain and odour is then perceived. Smell is also a chemical sense. The sense of smell gets activated when gaseous particles of a substance come in contact with the nasal fluids. The receptors of smell are spindle shaped cells embedded in the olfactory tissues, which are connected to the olfactory nerve. Smell is directly connected to the brain. The receptors in the nose which are present in the olfactory epithelium of each nasal cavity are directly connected to the olfactory bulbs of the brain which are positioned just below the frontal lobes in the brain. The olfactory bulbs are also connected to the olfactory cortex on the inside of the temporal lobes and are there till the neighbouring cortex.

One important characteristic of the sense of smell is that it is adaptable. For example if you come across a very unpleasant smell, this smell seems unbearable at first but the nose adjust to it after some time. It has been found that after a brief period of intense stimulation most of our sense organs does not show much response. This characteristic of adaptability of the olfactory sensation is a natural protective mechanism.

iii. **Skin sensations**: The skin detects the sensation of pressure, warmth, cold and pain. There are specialized nerve endings which react to a specific type of stimuli for each type of cutaneous or skin sensation. Different parts of the body have different degrees of sensitivity for the various stimuli. Some parts are more responsive to touch, others to pain, some to heat and some to cold. The fingertips and the lips are the two most responsive parts to touch or pressure. The fingertips are also responsive to pain. One square centimeter on the tip off the finger is reported to have sixty pain spots. In a similar manner it is found that the cornea of the eye has many pain spots but no touch spots.

The specialized receptor nerve endings are located deeper in the skin tissue. When the skin feels the sensation of pain because of pinching, pricking or cutting then the stimulation goes below the general protective layer of skin. When the skin is exposed to extreme heat or cold then it penetrates into the skin and there is sensation of pain.

The internal organs inside the body are also more or less insensitive to pain.

iv. **Motor sensations**: These sensations are related to motion. Pulling and contractions are types of motor sensations. They are caused by the muscles, tendons and joints. The brain receives the information from these sensations through the sensory nerves. Motor sensation cause pressure on the skin.

The sensory impulses from muscles, tendons and joints which control the coordination of body movements is called as kinesthetic sense. Thus it may be referred to as the awareness of body movements. Nerve endings from the muscles, tendons and joints connect with the nerve pathways to
various parts of the brain for registering kinaesthetic sensations. These sensations are used from muscles and tendons as cues for performing many activities. These type of sensations usually give conscious attention to the responses of our muscle and tendon senses.

The kinaesthetic sense mechanism helps in maintaining muscle control. The process of integrating, organizing and interpreting sensations is called as perception. There can be no differentiating point between sensation and perception. But sensation is a physical process and perception is a psychological process. Psychologically, sensation is the act of receiving a stimulus by a sense organ. Perception is the act of interpreting a stimulus registered in the brain by one or sense mechanism.

Psychophysics can be defined as the study of how physical stimuli are translated into psychological experience.

In order to measure these events, psychologists use thresholds.

6.2.5 Thresholds

Threshold is a dividing line between what has detectable energy and what does not.

There can be two types of thresholds:

- Absolute Threshold
- Differential threshold

- Absolute Threshold

The absolute threshold is the smallest possible strength that can be detected. Each sense receptor like eye, ear or nose requires some minimum level of energy to exist before perception is organized, this minimum level of energy is called as absolute threshold. For example the absolute threshold for vision is the smallest amount of light that can be detected which is estimated to be a single candle flame about 30 miles (48 km.) away on a perfectly dark night.

For hearing the absolute threshold value is the sound of tick of a watch under quiet conditions at 20 feet. For taste it is one teaspoon of sugar in two gallons of water. For smell it is one drop of perfume diffused into the entire volume of six room apartment. For touch the absolute threshold is a wing of a fly falling on your cheek from a distance of 1 centimeter.

- Differential Threshold

Differential threshold is also a statistical quantity, it is the smallest amount by which two stimuli must be different so that they can be perceived differently. It is the smallest difference, which can be discriminated between two stimuli. The more intense the stimulus the more amount of change is required for noticeable difference. The minimum difference. Threshold is computed by Weber’s law, which states that each sense varies according to a constant. For example, the constant for
hearing is 5 decibels; in order to notice the difference between two sounds one has to be higher or lower by 5 decibels. Weber’s constant for vision is 8 percent, so to notice any change in the light of 100 candles, 8 more candles have to be added. The difference threshold is also called the just noticeable difference (JND).

6.2.6 Subliminal Perception
Subliminal Perception refers to any situation in which the unnoticed stimuli are perceived. Subliminal perception is said to occur when stimuli presented below the threshold or line of awareness and influence thoughts, feelings or actions.

For example, evidence suggests that surgical patients who undergo general anaesthesia may have some memory for events which occurred during the surgery if their memory is assessed via indirect methods. Subliminal perception is supposed to occur when a stimulus is too weak to be perceived, yet a person is influenced by it.

6.2.7 Perception
Perception is a process by which organisms select, organize and interpret the stimulus (People, places, objects and situations) in order to give meaning to the world around them. When you see a flower sensation of colour, smell, touch are aroused and meaning is given to this and the object is perceived as a flower.

Perception is a complex process because it is a combination of a number of sub processes. These are as follows:

i. **Receptor process** - the first process involved in the process of reception is the receptor process. For example the rose stimulates three receptor cells and three different receptor processes of eye, nose and touch.

ii. **Unification process** – for perceiving rose, unification of all the three sensations are required.

iii. **Symbolic process** - every object reminds of something, and so a symbol is attached to it. Every time the rose is perceived the symbol gets associated with it.

iv. **Affective process** - every object also represents some emotions, pleasant or unpleasant. Thus it is concluded that perception is a complex process and involves sensations and past experience.

It is important to understand that how the selection of stimulus takes place. The principles by which people organize isolated parts of a visual stimulus into groups or whole objects are governed by laws of grouping.

6.2.8 Characteristics of Perception

The main characteristics of perception are as follows:

1. Unity and continuity
2. Attention
3. Persistency with varied efforts
1. **Unity and continuity**: If the sensations are scattered then perception is not possible because in that case it will lack meaning. Take the example of an apple as an object which includes the sensation of color, taste, smell which are not separated, there is unity and continuity in the sensations which helps us to perceive an apple.

2. **Attention**: Perception means giving meaning to the sensations. Closeness of the sense organs and the objects may not result in perception because no attention was given to it.

3. **Persistence with varied efforts**: For understanding complex things the perceiver has to constantly change his efforts. If for example some new or unfamiliar thing is perceived by the subject then he would like to know more about that. He would like to touch it, smell it and sometimes taste it in order to understand it better. These changing perceptions have a unity and persistency.

4. **Adapting to varying circumstances**: In some cases of perception the sensations keep on changing. For example a football player has to keep track of his opponent and also adapt himself according to the strategies of his opponent.

5. **Learning by experience**: A person learns to perceive unfamiliar or new things by learning. A person who has never seen a plane in the sky cannot perceive it. If he once sees it, then he will be able to recognize the sensation and identify it as a plane.

6. **Reproduction in perception**: Reproduction of past experience and connecting with present sensations result in perception.

**Check Your Progress**

1. What do you mean by measurement in psychology?
2. Enumerate the meaning of sensation.
3. List the type of the sensation.
4. List the various parts of the structure of eye.
5. State the process which leads us to see things.
6. Enumerate the meaning of night blindness.
7. What do you mean by colour blindness?
8. How does hearing occur?
9. Explain the various sensations.
10. What is the role of thresholds?
11. Enumerate the process of perception.
12. List the sub processes which form the perception.
6.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Measurement in psychology means converting the variables into quantitative values for interpreting the data collected. A researcher needs to plan his experiments as to know how he will collect the data, treat the data and then discover the relationship between two types of variables. One simple experimental design is when the researcher manipulates independent variable and studies its effect on dependent variable.

2. Sensations can be defined as the passive process of bringing information from the outside world into the body and to the brain. The process is passive in the sense that you do not have to be consciously engaging in a ‘sensing’ process. If a person is unable to organize or interpret the sensations then everything around will be jumbled.

3. The sensation can be divided into three types: organic sensation, motor sensation and special sensation. Organic sensations are those sensations which are because of internal organs. These sensations are not because of any external stimulation. Hunger is considered to be an organic sensation which occurs because of the contradiction of walls of the stomach. Special sensations are those which are caused by the specific sense organs like eye, ear, nose, tongue and skin. These special sensations can be differentiated from each other. The source of the special sensations is external. Visual sensations are only activated or stimulated because of the light waves. These type of sensations are experienced through the sense organ of eye. The visual sensations can further be classified into two types. These two types of visual sensations are sensation of brightness and sensation of colour.

4. The various parts of the structure of eye are:
   i. Cornea – the cornea is a round and transparent area in the eye which allows light to pass into the eye. The amount of light is regulated by the pupil.
   ii. Lens – the lens is a transparent structure in the eye that focuses light on the retina.
   iii. Retina – the retina is another important part in the eye which is actually a inner membrane of the eye that receives information about light using rods and cones. The retina carries the information.
   iv. Fovea – it is the most sensitive part of the eye in the daylight.
   v. Pupil – pupil is the opening at the center of the iris which controls the amount of light entering the eye.
   vi. Rods and Cones – Rods are the visual receptors which help in the vision during the night.
vi. Cones - Cones are the visual receptor cells that are important in daylight vision and color vision. The cones are not effective in dim lighting. The rods are better for night vision because they are much more sensitive than cones.

5. The light waves from the object enter into the eye through the pupil and pass through the lens. The true receptor of the visual stimuli is the retina. The optic nerve is attached to the retina and serves as a medium for carrying the visual impulses to the nervous system. In the centre of the retina, there is a small depression which is referred to as fovea. This part is considered to be the point of greatest concentration and therefore the area of sharpest vision during the day light.

6. It is a common fact that many people are not able to see properly during the night. This condition is known as Night blindness. Such type of people suffer from a visual problem to adapt to the conditions of low illumination. They have acute problem with the rod cells in the eye.

7. The inability of some people to distinguish certain colours is called as colour blindness. The people who are colour blind cannot see red and green colour. They only see five colours. These five colours which colour blind people can actually see are yellow, blue, black, white and grey.

8. Hearing occurs when sound acts as a stimulus to the auditory sense. Sound consists of alternative waves of condensation and rare fraction in the form of vibrations in the air. These are known as sound waves. Sound waves generally strikes the tympanic membrane or eardrum. Just beside the eardrum is the middle ear which has three parts, hammer, anvil and stirrup.

9. The various sensations are as follows:

   i. Taste sensations: These can be felt by the tongue. The tongue is equipped with taste cells grouped into taste buds and these are the receptors that receive the gustatory stimulus.

   ii. Olfactory sensations: These are located in the nose. The nose detects the smell and sends it to the brain and odour is then perceived. Smell is also a chemical sense. The sense of smell gets activated when gaseous particles of a substance come in contact with the nasal fluids.

   iii. Skin sensations: The skin detects the sensation of pressure, warmth, cold and pain. There are specialized nerve endings which react to a specific type of stimuli for each type of cutaneous or skin sensation.

   iv. Motor sensations: These sensations are related to motion. Pulling and contractions are types of motor sensations. They are caused by the muscles, tendons and joints.

10. Threshold is a dividing line between what has detectable energy and what does not.
11. Perception is a process by which organisms select, organize and interpret the stimulus (People, places, objects and situations) in order to give meaning to the world around them. When you see a flower sensation of colour, smell, touch are aroused and meaning is given to this and the object is perceived as a flower.

12. Perception is a complex process because it is a combination of a number of sub processes. These are as follows:
   i. Receptor process - the first process involved in the process of reception is the receptor process. For example the rose stimulates three receptor cells and three different receptor processes of eye, nose and touch.
   ii. Unification process – for perceiving rose, unification of all the three sensations are required.
   iii. Symbolic process - every object reminds of something, and so a symbol is attached to it. Every time the rose is perceived the symbol gets associated with it.
   iv. Affective process - every object also represents some emotions, pleasant or unpleasant. Thus it is concluded that perception is a complex process and involves sensations and past experience.

6.4 SUMMARY

- Many statistical tools are used to understand the results of psychological studies. Statistical analysis supports (or refutes) the researcher’s hypothesis; it can also be used to determine if the findings are statistically significant. When results are said to be statistically significant, it means that it is unlikely that these results are due to chance.
- Sensations can be defined as the passive process of bringing information from the outside world into the body and to the brain. The process is passive in the sense that you do not have to be consciously engaging in a ‘sensing’ process. If a person is unable to organize or interpret the sensations then everything around will be jumbled.
- Visual sensations are only activated or stimulated because of the light waves. These type of sensations are experienced through the sense organ of eye. The visual sensations can further be classified into two types. These two types of visual sensations are sensation of brightness and sensation of colour.
- Rods are the visual receptors which help in the vision during the night. Rods are more than the cones. Rods are considered to be good for peripheral vision because there are more on the periphery of the retina.
- The retina has two kinds of receiving cells the rods and the cones. They are so named because of their shape. The cones are concentrated in the centre of the retina and the rod cells on the outer margin.
NOTES

- The eye adapts to discriminate colours as the day and night merge. At the first part of twilight one can still distinguish red, yellow green and blue although they are not very bright. Then at a particular point of diminished light the colours start becoming bright. This change is called as Purkinje phenomenon.

- The inability of some people to distinguish certain colours is called as colour blindness. The people who are colour blind cannot see red and green colour. They only see five colours. These five colours which colour blind people can actually see are yellow, blue, black, white and grey.

- The ear is a mechanical receptor of sensations. The ear can be divided into three parts, the external ear, the middle ear and the inner ear. The external ear is that part of the ear which can be seen from outside. A very thin membrane separates the external ear from the middle ear.

- Hearing occurs when sound acts as a stimulus to the auditory sense. Sound consists of alternative waves of condensation and rare fraction in the form of vibrations in the air. These are known as sound waves. Sound waves generally strikes the tympanic membrane or eardrum.

- There are five basic taste sensations that can be distinguished by tongue alone. These are sweet, sour, bitter and salty plus the taste of metallic substances. There are different areas on the tongue for different types of tastes.

- One important characteristic of the sense of smell is that it is adaptable. For example if you come across a very unpleasant smell, this smell seems unbearable at first but the nose adjusts to it after some time.

- The sensory impulses from muscles, tendons and joints which control the coordination of body movements is called as kinaesthetic sense. Thus it may be referred to as the awareness of body movements.

- Differential threshold is also a statistical quantity, it is the smallest amount by which two stimuli must be different so that they can be perceived differently. It is the smallest difference, which can be discriminated between two stimuli. The more intense the stimulus the more amount of change is required for noticeable difference.

- Subliminal perception refers to any situation in which the unnoted stimuli are perceived. Subliminal perception is said to occur when stimuli presented below the threshold or line of awareness and influence thoughts, feelings or actions.

- It is important to understand that how the selection of stimulus takes place. The principles by which people organize isolated parts of a visual stimulus into groups or whole objects are governed by laws of grouping.
6.5 KEY WORDS

- **The sclera**: Also known as the white of the eye, it is the opaque, fibrous, protective, outer layer of the human eye containing mainly collagen and some elastic fibre.
- **The vitreous humour**: Also known simply as the vitreous is a clear, colourless fluid that fills the space between the lens and the retina of our eye.
- **The aqueous humour**: This is a transparent, watery fluid similar to plasma, but containing low protein concentrations. It is secreted from the ciliary epithelium, a structure supporting the lens.
- **The Purkinje phenomenon**: It is named after the Czech anatomist Jan Evangelista Purkinje. It is the tendency for the peak luminance sensitivity of the human eye to shift toward the blue end of the colour spectrum at low illumination levels as part of dark adaptation.
- **Piano Theory**: Hermann von Helmholtz, drawing upon his knowledge of the physiology of the inner ear, in particular the basilar membrane, put forward a version of place theory known as the resonance theory or the piano theory.

6.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short Answer Questions**

1. Define the terms stimulus, receptor and response with reference to our eye.
2. State how different types of sensations have different traits.
3. Draw a structure of eye with a detailed description of its various parts that make it.
4. Write a brief note on night vision and the Purkinje phenomenon.
5. Enumerate the role of skin sensations.
6. What is the significance of different threshold?
7. Write a brief note on the process of perception.

**Long Answer Questions**

1. Discuss the scope of measurement in psychology.
2. Analyse the various types of sensations.
3. Write a comprehensive note on blind spot and after images.
4. ‘The ear is a mechanical receptor of sensations.’ Explain this statement.
5. Discuss in detail the two types of thresholds.
6. Elaborate the sub-processes which form the perception.
7. Discuss the characteristics of perception.

6.7 FURTHER READINGS


UNIT 7  FOUNDATIONS OF BEHAVIOUR

Structure
7.0 Introduction
7.1 Objectives
7.2 The Central and Peripheral Nervous System
7.3 Impact of the Functions of Endoergic Glands and Summary
   7.3.1 Endocrine Glands and their Hormones
7.4 Answers to Check Your Progress Questions
7.5 Summary
7.6 Key Words
7.7 Self Assessment Questions and Exercises
7.8 Further Readings

7.0 INTRODUCTION

Nervous system plays a centralized role in biological organisms namely primates and humans. The nervous system of a human plays a fundamental role in every function of body. The brain receives signals in both internal and external information, extracted as stimuli, by different human nerves and then communicates the proper responses. Human brain has been structurally divided into the forebrain, midbrain and hindbrain. The forebrain is further divided into the telencephalon and the diencephalon. The telencephalon consists of the cerebrum, basal ganglia and the limbic system which consists of amygdala, septum and the hippocampus. The diencephalon consists of the thalamus and the hypothalamus.

The nerves which arise from brain are called cranial nerves, while the nerves which originate from the spinal cord are termed as spinal nerves. The PNS has both sensory and motor fibres which are spread over the entire body. Mixed nerves are nerves that contain both sensory and motor nerve fibres and thus perform sensory and motor functions. In contrast to the cranial nerves, the spinal nerves originate from the spinal cord. These nerves are bilaterally symmetrical and hence occur in pairs.

The sympathetic nervous system prepares the body during emergencies like states of stress and arousal, whereas, the parasympathetic nervous system orients the body towards internal maintenance. The sympathetic nervous system dominates during muscle activity and helps in spending energy. The spinal cord consists of a central pia mater which is also known as the grey matter. The surrounding white matter is the dura mater. The dura mater has a myelin sheath covering it. Because of the presence of the myelin sheath, the white matter becomes tough. The descending pathways are motor nerves carrying information from the
brain to the PNS, for motor responses of the body. They consist of pyramidal and extra pyramidal pathways.

Glands are of two types: endocrine and exocrine. Endocrine glands are known as ductless glands because their products are secreted directly into the circulatory system (blood), without intermediate “passageways”. The endocrine glands which secrete only hormones are known as holocrine glands.

This unit aims at discussing the structure of central and peripheral nervous system and analyses the function of endocrine glands in a comprehensive way.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the structure of nervous system and its various parts
- Examine the functioning of the peripheral nervous system
- Enumerate the role of cranial nerves
- Know the formation of plexuses by spinal nerves
- Understand the function of the autonomic nervous system (ANS)
- Describe sympathetic and the parasympathetic nervous system
- Enumerate the role of reflex in neural circuits
- Enhance knowledge about pyramidal pathways
- Understand the functioning of endocrine glands

7.2 THE CENTRAL AND PERIPHERAL NERVOUS SYSTEM

We have already discussed the central and peripheral nervous system in Unit 3. Let us do a quick recapitulation.

The nervous system can be divided into the Central Nervous System (CNS) and the Peripheral Nervous System (PNS). The central nervous system is divided into the brain and the spinal cord. The brain has been structurally divided into the forebrain, midbrain and hindbrain. The forebrain is further divided into the telencephalon and the diencephalon. The telencephalon consists of the cerebrum, basal ganglia and the limbic system. The cerebrum is divided into the right and the left hemisphere. Each hemisphere is further divided into four lobes, namely, frontal, temporal, parietal and occipital lobes. The limbic system consists of amygdala, septum and the hippocampus. The diencephalon consists of the thalamus and the hypothalamus.

The midbrain is divided into tegmentum and tectum. The tectum consists of the superior and the inferior colliculus. The hindbrain consists of the medulla, the
pons and the cerebellum. The spinal cord consists of three nerve pathways, namely, the ascending, the descending and the transverse pathways. The ascending pathways are further divided into the cuneate gracile (lemniscal system) and the spinothalamic system, whereas, the descending pathways are divided into the pyramidal motor system and the extrapyramidal motor system.

The peripheral nervous system consists of cranial nerves and spinal nerves. Each cranial and spinal nerve has sensory and motor fibres. These motor fibres are somatic and autonomic in nature. The autonomic nervous system further consists of the sympathetic nervous system and the parasympathetic nervous system. After this brief review of the major divisions of the nervous system, we now read about them in further detail.

The PNS (peripheral nervous system) consists of nerves which originate from the CNS and connect either receptors or efferent organs. The nerves which arise from brain are called cranial nerves, while the nerves which originate from the spinal cord are termed as spinal nerves. The PNS has both sensory and motor fibres which are spread over the entire body. Mixed nerves are nerves that contain both sensory and motor nerve fibres and thus perform sensory and motor functions.

The parasympathetic nervous system consists of one set of motor fibres. These nerve fibres originate from the brain and the spinal cord. They are seen to exert inhibitory and excitatory control. The parasympathetic nervous system is further controlled by the central nervous system. Its motor fibres directly reach the target organ. In humans, cranial nerves are present in twelve pairs. These are as follows:

- **Olfactory nerve**: It is connected to the brain and different parts of the body, through the olfactory epithelium of the nasal chamber. It is sensory in nature and its main function is to regulate the sense of smell.

- **Optic nerve**: It is connected to the side of the diencephalon. The optic nerve is connected to the retina of the eye. It is sensory in nature and its main function is to regulate the sense of sight.

- **Oculomotor nerve**: It is connected to the floor of the midbrain and also to the inferior oblique, superior and inferior rectus and medial and rectus eye muscles. It is motor in nature and its main function is to control the movement of the eye ball.

- **Pathetic nerve**: It is connected to the floor of the midbrain and the superior oblique eye muscles. It is motor in nature and its main function is to control the movement of the eye ball.

- **Trigeminal nerve**: It is connected to the ventral side of the pons varolii. It is a mixed nerve and regulates the sensation of taste, touch and jaw movements (that are largely involved in chewing).
• **Abducens nerve**: It is connected to the ventral side of the medulla oblongata and the lateral rectus eye muscle. It is a motor nerve and is involved in the regulation of the sensation of taste, touch and jaw movements.

• **Facial nerve**: It is connected to the lateral side of the pons varolii and also to the taste buds of the tongue, muscles of the face and salivary glands. It is a mixed nerve and is involved in the regulation of the sensation of taste, facial expressions and salivary secretions.

• **Auditory nerve**: It is connected to the lateral side of the medulla oblongata and the internal ear. It is a sensory nerve which regulates the sense of hearing and balance.

• **Gluco-pharyngeal nerve**: It is connected to the lateral side of the medulla oblongata and to the tongue, pharyngeal mixed muscles and the parotid salivary glands. It is a mixed nerve and is involved in the regulation of taste, movement of pharynx and salivary secretions.

• **Vagus nerve**: It is connected to the lateral side of the medulla oblongata and to the larynx, pharynx, oesophagus, lungs, heart, intestine and stomach. It is a mixed nerve and is involved in the regulation of speech, swallowing, decrease of heart rate, stimuli for peristalsis and respiratory movement.

• **Spinal accessory nerve**: it is connected to the lateral side of the medulla oblongata and to the larynx, pharynx, neck and the shoulder. It is a motor nerve and it regulates the movement of the larynx, pharynx, neck and shoulders.

• **Hypoglossal nerve**: it is connected to the ventral side of the medulla oblongata and to the muscles of the tongue. It is a motor nerve and it regulates the movement of the tongue.

In contrast to the cranial nerves, the spinal nerves originate from the spinal cord. These nerves are bilaterally symmetrical and hence occur in pairs. There are 31 pairs of spinal nerves and they are numbered and named according to the vertebrae with which they are associated. These consist of 8 pairs of cervical nerves, 12 pairs of thoracic nerves, 5 pairs of lumbar nerves, 5 pairs of sacral nerves and 1 pair of coccygeal nerve. Spinal nerves are formed by the union of the dorsal and ventral roots shortly after they leave the spinal cord. Each spinal nerve has afferent (sensory) and efferent (motor) fibres. Motor fibres come from the ventral root and the sensory fibres go into the dorsal root. Thus all spinal nerves are mixed nerves because they carry both, sensory and motor impulses. Some of the spinal nerves are connected to the autonomic nervous system. Motor nerves of this system stimulate the skeletal muscles whereas ANS stimulates the cardiac muscles.

Certain spinal nerves combine to form the following plexuses:

• **Cervical plexus**: innervates the neck and diaphragm

• **Brachial plexus**: connects the chest and the arm
- **Lumber plexus**: innervates the legs
- **Sacral plexus**: connects the pelvic region
- **Coccygeal plexus**: also innervates the pelvic region

After getting an understanding of cranial and spinal nerves, we look at the various functions performed by the PNS. The parasympathetic nervous system carries sensory information from receptors to CNS, through the cranial and spinal segments. It also carries information from the CNS. PNS forms the core for stimulus response associations.

The autonomic nervous system (ANS) is called so because it controls and coordinates the involuntary activities of various organs. It is also known as the visceral motor system because it consists of motor fibre of PNS, which in turn, stimulate the smooth muscles and glands. ANS consists of the sympathetic nervous system and the parasympathetic nervous system.

In contrast to the parasympathetic nervous system, the autonomic nervous system has two sets of motor fibres, namely sympathetic and parasympathetic. Its nerve fibres originate from the spinal cord. Both, the sympathetic and the parasympathetic fibres are seen to have opposite effects on the smooth muscles and fibres. For instance, if the sympathetic nerve excites a particular muscle then the parasympathetic nerve inhibits the same muscle and vice versa. The motor pathways consist of preganglionic and postganglionic fibres. Preganglionic fibres originate from the spinal cord, whereas postganglionic fibres connect preganglionic fibres with smooth muscles and glands.

Sympathetic and the parasympathetic fibres have certain similarities and certain differences. The similarities are that both are parts of ANS; both are motor fibres and both contain preganglionic and postganglionic fibres. But the two are structurally and chemically different. The preganglionic fibres of the sympathetic nervous system originate from the thoracic and the lumbar region of spinal cord, whereas, the preganglionic fibres of the parasympathetic nervous system originate from the brain stem and the sacral region of spinal cord. The preganglionic fibres and the postganglionic fibres of the sympathetic nervous system are short and long respectively. The preganglionic fibres enter into the ganglia, which lies outside the spinal cord and from there postganglionic fibres originate. These reach the target organ. The preganglionic fibres and the postganglionic fibres of the parasympathetic nervous system are long and short respectively.

The sympathetic nervous system prepares the body during emergencies like states of stress and arousal, whereas, the parasympathetic nervous system orients the body towards internal maintenance. The sympathetic nervous system dominates during muscle activity and helps in spending energy. The parasympathetic nervous system, in contrast, acts during conservation of energy. In addition, both sympathetic and parasympathetic nervous systems have opposing effects on several...
parts of the body. For example, the sympathetic nervous system dilates the pupil, inhibits salivary flow, increase heart rate; dilates bronchi, inactivates the intestines, constricts blood vessels, has no effect on the tear glands and causes the adrenal medulla to release hormones. On the other hand, the parasympathetic nervous system constricts the pupils, stimulates the tear glands, stimulates salivary flow, decrease heart rate, constrict bronchi, activates intestines, dilate blood vessels and has no reaction of the adrenal medulla.

The autonomic nervous system performs several functions. It shifts the flow of blood from one part of the body to another, so as to control its supply according to the needs. It also regulates the internal environment whenever the homeostasis is upset, in order to restore the balance and facilitate normal functioning.

Both sympathetic and the parasympathetic nervous system are influenced largely by the hypothalamus, which is often known as the ‘head ganglion’ of the autonomic nervous system. Earlier, it was thought that the peripheral nervous system controls and coordinates voluntary activities of the body and the autonomic nervous system controls and coordinates involuntary activities of our body. However, a research by Miller (1969) showed that lower animals and humans can be trained to control some ANS responses. Since blood pressure can be controlled voluntarily, so this functional difference is questionable.

The central nervous system (CNS) is a hollow, dorsally placed structure, lying along the mid-dorsal axis of the body. It comprises of the brain and the spinal cord. The brain is lodged in the skull while spinal cord is enclosed by the vertebral column. The spinal cord is a posterior part of the CNS. It is a conical structure which is surrounded by three protective membranes, namely, the pia mater, the arachnoid mater and the dura mater. The pia mater consists largely of grey matter. It is a thin innermost layer. It is surrounded by the arachnoids membrane, which forms the middle layer. The outermost tough membrane is the dura mater, which largely consists of white matter. Certain spaces are present in between these membranes. The subarachnoid and subdural spaces are filled with cerebrospinal fluid. The epidural space above the dura mater contains fatty and connective tissues and veins.

The spinal cord runs mid-dorsally within the vertebral column and lies in its neural canal. It is protected by the vertebral column and passes through a hole in each vertebra. The vertebral column is composed of 24 individual vertebrae. It consists of 7 cervical vertebrae; 12 thoracic vertebrae and 5 lumbar vertebrae. The 7 cervical vertebrae are present in the neck, the 12 thoracic vertebrae are present in the chest and the 5 lumbar vertebrae are present in the lower back region. The fused vertebrae that make the sacral and coccygeal portion of the column are located in the pelvic region. The 5 sacral vertebrae are fused in the adult. These form one structure known as the sacrum and the 4 coccygeal vertebrae are fused to form a curved triangular bone known as the coccyx.
The diameter of the spinal cord is less than 3/4th of an inch. It is only about
2/3 times as long as the vertebral column, the rest of the space is filled by a mass
of spinal roots. These compose the *cauda equina*. A root is bundle of axons
running in and out of the spinal cord, surrounded by connective tissues. The spinal
roots consist of the ventral and the dorsal roots. The dorsal root of the spinal cord
consists of incoming afferent or sensory fibres and the ventral root contains the
outgoing efferent or motor fibres. They join together, outside the spinal cord and
merge to form the spinal nerves. The sensory fibres, with their cell bodies outside
the cord, form a bundle which constitutes the dorsal root ganglion. No such ganglion
formation is seen in the ventral root.

The spinal cord consists of a central pia mater which is also known as the
grey matter. The surrounding white matter is the dura mater. The dura mater has a
myelin sheath covering it. Because of the presence of the myelin sheath, the white
matter becomes tough. The grey or pia mater has no myelin sheath and it is hence
fragile. The white matter consists of ascending and the descending myelinated
nerve axons. On the contrary, the grey matter consists of nerve endings, neural cell
bodies and non-myelinated axons which form the synapse.

The structure of the spinal cord also consists of nerve pathways connecting
the brain on one hand and PNS on the other. The spinal cord acts as a relay
station between the brain and the PNS, through these ascending and descending
pathways. It is involved in all behaviours below the neck, that is, behaviours relating
to skeletal autonomic sections and voluntary behaviours with brain involvement. It
helps in coordinating behaviours with environmental stimuli as it connects information
from receptors and responding muscles. The spinal cord is also acts as a centre
for reflex actions.

A reflex is a rapid automatic response made to a particular stimulus. There
are two types of reflexes namely, *skeletal reflex* (for example, the knee jerk) and
the *autonomic reflex* (for example, salivation, eyelid movement, sneezing, etc.).
A reflex behaviour is rooted in simple neural circuits called reflex arcs. One such
arc is a two neuron circuit known as the monosynaptic reflexes. It is so called as it
involves only one synapse between a sensory and a motor neuron. The knee jerk
reflex is controlled by monosynaptic reflexes.

All behaviours are not simple. Some behaviours are complex, which involve
other sides of the body and other organs. These behaviours are executed through
polysynaptic reflexes. These reflexes involve more than one synapse between a
sensory and a motor neuron. For example, when reflex involves both sides of the
body requiring balance, the neural activity passes in two directions once it reaches
the spinal cord. The two directions involve the ipsilateral reflex and the contralateral
reflex. The ipsilateral reflex activates the same side of the body. The contralateral
reflex activates the other side of the body. These are done by crossing through the
grey matter.
All reflex actions are triggered purely by the spinal cord. Some reflexes also take place with the involvement of the brain. For example, we can consciously stop knee jerks that occur as the circuits of the spinal reflex are lined to nerve pathways. These nerve pathways ascend and descend from the brain. Hence, it is possible for the brain to control the autonomy of the spinal nerves.

Ascending pathways are sensory and they carry the sensory information from the body to the brain. Most of the information entering at the spinal level of CNS originates from the body’s skin. This information is known as somatosensory. Ascending pathways consist of the lemniscal and the spinothalamic pathways.

The lemniscal pathway is situated in the dorsal and medial section of the spinal cord. It consists of the gracile tract, which covers the lower torso and lower limbs and the cuneate tract, which covers the upper torso and upper limbs. In these portions of the spinal cord, the cuneate and gracile tracts lie adjacent to each other, with each on both sides of the spinal cord. These tracts carry information arising from the sensations of light touch on the skin, kinesthetic movement cues, and limb position. Most of this sort of information crosses through the brain to the contralateral side and eventually reaches the right side of the neo cortex.

In contrast to the lemniscal pathway, the spinothalamic pathway is situated in the ventral and lateral portion of the spinal cord. It carries information arising from the sensations on the skin related to deep pressure, temperature changes and pain. These tracts are divided into about 50 per cent contralateral (opposite sided) and 50 per cent ipsilateral (same sided) systems. It means that half of the ascending spinothalamic fibres cross the midline of the CNS while the other half do not cross the midline, but rather stay on the same side of the midline of the CNS.

The descending pathways are motor nerves carrying information from the brain to the PNS, for motor responses of the body. They consist of pyramidal and extra pyramidal pathways. Both these pathways are seen to differ functionally and structurally in primate and humans. For example, the pyramidal pathways control the capacity to perform discrete movements, whereas, the extra pyramidal pathways control the capacity to execute smooth and integrated movements. Pyramidal fibres originate from specific sites on the neocortex, whereas, extra pyramidal fibres originate in widespread sites on the neocortex as well as in several areas of the brain, underneath the neocortex. These areas are known as sub-cortical areas.

Around 80 per cent of the descending pyramidal fibres form the neocortex. They cross over the middle of the CNS at the base of the brain and continue along the lateral corticospinal tract in the spinal cord; the remaining 20 per cent continue without crossing through the ventral corticospinal tract. Extra pyramidal fibres either cross or do not cross the midline as they descend from cortical and sub-cortical areas.
Check Your Progress

1. What do you mean by the Peripheral Nervous System (PNS)?
2. What is the parasympathetic nervous system?
3. List the pairs of cranial nerve.
4. List the plexuses formed by certain spinal nerves.
5. Explain the function of autonomic nervous system (ANS).
6. Enumerate the preganglionic and the postganglionic fibres.
7. How is the vertebral column composed?
8. How does the spinal cord act?
9. Explain the functions of reflexes.
10. What is the role of the pyramidal pathways?

7.3 IMPACT OF THE FUNCTIONS OF ENDOERGIC GLANDS AND SUMMARY

Let us discuss the endocrine glands and their hormones.

7.3.1 Endocrine Glands and their Hormones

On the basis of secretion, glands are of two types: endocrine and exocrine. Endocrine glands are known as ductless glands because their products are secreted directly into the circulatory system (blood), without intermediate ‘passageways’. Examples of endocrine glands are thyroid, adrenalin, etc. Exocrine glands secrete their products through specific ducts. Examples of exocrine glands are salivary glands, tear glands, sweat glands, etc.

The endocrine glands which secrete only hormones are known as holocrine glands. Examples of holocrine glands are thyroid gland, parathyroid gland, adrenal gland and pituitary gland. However, endocrine glands that perform the dual function of secreting both hormones and performing some other function are known as heterocrine glands. Examples of heterocrine glands are pancreas, testes and ovaries. The study of endocrine glands and hormones secreted by them is known as endocrinology.

Features of Endocrine Glands

Endocrine glands are characterized by the following features:

- Endocrine glands contain chemicals which are known as hormones. These control behaviours.
- Some glands (for example, parathyroid), secrete only one hormone while others (like anterior pituitary), secrete several hormones.
Glands are under neural control. For example, hypothalamus is responsible for hormonal secretion.

Each hormone modulates the functioning of a target tissue or target organ, which is located somewhere in the body. The effects of the hormones may be specific to a localized region. Whereas, many of the anterior pituitary hormones act on the target organ, which itself can be a gland.

The endocrine glands have balanced secretion that depends on the need of the body, thereby maintaining homeostasis. This implies that these behaviours are associated with stress, growth and development in general and reproduction.

Features of Exocrine Glands
Some of the features of exocrine glands include:

- These glands that produce and secrete substances onto an epithelial surface by way of a duct.
- Some examples of exocrine glands include salivary glands that secrete saliva into the mouth, bile-producing glands of the liver, prostate gland, gastric glands, sweat glands, etc.
- Exocrine glands can be classified on the basis of structure, by method of secretion, and by the product secreted.

Check Your Progress
11. Enumerate the function of glands.
12. List the features of endocrine glands.

7.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The PNS (peripheral nervous system) consists of nerves which originate from the CNS and connect either receptors or efferent organs. The nerves which arise from brain are called cranial nerves, while the nerves which originate from the spinal cord are termed as spinal nerves.

2. The parasympathetic nervous system consists of one set of motor fibres. These nerve fibres originate from the brain and the spinal cord. They are seen to exert inhibitory and excitatory control. The parasympathetic nervous system is further controlled by the central nervous system.

3. These are as follows:
   - Olfactory nerve: It is connected to the brain and different parts of the body, through the olfactory epithelium of the nasal chamber.
   - Optic nerve: It is connected to the side of the diencephalon.
- Oculomotor nerve: It is connected to the floor of the midbrain and also to the inferior oblique, superior and inferior rectus and medial and rectus eye muscles.
- Pathetic nerve: It is connected to the floor of the midbrain and the superior oblique eye muscles.
- Trigeminal nerve: It is connected to the ventral side of the pons varolii. It is a mixed nerve and regulates the sensation of taste, touch and jaw movements.
- Abduccens nerve: It is connected to the ventral side of the medulla oblongata and the lateral rectus eye muscle.
- Facial nerve: It is connected to the lateral side of the pons varolii and also to the taste buds of the tongue, muscles of the face and salivary glands.
- Auditory nerve: It is connected to the lateral side of the medulla oblongata and the internal ear.
- Gulo-pharyngeal nerve: It is connected to the lateral side of the medulla oblongata and to the tongue, pharyngeal mixed muscles and the parotid salivary glands.
- Vagus nerve: It is connected to the lateral side of the medulla oblongata and to the larynx, pharynx, oesophagus, lungs, heart, intestine and stomach.
- Spinal accessory nerve: it is connected to the lateral side of the medulla oblongata and to the larynx, pharynx, neck and the shoulder.
- Hypoglossal nerve: it is connected to the ventral side of the medulla oblongata and to the muscles of the tongue.

4. Certain spinal nerves combine to form the following plexuses.
   - Cervical plexus: innervates the neck and diaphragm
   - Brachial plexus: connects the chest and the arm
   - Lumbar plexus: innervates the legs
   - Sacral plexus: connects the pelvic region
   - Coccygeal plexus: also innervates the pelvic region

5. The autonomic nervous system (ANS) is called so because it controls and coordinates the involuntary activities of various organs. It is also known as the visceral motor system because it consists of motor fibre of PNS, which in turn, stimulate the smooth muscles and glands. ANS consists of the sympathetic nervous system and the parasympathetic nervous system.

6. The preganglionic fibres of the sympathetic nervous system originate from the thoracic and the lumbar region of spinal cord, whereas, the preganglionic fibres of the parasympathetic nervous system originate from the brain stem
and the sacral region of spinal cord. The preganglionic fibres and the
postganglionic fibres of the sympathetic nervous system are short and long
respectively. The preganglionic fibres enter into the ganglia, which lies outside
the spinal cord and from there postganglionic fibres originate.

7. The vertebral column is composed of 24 individual vertebrae. It consists of
7 cervical vertebrae; 12 thoracic vertebrae and 5 lumbar vertebrae. The 7
cervical vertebrae are present in the neck, the 12 thoracic vertebrae are
present in the chest and the 5 lumbar vertebrae are present in the lower
back region.

8. The spinal cord acts as a relay station between the brain and the PNS,
through these ascending and descending pathways. It is involved in all
behaviours below the neck, that is, behaviours relating to skeletal autonomic
sections and voluntary behaviours with brain involvement. It helps in
coordinating behaviours with environmental stimuli as it connects information
from receptors and responding muscles. The spinal cord is also acts as a
centre for reflex actions.

9. A reflex is a rapid automatic response made to a particular stimulus. There
are two types of reflexes namely, skeletal reflex (for example, the knee
jerk) and the autonomic reflex (for example, salivation, eyelid movement,
sneezing, etc.). A reflex behaviour is rooted in simple neural circuits called
reflex arcs. One such arc is a two neuron circuit known as the monosynaptic
reflexes. It is so called as it involves only one synapse between a sensory
and a motor neuron. The knee jerk reflex is controlled by monosynaptic
reflexes.

10. The pyramidal pathways control the capacity to perform discrete movements,
whereas, the extra pyramidal pathways control the capacity to execute
smooth and integrated movements.

11. On the basis of secretion, glands are of two types: endocrine and exocrine.
Endocrine glands are known as ductless glands because their products are
secreted directly into the circulatory system (blood), without intermediate
‘passageways’. Examples of endocrine glands are thyroid, adrenalin, etc.
Exocrine glands secrete their products through specific ducts. Examples of
exocrine glands are salivary glands, tear glands, sweat glands, etc.

12. Endocrine glands are characterized by the following features:
   ● Endocrine glands contain chemicals which are known as hormones. These
cell control behaviours.
   ● Some glands (for example, parathyroid), secrete only one hormone while
others (like anterior pituitary), secrete several hormones.
   ● Glands are under neural control. For example, hypothalamus is
responsible for hormonal secretion.
Each hormone modulates the functioning of a target tissue or target organ, which is located somewhere in the body. The effects of the hormones may be specific to a localized region. Whereas, many of the anterior pituitary hormones act on the target organ, which itself can be a gland.

The endocrine glands have balanced secretion that depends on the need of the body, thereby maintaining homeostasis. This implies that these behaviours are associated with stress, growth and development in general and reproduction.

7.5 SUMMARY

The nervous system can be divided into the Central Nervous System (CNS) and the Peripheral Nervous System (PNS). The central nervous system is divided into the brain and the spinal cord. The brain has been structurally divided into the forebrain, midbrain and hindbrain.

The midbrain is divided into tegmentum and tectum. The tectum consists of the superior and the inferior colliculus. The hindbrain consists of the medulla, the pons and the cerebellum.

The parasympathetic nervous system consists of one set of motor fibres. These nerve fibres originate from the brain and the spinal cord. They are seen to exert inhibitory and excitatory control.

In contrast to the cranial nerves, the spinal nerves originate from the spinal cord. These nerves are bilaterally symmetrical and hence occur in pairs. There are 31 pairs of spinal nerves and they are numbered and named according to the vertebrae with which they are associated.

The autonomic nervous system (ANS) is called so because it controls and coordinates the involuntary activities of various organs. It is also known as the visceral motor system because it consists of motor fibre of PNS, which in turn, stimulate the smooth muscles and glands.

Sympathetic and the parasympathetic fibres have certain similarities and certain differences. The similarities are that both are parts of ANS; both are motor fibres and both contain preganglionic and postganglionic fibres.

The sympathetic nervous system dominates during muscle activity and helps in spending energy. The parasympathetic nervous system, in contrast, acts during conservation of energy. In addition, both sympathetic and parasympathetic nervous systems have opposing effects on several parts of the body.

The central nervous system (CNS) is a hollow, dorsally placed structure, lying along the mid-dorsal axis of the body. It comprises of the brain and the spinal cord. The brain is lodged in the skull while spinal cord is enclosed by the vertebral column.
The spinal cord runs mid-dorsally within the vertebral column and lies in its neural canal. It is protected by the vertebral column and passes through a hole in each vertebra. The vertebral column is composed of 24 individual vertebrae.

The spinal cord consists of a central pia mater which is also known as the grey matter. The surrounding white matter is the dura mater. The dura mater has a myelin sheath covering it.

All behaviours are not simple. Some behaviours are complex, which involve other sides of the body and other organs. These behaviours are executed through polysynaptic reflexes. These reflexes involve more than one synapse between a sensory and a motor neuron.

The lemniscal pathway is situated in the dorsal and medical section of the spinal cord. It consists of the gracile tract, which covers the lower torso and lower limbs and the cuneate tract, which covers the upper torso and upper limbs.

Pyramidal fibres originate from specific sites on the neocortex, whereas, extra pyramidal fibres originate in widespread sites on the neocortex as well as in several areas of the brain, underneath the neocortex. These areas are known as sub-cortical areas.

The endocrine glands which secrete only hormones are known as holocrine glands. Examples of holocrine glands are thyroid gland, parathyroid gland, adrenal gland and pituitary gland. However, endocrine glands that perform the dual function of secreting both hormones and performing some other function are known as heterocrine glands.

### 7.6 KEY WORDS

- **The cauda equina**: This is a bundle of spinal nerves and spinal nerve rootlets. These nerves are located at the lower end of the spinal cord in the lumbosacral spine.

- **The somatosensory system**: This is a complex system of sensory neurons and pathways that responds to changes at the surface or inside the body.

- **Primates**: A member of the most developed and intelligent group of mammals, including humans, monkeys, and apes.

- **Neocortex**: This is a part of the cerebral cortex concerned with sight and hearing in mammals, regarded as the most recently evolved part of the cortex.

- **Endocrinology**: The study of endocrine glands and hormones secreted by them is known as endocrinology.
7.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions
1. Write a brief note on the peripheral nervous system (PNS).
2. State the functions of the spinal nerves.
3. Enumerate the role of the autonomic nervous system (ANS).
4. What is the function of the sympathetic nervous system?
5. Enumerate the structure of spinal cord.
6. State the significance of reflex in neural circuits.
7. Write a brief note on the function of the endocrine glands.

Long Answer Questions
1. Discuss in detail the Central Nervous System (CNS) and the Peripheral Nervous System (PNS).
2. Analyse the structure and functions of cranial nerves.
3. Write a comprehensive note on plexuses formed by spinal nerves.
4. Discuss the autonomic nervous system (ANS) response in lower animals and humans.
5. Discuss in detail the spinal cord’s structure and function in nervous system.
6. Elaborate the role of the pyramidal pathways.
7. Discuss the main characteristics of endocrine glands.

7.8 FURTHER READINGS

BLOCK - III
BIOLOGICAL BASIS OF BEHAVIOUR AND CONSCIOUSNESS

UNIT 8  HEREDITY AND ENVIRONMENT BEHAVIOUR

Structure
8.0  Introduction
8.1  Objectives
8.2  Biological Basis of Behaviour: Heridity vs. Environment
  8.2.1  Behaviour Genetics
  8.2.2  Experiment with Twin Study
  8.2.3  Evolutionary Perspective
  8.2.4  Biological and Cultural Root
  8.2.5  Socio-Cultural Shaping of Behaviour
8.3  Answers to Check Your Progress Questions
8.4  Summary
8.5  Key Words
8.6  Self Assessment Questions and Exercises
8.7  Further Readings

8.0  INTRODUCTION

British scientist Sir Francis Galton coined the phrase “nature and nurture.” Galton’s study was about the relationship between behaviour and heredity. He studied the families of outstanding men of his day and concluded that mental powers run in families. Galton became the first to use twins in genetic research and pioneered many of the statistical methods of analysis that are in use today. Genetic methods are now used to estimate the impact of genetic and environmental factors on individual differences in any complex trait, including behavioural traits.

The twin study relies on nature that results in identical twins or fraternal. The adoption study is an experimental design that relies on a social accident in which children are adopted away from their biological parents early in life. Because of the stronger genetic link between the adopted children and their biological parents, the implication is that heredity plays an important role in intelligence. There are instances of behavioural disorders which are much more difficult because multiple genes are involved and each gene has a relatively small effect. Some genes that are more active in influencing the trait are called dominant. A dominant gene will always be expressed in the actual trait. A person with a dominant brown hair colour gene will have brown hair, no matter what the other gene is.
This unit aims at discussing how heredity and environment operate together in the development of human behaviour and mind.

### 8.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the concept of heredity
- Explain the role of environment in shaping human development
- Understand how heredity and environment operate together
- Understand the causes behind the complex behaviour
- Discuss the role of social and physical surrounding on the behaviour
- Analyse the significance of behaviour genetics
- Understand the use of adoption studies to determine the behaviour
- Analyse the role of genes in influencing traits in humans
- Enumerate the biological and cultural root

### 8.2 BIOLOGICAL BASIS OF BEHAVIOUR: HERIDITY VS. ENVIRONMENT

Nature refers to heredity, the influence of inherited characteristics on personality, physical growth, intellectual growth and social interaction. Nurturing refers to an organism’s environmental experiences that include parenting styles, physical surroundings, social conditions, etc. The interaction of nature and nurture influences every aspect of mind and behaviour to a degree. Neither of the two factors operates alone (Sylvia S. Mader, 2003). Heredity and environment operate together to produce temperament, height, weight, ability to pitch a baseball, reading ability and so on. Now a question before us is that if Zhang Liyin becomes an Olympic champion in gymnastics, will it be because of her heredity or environment. The answer is both. According to William Greenough (2001) the interaction of heredity and environment is so extensive that to ask, which is more important—nature or nurture—is like asking which is more important to a rectangle, height or width. People who are more successful at constructing optimal life experiences then others are the ones who looked for and found meaningful life theme as they developed. Their lives were not restricted to simple biological survival and passive acceptance of environmental dictates. Psychologists agreed that much complex behaviours have some genetic loading that makes people likely to develop in a particular way. However, our actual development also depends on what we experience in our environment (J. Gottlieb, 2004). The influence of the environment ranges from the things that are lumped together under nurture (like peer relations, family dynamics, neighbourhood quality, parenting and schooling) to biological encounters (like cellular activities, complications in birth, and viruses).
Some psychologists, however, believe that we can develop beyond what our genetic inheritance and our environment give us. They argue that a key aspect of development involves seeking optimal experiences in life (M. Massimini and A. Delle Fave, 2000). They cite examples of people who go beyond simple biological adaptation to actively choose from the environment the things that serve their purposes. These individuals build and construct their own lives, authoring a unique developmental path.

The social and the physical surrounding in which a person lives, conducts himself or herself, grows, is called the environment. Environment also includes the context of school, family and community within which a person lives and interacts with the genetic characterization. By studying the identical and fraternal twins, the influence of environment heredity can be sorted out. Identical twins have more similarity in intelligence than fraternal twins, even when they are separated at birth and reared in different homes. They are also similar when it comes to susceptibility to schizophrenia and some personality characteristic. Recent studies shows that intelligence as well as the amount of grey matter is more correlated in identical twins than in fraternal twins (Thompson et al, 2001). Intelligent people have more grey matter and the amount of grey matter appears to be strongly related to genetic factors.

### 8.2.1 Behaviour Genetics

Behaviour genetics is the study of the degree and nature of heredity’s influence on behaviour. Twin studies and behaviour genetics examine the extent to which individuals are shaped by their heredity and their environmental experiences (D. Wahlsten, 2000). The behavioural similarities of identical twins are compared with fraternal.

### 8.2.2 Experiment with Twin Study

In a twin study, 7000 paired identical and fraternal twins were compared on the personality test of extraversion and neuroticism (Rose and others, 1988). The identical twins had more similarity than the fraternal twins on both the personality traits, suggesting that gene influences both traits.

In another type of twin study, researchers evaluate identical twins that have been reared in separate environments. If their behaviour is similar, the assumption is that heredity has played an important role in shaping their behaviour. This strategy is based on the Minnesota Study of Twins Reared Apart, directed by Thomas Bouchard and his colleagues (1996). They bring identical twins who have been reared apart to Minneapolis from all over the world to study their behaviour. They ask many questions about their vocational orientation, childhood environment and family, values and personal interests. Also, their medical history along with information about their exercise habits, diet and smoking are obtained.

Critics argue that some of the separated twins in the Minnesota study had been together several months prior to their adoption, that some had been reunited...
prior to their testing (in some cases, for a number of years), that adoption agencies
often put identical twins in similar homes, and that even strangers who spend several
hours together are likely to come up with some coincidental similarities (L.E. Adler,

Behaviour genetics also use adoption studies to try to determine whether
the behaviour of adopted children is more like that of their biological parents or
their adopted parents. Another type of adoption study compares biological and
adopted siblings. In one study, the educational levels attend by biological parents
were better predictors of the adopted children’s IQ scores than were the IQs of
the children’s adoptive parents (Scarr and Weinberg, 1983). Because of the stronger
genetic link between the adopted children and their biological parents, the
implication is that heredity plays an important role in intelligence. However,
numerous studies document the critical role of environment in intelligence as well

Behaviour genetics is the science of heredity which studies the origins of
behaviour that determine how much of the behaviour is the result of genetic
inheritance and how much due to person’s experience. DNA (deoxyribonucleic
acid) is a very special kind of molecule (the smallest particle of a substance) that
still has all the properties of the substances. DNA consist of two strands, each
composed of certain sugars and phosphates. Due to the unique shapes of DNA
each molecule of DNA is linked end to end with the others, forming a very long
strand, sections of this DNA strand are linked by the amines, which are usually
referred to by letters A, T, G and C. Amines are organic structures that contain the
genetic codes for building the proteins that make up organic life chain colouring,
muscles and skin. It controls the life of each cell. Each section of DNA containing
a certain sequence of these amines is called a gene. Genes are located on rod-
shaped structures called chromosomes, which are found in the nucleus of a cell.
Humans have a total of forty-six chromosomes in each cell of their bodies (with
the exception of the egg and the sperm). Twenty-three of these chromosomes
come from the mother’s egg and the other 23 from the father’s sperm. Most
characteristics are determined by twenty-two such pairs, called the autosomes.
The last pair determines the sex of the person. These two chromosomes are called
the sex chromosomes. There is a gene for hair colour on each chromosome. The
actual colour of the person’s hair will be determined by those two genes, one gene
from each parent. Some genes that are more active in influencing the trait are
called dominant. A dominant gene will always be expressed in the actual trait. A
person with a dominant brown hair colour gene will have brown hair, no matter
what the other gene is.

Some genes are less active in influencing the trait and will only be expressed
in the actual trait if they are paired with another less active gene. These genes tend
to recede, or fade into the background when paired with a more dominant gene.
These are called recessive. Several genetic disorders are carried by recessive
genes. Diseases carried by recessive genes are inherited when a child inherits two
recessive genes, one from each parent. Disorders inherited in this manner are cystic fibrosis (a disease of the respiratory and digestive tracts, sickle cell anaemia (a blood disorder), etc. Each cell and each sperm are supposed to have twenty-three chromosomes. In the creation of these cells a chromosome can end up in the wrong cell, leaving one cell with only twenty-two and the other with twenty-four. If either of these cells survives to mate, the missing or extra chromosome can cause mild to severe problems in development (American Academy of Paediatrics, 1995; Barnes and Carey, 2002; Gardner and Sutherland, 1996). Down syndrome is a disorder in which there is an extra chromosome in what would normally be the twenty-first pair. Symptoms include almond-shaped, wide-set eyes and mental retardation (Baren and Carey, 2002; Hernandez and Fisher, 1996). Klinefelter’s syndrome is a disorder in which the twenty-three set of sex chromosomes is XXY with the extra X producing a male with reduced masculine characteristics enlarge breast, obesity and excessive height (Bock, 1993) and Turner’s Syndrome is a disorder in females in which the twenty-third pair is actually missing on X, so that the result is a lone X chromosome (Rauke and W. Saenger, 2001). These females tend to be very short infertile and sexually under developed (American Academy of Paediatrics, 1995; Rover 1993).

8.2.3 Evolutionary Perspective

Natural selection, the process described by Charles Darwin to account for evolutionary change, plays an important role in shaping both behaviour and brain. Evolutionary psychology is focussed on the study of how evolution explains physiological processes. Psychologists and researchers take the basic principles of evolution, including natural selection, and apply them to psychological phenomena. This perspective suggests that these mental processes exist because they serve an evolutionary purpose—they aid in survival and reproduction.

8.2.4 Biological and Cultural Root

In the evolutionary scheme, some individuals are more successful at solving problems and adapting effectively than others (Crawford and Salmon, 2004; Goldsmith and Zimmerman, 2001). Those who are successful pass on their genes to the next generation; those who are less successful do not.

In this evolutionary psychology view, psychological functions have become more specialized over human history (David Buss, 2000, 2004; L. Cosmides and others, 2003). Following are among the specialized psychological functions that evolutionary psychologists study:

- Development of a fear of strangers between 3 and 24 months of age, as well as very common fears of snakes, spiders, heights, open spaces and darkness (Marks, 1987).
- Perceptual adaptations for tracking motion (Ashida, Seiffert, and Osaka, 2001).
● Children imitate high-status models and not low-status models (A. Bandura, 1977).

Throughout the world, kind, intelligent, and dependable mates are preferred (David Buss and others, 1990). Evolutionary psychologists believe that these specialized functions developed because they helped humans adapt and solve problems in past environments (S.J.C. Gaulin and D.H. McBurney, 2004). Some critics caution that evolutionary psychology places too much emphasis on the biological foundations of behaviour. For example, Albert Bandura (1998), whose social cognitive theory acknowledges the importance of human adaptation and change, rejects what he calls 'one-sided evolutionism', in which social behaviour is considered to be solely the product of evolved biology. Bandura recommends a bidirectional view: Evolutionary pressures created changes in biological structures facilitating the use of tools, which enabled organisms to manipulate, alter and construct new environmental conditions. Environmental innovations of increasing complexity, in turn, produced new pressures for the evolution of specialized biological systems facilitating consciousness, thought, and language.

Scientists such as Steven Jay Gould (1981) agree that human evolution gave us body structure and biological potentialities, not behavioural dictates. The advanced biological capacities that evolved can be instrumental in producing diverse cultures; for example, aggressive or peaceful. Russian-American scientist Theodore Dobzhansky (1977) reminds us that the human species has evolved the capacity for learnability and plasticity, which allows us to adapt to diverse contexts. Most psychologists would agree that the interaction of biology and environment is the basis for own development as human beings (C.G. Coll, E.L. Bearer and R.M. Lerner, 2004).

8.2.5 Socio-Cultural Shaping of Behaviour

The behaviour of human beings is meaningful in its cultural context. In terms of shared practices and meaning, different cultures guide us in choosing our goals. Different patterns of behaviour are found in different cultures which emerge in the context of interaction of the people which are encoded in different forms. Various customs, traditions and cultural artefacts display these codes. It has both material and subjective aspects. Culture flows from one generation to another. The subjective part includes roles, norms, values, etc.; whereas the material part includes different artefacts, sculptures, tools, etc. Culture works in different ways, on one side it provides us with opportunities and on the other side it constrains us. Different skills and behaviour patterns are discouraged and encouraged depending on the particular cultural context. Different demands are put by an extended family and a nuclear family. In the same way, schools in remote villages and cities differ in their functioning; for example, interaction pattern, classroom organization, etc. Every culture tries to maintain its identity.
### Check Your Progress

1. How do nature and nurture impact the mind and behaviour?
2. What do you mean by the environment?
3. How do heredity and environment operate together?
4. What is behaviour genetics?
5. State the outcome of the twin study.
6. Enumerate the findings of adoption studies by behaviour genetics.
7. State the role of DNA in determining the origins of behaviour.
8. What do you mean by recessive gene?
9. What is Down syndrome?

### 8.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Nature refers to heredity, the influence of inherited characteristics on personality, physical growth, intellectual growth and social interaction. Nurturing refers to an organism’s environmental experiences that include parenting styles, physical surroundings social conditions, etc. The interaction of nature and nurture influences every aspect of mind and behaviour to a degree. Neither of the two factors operates alone.

2. The social and the physical surrounding in which a person lives, conducts himself or herself, grows, is called the environment. Environment also includes the context of school, family and community within which a person lives and interacts with the genetic characterization.

3. Heredity and environment operate together to produce temperament, height, weight, ability to pitch a baseball, reading ability and so on. Psychologists agreed that much complex behaviours have some genetic loading that makes people likely to develop in a particular way. However, our actual development also depends on what we experience in our environment.

4. Behaviour genetics is the science of heredity which studies the origins of behaviour that determine how much of the behaviour is the result of genetic inheritance and how much due to person’s experience.

5. In a twin study, 7000 paired identical and fraternal twins were compared on the personality test of extraversion and neuroticism. The identical twins had more similarity than the fraternal twins on both the personality traits, suggesting that gene influences both traits.

6. Behaviour genetics also use adoption studies to try to determine whether the behaviour of adopted children is more like that of their biological parents
or their adopted parents. Another type of adoption study compares biological and adopted siblings. In one study, the educational levels attained by biological parents were better predictors of the adopted children’s IQ scores than were the IQs of the children’s adoptive parents.

7. DNA (deoxyribonucleic acid) is a very special kind of molecule (the smallest particle of a substance) that still has all the properties of the substances. DNA consist of two strands, each composed of certain sugars and phosphates. Due to the unique shapes of DNA each molecule of DNA is linked end to end with the others, forming a very long strand, sections of this DNA strand are linked by the amines, which are usually referred to by letters A, T, G and C. Amines are organic structures that contain the genetic codes for building the proteins that make up organic life chain colouring, muscles and skin.

8. Some genes are less active in influencing the trait and will only be expressed in the actual trait if they are paired with another less active gene. These genes tend to recede, or fade into the background when paired with a more dominant gene. These are called recessive. Several genetic disorders are carried by recessive genes. Diseases carried by recessive genes are inherited when a child inherits two recessive genes, one from each parent.

9. Down syndrome is a disorder in which there is an extra chromosome in what would normally be the twenty-first pair. Symptoms include almond-shaped, wide-set eyes and mental retardation.

8.4 SUMMARY

- Nature refers to heredity, the influence of inherited characteristics on personality, physical growth, intellectual growth and social interaction. Nurturing refers to an organism’s environmental experiences that include parenting styles, physical surroundings social conditions, etc. The interaction of nature and nurture influences every aspect of mind and behaviour to a degree.

- According to William Greenough (2001) the interaction of heredity and environment is so extensive that to ask, which is more important—nature or nurture—is like asking which is more important to a rectangle, height or width. People who are more successful at constructing optimal life experiences then others are the ones who looked for and found meaningful life theme as they developed.

- Psychologists agreed that much complex behaviours have some genetic loading that makes people likely to develop in a particular way. However, our actual development also depends on what we experience in our environment.
Some psychologists, however, believe that we can develop beyond what our genetic inheritance and our environment give us. They argue that a key aspect of development involves seeking optimal experiences in life.

The social and the physical surrounding in which a person lives, conducts himself or herself, grows, is called the environment. Environment also includes the context of school, family and community within which a person lives and interacts with the genetic characterization.

Recent studies show that intelligence as well as the amount of grey matter is more correlated in identical twins than in fraternal twins. Intelligent people have more grey matter and the amount of grey matter appears to be strongly related to genetic factors.

In a twin study, 7000 paired identical and fraternal twins were compared on the personality test of extraversion and neuroticism (Rose and others, 1988). The identical twins had more similarity than the fraternal twins on both the personality traits, suggesting that gene influences both traits.

Behaviour genetics is the science of heredity which studies the origins of behaviour that determine how much of the behaviour is the result of genetic inheritance and how much due to person’s experience.

Humans have a total of forty-six chromosomes in each cell of their bodies (with the exception of the egg and the sperm). Twenty-three of these chromosomes come from the mother’s egg and the other 23 from the father’s sperm. Most characteristics are determined by twenty-two such pairs, called the autosomes. The last pair determines the sex of the person.

Some genes are less active in influencing the trait and will only be expressed in the actual trait if they are paired with another less active gene. These genes tend to recede, or fade into the background when paired with a more dominant gene. These are called recessive.

Natural selection, the process described by Charles Darwin to account for evolutionary change, plays an important role in shaping both behaviour and brain.

Scientists such as Steven Jay Gould (1981) agree that human evolution gave us body structure and biological potentialities, not behavioural dictates. The advanced biological capacities that evolved can be instrumental in producing diverse cultures.

Culture works in different ways, on one side it provides us with opportunities and on the other side it constrains us. Different skills and behaviour patterns are discouraged and encouraged depending on the particular cultural context.
8.5 KEY WORDS

- **Genetics**: This is the study of genes, genetic variation, and heredity in living organisms. It is generally considered a field of biology, but intersects frequently with many other life sciences and is strongly linked with the study of information systems.

- **Adoption studies**: These are one form of clinical genetic study designed to evaluate genetic and environmental influences on phenotype.

- **Klinefelter syndrome**: Also known as 47, XXY or XXY, this is the set of symptoms that result from two or more X chromosomes in males. Often, symptoms may be subtle and many people do not realize they are affected. Klinefelter syndrome usually occurs randomly.

- **Down syndrome**: Also known as trisomy 21, this is a genetic disorder. Down syndrome is a genetic condition that results when there is an extra copy of a specific chromosome, chromosome 21. It causes a distinct facial appearance, intellectual disability and developmental delays.

- **Social cognitive theory**: This is used in psychology, education, and communication. It holds that portions of an individual’s knowledge acquisition can be directly related to observing others within the context of social interactions.

8.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short Answer Questions**

1. State the role of heredity in influencing behaviour and mind.
2. Write a brief note on behaviour genetics.
3. State the outcomes that emerge after the experiment with twin study.
4. What is the role of DNA in analysing the genes’ activity?
5. Enumerate the significance of a dominant gene.
6. State how missing or extra chromosome causes problem in development.
7. Write a brief note on the influence of cultural interactions on human behaviour.

**Long Answer Questions**

1. Discuss in detail the genetic and environment behaviour.
2. Analyse the role of heredity in shaping the development.
3. Write a comprehensive note on the Minnesota Study of Twins Reared Apart.
Hereditary and Environment Behaviour

4. Discuss the role of adoption studies to determine the behaviour of adopted children.

5. Analyse in detail the significance of gene in influencing the traits.

6. Elaborate the incidence of Turner’s syndrome.

7. Discuss how evolutionary psychology places too much emphasis on the biological foundations of behaviour?

8.7 FURTHER READINGS


UNIT 9 PRINCIPLES OF LEARNING

Structure

9.0 Introduction
9.1 Objectives
9.2 Factors Influencing Learning and Memory
  9.2.1 Learner-Related Factors
  9.2.2 Environmental Factors
  9.2.3 Resources Available and the Environmental Settings
  9.2.4 Transfer of Learning
  9.2.5 Learning Curve
  9.2.6 Memory
  9.2.7 Process of Memory
  9.2.8 Models of Memory
  9.2.9 Types of Memory
  9.2.10 Factors Influencing Memory
  9.2.11 Methods and Techniques of Memorization
  9.2.12 Forgetting
  9.2.13 Methods to Improve Memory
  9.2.14 Characteristics of Sharp Memory
9.3 Classical Conditioning
  9.3.1 Working of Classical Conditioning
  9.3.2 Application of Classical Conditioning
9.4 Instrumental/Operant Conditioning
9.5 Cognitive Learning
  9.5.1 Purposive Theory
  9.5.2 Seligman’s Learned Helplessness
  9.5.3 Insight Theory of Learning
9.6 Answers to Check Your Progress Questions
9.7 Summary
9.8 Key Words
9.9 Self Assessment Questions and Exercises
9.10 Further Readings

9.0 INTRODUCTION

As is universally acknowledged, a good memory and an efficient retentive function are of great help in everyday life to all of us who heavily lean on their facility in acquiring and retaining information. For psychologists to scientifically study human learning, retention has been defined as remembering now what has been learned before. It entails the process of preserving and maintaining effects of earlier learning experience and later using them. Memory is a comprehensive process which include learning, retention, recall and recognition. It is the habit states of a subject that give the capability for correct occurrences of a criterion response. There is an initial acquisition session in which the subject makes a discriminative response to a stimulus, followed by a period of time. Rehearsal is used both to maintain short-term store and to transfer information about the items to a semi-permanent long-term store.
The problem of improvement in learning has been experimentally studied and the results have invariably shown wide individual differences in the rate of improvement. This is true in the acquisition of both knowledge and skill. Forgetting occurs because the information stored in the memory cannot be brought to the conscious mind. There can be a number of reasons because of which the information cannot be recalled. Failure of recollection can be partial or temporary forgetting; the failure of retention is complete or permanent forgetting.

The study of classical conditioning began in the 20th century with the work of the Noble Prize winner Russian Physiologist, Ivan Pavlov. In his experiment on a dog, Pavlov observed that just prior to being fed, the dog secreted saliva from its mouth. The dog salivated in response to a number of stimuli associated with the food. Pavlov identified many key elements that must be responsible for conditioning to take place. Seligman and his colleagues accidentally discovered an unexpected phenomenon while experimenting on dogs using classical conditioning.

This unit aims at discussing the process of learning, memory and forgetting while analysing the various theories and experiments conducted by psychologists and behaviourists.

### 9.1 OBJECTIVES

After going through this unit, you will be able to:
- Understand the meaning and concept of learning
- Analyse the various factors of learning
- Describe into transfer of learning
- Understand the meaning of memory
- Analyse processes and models of memory
- Enumerate the various types of memory
- Understand factors influencing memory
- Discuss the various techniques and methods of memory
- Decode the meaning and concept of forgetting
- Understand the application of classical conditioning
- Explain the role of cognitive learning
- Analyse various theories on learning

### 9.2 FACTORS INFLUENCING LEARNING AND MEMORY

Learning is a process rather than a product. Learning involves a learner whose behaviour is changed or modified because of learning and the type of experience and training available for modifying the behaviour.
Therefore, there are two types of factors that influence the process of learning:

1. Learner-related factors
2. Environment-related factors

### 9.2.1 Learner-Related Factors

These factors are explained as follow:

1. **Health of the learner:** The health of the learner has a powerful effect on the learning process. Health includes both the physical and mental health. For example, if the individual is having a headache then it is very difficult for him to learn. Similarly, if a person is emotionally disturbed, then he can never concentrate and ultimately he cannot learn. Thus, it can be concluded that in order to see positive results of learning the subject has to be both physically and mentally fit.

2. **Potential of the learner:** The innate capacities and abilities of the learner also affect the process of learning. The potential also includes the interest, attitude and aptitude of the learner. If the individual has more interest in a particular field, then his learning will be better than a person who has no interest. The attitude that is both positive and negative also has an effect on the learning activity. If the individual has a positive attitude then he will be able to learn better. Thus, the basic skills do affect the learning process.

3. **Motivation of the learner:** The amount of motivation the individual has will decide the learning outcome. If the individual does not have high aspirations, then he will not be motivated to learn. The aspiration should not be too high also because there can be a feeling of frustration. So both aspirations and motivation can contribute significantly to learning.

4. **Learner’s objectives:** The objectives of the learner also affect the learning process. If he has a definite aim, then he will work hard in a particular direction and so learning will be more in that particular area.

5. **Readiness of the learner:** The other important factor that contributes to learning is the learner’s readiness. There will be no learning if the learner is not ready to receive it mentally and physically. Thus, if the learner has a strong will to learn something, then the learning will be very effective.

### 9.2.2 Environmental Factors

- Trainer-related factors
- Content-related factors
- Process-related factors

#### A. Trainer-related factors

1. **Personality of the Trainer:** Trainer has a very important role to play in the process of learning. The trainer sometimes becomes the ideal role model
for the learners. The learning activity cannot be fruitful unless there is interaction with the trainer and the learners. How well the trainer communicates the matter, which has to be learned in order that the learner achieves the goal, depends upon the personality of the trainer. Personality also affects the behaviour of the person and that is why the activities related to learning are differently carried out by different people.

2. **Knowledge of the subject**: The teachers must be thorough about the subject matter. That means they must know the subject really well. They must be able to handle all types of queries. The trainer must also have good presentation and oratory skills.

3. **Health of the trainer**: If the trainer is not in a sound mental or physical health, then it becomes difficult for him to convince and influence the learners. Poor mental health may also lead to adjustment problems, whereas a sound mental health of the trainer ensures that he properly adjusts to the environment and influences the learning process.

4. **Presentation skills of the trainer**: Presentation is at the heart of training. A good presentations makes it easy for students to learn.

B. **Content-related factors**

1. **Nature of content**: The learning process is also influenced by the nature of content. Learning is affected by factors like whether the content is direct or indirect, formal or informal or whether the content is organized or unstructured.

2. **Selection of content**: The selection of content also influences the learning process. The selection of content should depend upon the needs of the learners.

3. **Organization of the content**: In order to make the learning more effective, the content should be structured and must be organized. Selected content or learning experiences need better organization for effective sharing among the learners and teachers.

C. **Process-related factors**

1. **Learning methods**: Learning depends upon the methods and approaches used, like there should be linking of the new learning with the past learning. Past information helps the learner to understand the new information. For better learning, maximum senses should be used in a given situation. The learner who uses the sense of hearing, seeing, smell and touch will learn the things better. For example, if a small child wants to learn information about the computer, then if he is able to see the computer and feel its parts by touching then he will be able to learn it better than a child who has to learn the information without seeing.
2. Feedback: The learning results are also dependent upon what kind of reinforcement and feedback is given to the learner. If the learner exactly knows the progress of his learning and knows how well he is doing, it may work as an immediate reinforcement. He will be motivated to perform better. Feedback can be negative also; if the learner has problems, then remedial actions can be taken to improve the process of learning. Reinforcement must result from students’ practice. If the student shows firm understanding of the presented information, reinforcement should admire the success. However, if practice brings forth a student’s lack of understanding, reinforcement should come as repeated presentations, reviews and more practice, ensuring that the student eventually grasps the information.

9.2.3 Resources Available and the Environmental Settings

The learning process also depends upon the available resources like good learning material, proper illumination and appropriate learning environment like calm and peaceful settings. Some important factors contributing to learning environment are motivating climate, correct aptitude for learning, laboratory and library facilities to conduct research and project work for better learning of concepts. A good and conducive learning environment ensures that the learner is comfortable; for example, proper seating arrangement is there, the environment is calm, there are no distractions and there are facilities of rest and recreation if required, for the learner.

The other important requirement is that there should be a continuous motivation from the trainers to the learners. The trainer should also be highly motivated to impart information. Proper reinforcement should be provided to the learners to motivate them to learn. The trainer should make attention-holding presentations, giving realistic examples, preparing illustrative visuals and, in general, keeping the students interest level high will contribute in determining how quickly and easily learners understand new concepts. All these factors can be explained with the help of an example from a good educational institute, which provides good facilities to the learners. The trainers motivate the learners by giving rewards. The environment in an educational institute is calm and peaceful. There are negligible distractions. There are competitive and cooperative group situations. There are facilities of rest and recreation. Proper learning aids in terms of good reading material are provided to the learners. The learners also have an opportunity for self-expression and creativity. All these factors together enhance the learning effectiveness.

9.2.4 Transfer of Learning

Transfer of learning is very important for future development. When we learn to perform a task, we sometimes feel that it is influenced by our previous learning. The skills acquired in one activity is possibly transferred to the next situation. This is called transfer of learning.
According to Sorenson (1948): “Transfer refers to the transfer of knowledge, training and habits acquired in one situation to another situation.”

Sometimes, we feel that our previous knowledge was actually a barrier in the present learning. Thus, transfer of learning is not always positive but can have negative effects also. So transfer of learning can be positive, negative or there can be no transfer at all.

If the previous knowledge or learning helps or benefits the current learning, then it is termed as positive transfer, if the former learning interferes or is an obstacle in the present learning, then it is termed as negative transfer and if there is no effect of past learning either positive or negative in performing the present activity, then it is called zero transfer.

In some situations, there can be both positive as well as negative transfer.

### 9.2.5 Learning Curve

When a person is introduced to new information or a new skill, it may take several learning sessions to acquire that knowledge or skill. Psychologists refer to this acquisition process as the learning curve. In general, this term refers to the time it takes an individual to develop knowledge or a new skill.

The problem of improvement in learning has been experimentally studied and the results have invariably shown wide individual differences in the rate of improvement. This is true in the acquirement of both knowledge and skill. The learning curve has been found to be extremely irregular, varying even in the same individual. Figure 9.1 shows that the rate of learning is sometimes fast and sometimes slow.

![Rate of Learning](image)

### 9.2.6 Memory

Learning is of no use if we are not able to preserve our past experiences and able to recall them in future when needed. This ability of remembering and later recalling is called memory. It is a representation of actual past events. It has a very important role to play in the behaviour of a person.
According to Tulving (2000), memory is the means by which we retain and draw on our past experiences to use that information in the present. As a process memory refers to the dynamic mechanisms associated with strong retaining and retrieving information about past experience (Bjork, Schneider and Hernandez Blasi, 2003, Crowder, 1976).

Memory involves four factors learning, retention, recall and recognition. Thus memory is a complex process that starts with learning. Memory is also the ability to retain past learning in the brain, and then retain it for a long time and then recognize and recall it at a later stage according to the demand of the situation.

Bentley was of the view that experience acquired by a person leaves impression on the brain in the form of memory traces. These forms the basis of memory as a functional tendency, because retention ends when these traces are wiped off.

According to Woodworth (1945), ‘In defining memory, we should first repeat what has been said before, that this noun is properly a verb. The real fact is remembering.’

According to Stout (1938), ‘Memory is the ideal revival so far as Ideal revival is merely reproductive...this productive aspect of ideal revival requires the object of past experiences to be reinstated as far as possible in the order and manner of their original occurrence.

According to Ryburn (1956), ‘The power that we have to store our experiences and to the field of consciousness sometime after the experiences have occurred, is termed memory.’

9.2.7 Process of Memory

Memory starts with learning. The four stages of memory are:

- Learning
- Retention
- Recognition
- Recalling

i. Learning

Learning starts with encoding. The process of encoding is to translate the sensory information or simply the stimulus around into codes so that they can be stored and later retrieved when needed. The information in the memory can be done by two coding systems verbal and non-verbal i.e. use of imagery. The information in the short-term memory is stored in the forms of chunks. A chunk may be a letter or digit or a combination of letters and digits each combination being a chunk.

ii. Retention

The next step in memory is called retention. Retention means storage of the information, retaining the residues of experiences. The retention may be at the
conscious or sub-conscious level. Sometimes, we are able to recall things very easily without any effort this is the conscious state but sometimes somebody else reminds us of certain things this is sub conscious level and at the unconscious level the things cannot be recalled.

iii. Recognition
Sometimes recall comes after recognition as, for example, when we recognize an old friend the moment we see him and then we are reminded of good things about him. On other occasions, it is recall which precedes recognition. Sometimes, it happens we are going somewhere and someone asks us whether we have recognized him or not, and when he describes about himself we recognize the person. This shows that recognition sometimes follows a recall.

iv. Recalling
Recalling the information also depends upon how the information is encoded in the long-term memory. The meaningful information is recalled better than the meaningless information. Sometimes recalls come after recognition; for example, we see our old house and we are reminded of many pleasant memories related to that house. But sometimes we do not recognize a person who approaches us and asks us whether we have recognized or not and then we realize and recall that he was our old neighbour.

Tip of the tongue phenomenon in recall or retrieval is an important part in the process of memorization.

Sometimes we have a feeling that we know something for sure but are unable to recall it immediately. This is referred to as tip of the tongue state. The individual feels that he has all the relevant information but the exact word does not come to the tip of the tongue. The words which come to mind are quite similar in meaning and sound to the ‘target word’ which the individual wants to recall.

Thus recall is not an all or none process the subject may forget some characteristics of the word but may be able to retrieve some information related to the word.

9.2.8 Models of Memory
Waugh and Norman (1965) proposed the model of memory which had two structures, primary memory which holds temporary information currently in use and secondary memory which stores information for a very long period of time or permanently.

Atkinson and Shiffrin (1968) proposed the memory model in terms of three stores (Figure 9.2).

- Sensory store
- Short term store
- Long term store
9.2.9 Types of Memory

Based on the Atkinson and Shiffrin, model memory are basically three types: immediate or sensory memory, short-term memory and long-term memory.

1. Sensory memory

This type of memory helps the individual to recall immediately those events or things which have just occurred. The information stored in this type of memory is lost after a very short period of time or after the information is used by the individual. Like the number of the seat of the bus we forget after we occupy it, we remember it till we have not occupied the seat.

The new information takes the place of the old information and the new information is erased.

2. Short-term memory

This type of memory is also for a very short period of time, but it is not as short as in the case of immediate memory. The impressions do not erase very easily. The sensory impressions retained in the immediate memory are either immediately erased or transferred to the short term memory. The sensory information stored in the short term memory is lost in a very short period of time, if that information is not rehearsed or is transferred to long-term memory. The duration of the information in short-term memory last from 3 to 20 seconds. The sensory information in short term memory is encoded in the forms of visual and auditory impressions, signs words etc. the encoding in the short-term memory is not systematic. There are no rules or principles followed in the encoding process.

It has been proved by many experiments that only five to nine items can be stored in the short-term memory. Some information from sensory memory is transferred into short-term memory. In short-term memory there are three basic operations:

- **Iconic memory**: The ability to hold visual images.
- **Acoustic memory**: The ability to hold sounds. Acoustic memory can be held longer than iconic memory.
- **Working memory**: An active process to keep it until it is put to use.
Conard (1964) by his experiments proved the importance of acoustic code rather than a visual code. Thus the encoding of visually presented letters in by the subjects in the experiment was based on how they sound not by how they look.

Baddeley (1966) compared recall performance for lists of acoustically confusable words such as map, cab, man, mad and cap with that for lists of acoustically distinct words such as cow, pit, day, rig and bun. He concluded from this experiment that the recall performance was bad for the visual presentation of words. He also compared performance for lists of semantically similar words such as big, long, large, wide and broad with performance for lists of semantically dissimilar words such as old, foul, late, hot and strong. There was little difference in recall between the two lists.

Shulman (1970) Wickens, Dalezman and Eggmeier (1976) also studied as how the information is encoded in short-term memory. Their study concluded that there is some semantic encoding in short term memory.

Though primarily the encoding in short-term memory is acoustic, but there is a clear indication from the studies carried by different researchers that there is at least some semantic encoding in short-term memory.

**Difference between sensory memory and short-term memory**

The retention time is less than one second in sensory memory sometimes the retention time goes up to five seconds to auditory stimulus. This means that if the stimulus is in form of a sound then it remains for a longer period of time than other types of stimulus whereas in short-term memory the information last up to thirty seconds even if the information is not rehearsed or practiced in the short-term memory.

Span of memory that means how much information can be retained at a point of time is more in sensory memory than the short-term memory. Span of retention in sensory memory is generally eleven to sixteen items for a half a second in short-term memory this span is five to nine items. The information stored in the sensory memory is deleted or completely erased or sometimes it gets transferred to the short-term memory whereas the information in short-term memory is lost if it is not practiced or rehearsed. If the learner makes an attempt than the information after many repetitions gets transferred to long-term memory. Forgetting is almost immediate in sensory memory whereas in the short-term memory the forgetting is considered to be purposive and deliberate. The old information is erased to give place to new information.

**3. Long-term memory**

Long-term memory has a limitless capacity to store information. The information stored in the long-term memory is permanently retained and does not gets erased and that is why it is also called as permanent memory. The duration of the information is up to lifetime. Though the individual may face problems in recollecting the information from the long-term memory because the cues needed to retrieve the information are not complete, but forgetting is minimal from long-term memory store. The encoding process is very structured, planned and organized. Encoding
is done on the basis of meanings and other important characteristics related to the piece of information.

Long-term memory involves the information you make an effort (conscious or unconscious) to retain, because it's personally meaningful to you (for example, data about family and friends); you need it (such as job procedures or material you're studying for a test); or it made an emotional impression (a movie that had you riveted, the first time you ever caught a fish, the day your uncle died). Some information that you store in long-term memory requires a conscious effort to recall: episodic memories, which are personal memories about experiences you've had at specific times; and semantic memories (factual data not bound to time or place), which can be everything from the names of the planets to the color of your child's hair. Another type of long-term memory is procedural memory, which involves skills and routines you perform so often that they don't require conscious recall.

The information stored in long-term memory affects the process of perception, and influences what information the individual will attend to from the environment around. The information is stored in the form of schemas in the long-term memory.

Schemas are the mental models of different objects in the world in the mind. These schemas are the detailed knowledge structures present in the long-term memory. The schemas are organized in the long-term memory and the schemas of similar information are connected to each other. All the schemas related to one type of information gets activated and all the information related to a concept is recalled and all irrelevant information is not perceived this is how the individuals interprets the objects and situations around them.

According to Mander and Parker (1976), a schemata is an internal structure, developed through experience that organizes incoming information in relation to previous experience. Schemata is related to scripts. Gleitman (1985) describes a scenario of behaviour applicable to a particular setting such as a restaurant script, the sequence includes being seated, looking at the menu, ordering food, paying the bill and leaving.

The sensory impressions encoded in the long-term memory are of two types: episodic and semantic. Thus long-term memory can be explained in terms of episodic memory and semantic memory.

i. **Episodic memory**: This type of memory is related with the episodes in the life of a person. These episodes are the events and experiences associated with one's life. For example, for a married person some important episodes of his life will be his marriage, birth of a child, which will be a part of his long-term memory which he will never forget during his entire life span.

Similarly, a person who has witnessed a major accident will never be able to forget throughout his life and it will be permanently stored in his long-term memory and he will be able to recall it at any later stage of his life and narrate all the experiences related to this episode.
NOTES

ii. **Semantic memory**: Semantic memory is not related to events or episodes in the life of a person but it is related to the ideas, meanings, and concepts. This semantic memory is concerned with the knowledge of concepts which are more general in nature than the individual events in the life of a person. This type of memory is helpful during the childhood stage when the concepts are being formed. Semantic memory helps in forming a generalized picture of the world. Semantic memory is important in doing new and learning about new situations.

This type of memory is based on generalized rules, principles, and formulae.

In the long-term memory all the experiences and events are encoded in the form of language and can be retrieved when needed. All the information stored in the long-term memory does not get erased from our memory and remains permanent like the name of our parents, our relatives. General chemical formulae, name of capital cities are also stored in semantic memory.

**Difference between short-term memory and long-term memory**

The duration of information in short-term is only for thirty seconds or less. The duration of information in long-term memory can be for the entire life. Not more than five to nine items can be stored in long-term memory whereas long-term information has a limitless capacity to store different types of information. The information in the short-term memory is not organized and structured. There are no rules to store the information, but in long-term memory the encoding process is planned, organized, and structured. In semantic memory the information is organized on the basis of the meanings of the words. Information in short-term memory is very short lived and decays after a very short period of time, whereas the information in long-term memory is not completely erased though there may be difficulty in retrieving the information but the information is not completely forgotten.

**9.2.10 Factors Influencing Memory**

Various factors are responsible for affecting the process of memory. The factors can be both external which cannot be controlled by the individual as well as internal which lie within the individual. The other factors which influence the process of memory are the nature of the information and resources used in the process of memory.

**1. Nature of the information**

The nature of the information to be learned influences the process of memory. The information which is meaningful and the material which fulfills the needs of the learner is better recalled by the learner and it remains stored for a longer period of time. In an experiment conducted the subjects were shown.

Related paired words like Delhi–capital, apple–fruit, toys–children and some unrelated pair words like banana–rain, dance–wheat. It was found from this study that the subjects were able to recall the meaningful paired words better and the
meaningless words and non-paired words were not memorized. The intensity of the stimulus also effect the retention. Weak and not very clear sensations do not stay in the memory for a very long period of time. Clear pictures can remain in the memory for a long time. Distinct sensations like strong light, very bright picture is retained for long time. Recency also has an effect on retention. Recent events and experiences are retained longer. Duration or the time interval of the sensation also has an effect on the memory. A sensation which is present for a longer duration remains in the memory for a considerable time whereas the sensation for a shorter period of time vanishes quickly from the memory.

Events that are surprising and inconsistent with our expectations will be retained the most in the memory.

The amount of material also has an effect on the process of memory. If the material to be memorized is short and within reasonable limits then it is easy to memorize, but if the information is quite lengthy then there are more chances of failure.

Mental inclination of the learner also effects memory. If the learner is mentally inclined towards a piece of information then the retention will be for a longer period of time. For example, a sports lover will retain more of sports related events. A religious person will remember sacred things better.

2. Resources used in the process of memory

How much information is stored in the memory also depends upon the methods and techniques followed by the learner. For example, in the recitation method, the learner keeps on reciting the information that has to be learned. The other method of memorizing is sometimes the learner learns all the information as a whole and sometimes the information is learned in parts.

Freud was of the view that unpleasant things cannot be retained for long. The person becomes totally ignorant to the unpleasant experiences with the passage of time.

A person retains those things for a longer period which relate with his mental inclinations.

Intention also plays an important part in memory. If a person has an intention to learn then the retention will be better. All these methods and techniques are discussed in detail.

9.2.11 Methods and Techniques of Memorization

The person chooses the method and techniques according to the demands of the situation. Some of these methods used for memorizing are as follows:

1. Whole and part method

There are two methods of remembering a piece of information. For example, a student wants to learn one whole chapter. One method is to learn the chapter as a whole. This is the whole method of memorization. The other method is to divide
the poem into different parts and each part is memorized as a separate unit. The whole method is useful and the success rate of memorization is more if the piece of information is short. This method is less time taking also. Part method is useful when the information to be learned is quite lengthy and detailed.

2. Method of distributed and massed practice

In the distributed or space method, the complete information is not remembered in one go rather after memorizing some part of the information for some time, the rest is given to the learner after repeated intervals of time. In massed or un-spaced method of memorizing no break is given to the learner. The whole information is memorized without any rest in one go. For memorizing long detailed information, spaced or distributed method is better. This method breaks the monotony of the work and proper rest again motivates the learner to put in extra efforts to memorize the detailed piece of information. In spacing at each learning session, the context of encoding may differ. The individuals may use alternative strategies and cues for encoding. It is difficult to say which method is better because both have a set of advantages and disadvantages and depends upon the skills of the learner and also the environmental conditions.

9.2.12 Forgetting

Forgetting occurs because the information stored in the memory cannot be brought to the conscious mind. There can be a number of reasons because of which the information cannot be recalled. Failure of recollection can be partial or temporary forgetting; the failure of retention is complete or permanent forgetting.

Forgetting is important for us also as unless we forget the incorrect responses we cannot learn the correct ones. Thus, forgetting can be considered to be a boon for us.

Munn (1967): ‘Forgetting is the loss, permanent or temporary, of the ability to recall or recognize something learned earlier.’

Drever (1952): ‘Forgetting means failure at any time to recall an experience when attempting to do so or to perform an action previously learned.’

Does quick learning also contribute to forgetting? There is an old saying: ‘Quick learners are quick forgetters also.’ This is not always true. If a learner fully understands and grasps the information quickly, then it cannot be forgotten. Slow learning, on the other hand, may create monotony and it is a sign of unsystematic learning.

According to Ebbinghaus, forgetting is a passive mental process.

On the basis of many researches conducted, the following can be the causes of forgetting.

i. Disuse

According to the theory of disuse, any learnt material if not rehearsed or practiced regularly will decay due to disuse. This theory is also called as natural decay
theory. Thus, decay theory asserts that information is forgotten because of the gradual disappearance rather than displacement of the memory trace unless some effort is made to keep it intact. Forgetting is considered to be a natural and universal phenomenon. Some psychologists also agree that with the passage of time there is a decay of the memory. The rate of decay increases with the passage of time. Ebbinghaus (1885) studied the phenomenon of forgetting. He conducted many experiments to describe the process of forgetting and plotted a curve of forgetting.

Ebbinghaus concluded that after twenty minutes of time forty seven percent information is forgotten. After one day sixty six per cent information is lost; after two days, seventy two percent information is forgotten; after six days, seventy five percent information decays and after thirty one days, seventy nine percent information is forgotten. Ebbinghaus plotted these results on a graph paper.

There are many arguments against the decay theory of forgetting because many psychologists assert that forgetting is not only due to disuse but also other activities after learning.

ii. Interference effects
According to the interference theory of forgetting the information cannot be retrieved not just because of the passage of time but also because there has been a new learning. New learning has a negative effect on recalling past learning. This is called as retroactive inhibition. Retroactive inhibition is effected by the similarity between past learning and interpolated activities.

Retroactive inhibition is also effected by the amount of past learning and interpolated activity.

If the amount of interpolated activity is more than the past learning, the hindrance to recall will be more.

A second kind of interference is proactive interference or proactive inhibition. Proactive inhibition occurs before meaning of the-to-be remembered material. According to underwood (1957), the amount of proactive interference generally climbs with increase in the length of time between when the information is retrieved.

The recency effect mean the subject’s ability to recall words at and near the end of a list. The primacy effect is the superior recall of words at and near the beginning of a list. Both the recency effect and the primacy effect influence the process of recall.

iii. Motivated forgetting
Another facet to forgetting is the aspect of the motives of the person. The principle of repression is applicable when some memories cannot be retrieved because they cause personal discomfort. The psychoanalysts emphasizes that the major cause of forgetting is repression. Repression means pushing of the experiences and thoughts into the unconscious. According to Freud, it is natural for human beings to repress sorrowful thoughts because of the pain of the cause if remembered.
The memories are not lost but can be traced under appropriate conditions. For example, the individual forgets all personal references because of some severe emotional shock.

9.2.13 Methods to Improve Memory

Some parts of the brain have very important role to play in memory. The three areas of the brain which contribute to memory are hippocampus, amygdala and cerebral cortex. The most important part is the hippocampus, which helps in processing the information. The amygdala is another area near the hippocampus which processes emotions and stores memories that involve emotion and the third area called cerebral cortex, forms the outer layer of the brain, and it stores the information present in the long-term memory in different zones, depending on the factors as to how the information is processed like language formation or sensory input, problem-solving, etc.

There are three stages that the brain goes through in forming and retaining memories.

- Stages of memory foundation and maintenance are acquisition, consolidation and retrieval.
- i. Acquisition
  
  Acquisition means the information enters the brain through nerve cells and gets encoded. Encoding is only successful if attention is concentrated intentionally. If the learner is not focused then the information does not get encoded and is lost. That is the reason why we have to pay attention to memorize any piece of information. Distractions can cause loss of attention and ultimately no acquisition.
- ii. Consolidation
  
  The acquisition of any information leads to the next stage of consolidation. If the information is encoded then the hippocampus processes the information and it is stored in the long term memory. If the subject is able to relate the current information with the past learning then the consolidation will be better. Emotional responses are also consolidated easily.
- iii. Retrieval
  
  In recalling the information, the brain has to activate the same pattern of nerve cells it has used to store it. The more frequently you need the information, the easier it is to retrieve it along healthy nerve cell connections.

  Mnemonics is a method of remembering items by imposing a structure of organisation on the material to be memorized. This method serves as a set of clues to remember pieces of information by associating the information with a visual image, a sentence, or a word. The three basic principles of mnemonics are imagination, association and location.
a. Imagination
We all tend to learn verbal material better when we connect them with some visual image. The images strengthen the associations needed to create effective mnemonics. For example, all manufacturers use imagery in brand name of their products so that their brands are easily remembered by people. Charlie Chaplin’s image is associated with shoe polish. Pleasant images are stored and recalled easily than the unpleasant ones. Unpleasant images are blocked by the brain and cannot be recollected.

b. Association
By association, people link a thing to be remembered to a way of remembering it. Associations can be created by merging two images together or by relating two things with same colour, shape or smell or placing things on top of each other.

c. Location
With location the things to be remembered can be linked. Different locations may be related with different things. For example, linking Delhi with few things and relating Mumbai with the other things.

According to Koriat and Goldsmith (1996), to preserve or enhance the integrity of memories during consolidation we may use various metamemory strategies. Metamemory strategies involve reflecting on our own memory processes with a view to improving our memory. Some of the metamemory strategies are discussed as follows:

1. Rehearsal: Rehearsal means the repeated recitation of the information to be learned. Rehearsal can be overt or covert. Overt means when the rehearsal can be observed by others. Covert means when the rehearsal is silent and cannot be observed by others. The effects of such rehearsal is called as practice effects. A learner must transfer the information by rehearsal to long term memory. There can be two types of rehearsal, elaborative rehearsal and maintenance rehearsal. In elaborative rehearsal, the individual tries to elaborate the meaning of information to be remembered and also tries to connect with the information which is known to him. Maintenance rehearsal means repeating the information without elaborating. Such information is not passed to long term memory because it was not related with already known information.

2. Organization of the information: According to Best (2003), mnemonic devices are specific techniques to help you memorize lists of words. There are a number of techniques to memorize, which are discussed in the followings:
   i. Categorical clustering: One organizes a list of items into a set of categories. For example, if you want to remember a list of words of different types then the items can be clustered into different categories like colours, fruits, vegetables, etc.
   ii. Interactive images: This technique focuses on association of each new word with a word on a previously memorized list and forms an interactive
image between the two words. Interactive images can be created to relate
the isolated words in a list. For example, if the unrelated words like road,
shop, pencil, table are to be remembered then these words can be memorized
by generating interactive images. For example, you can imagine you are
going on a road which has many shops the shop sells pencil and table.

iii. **Peg word system**: Associate each new word with a word on a previously
memorized list and form an interactive image between the two. For example,
in one of the experiments cited one list of words was from a nursery rhyme,
one is a bun, two is a shoe, three is a tree, four is a door and so on. To
learn new words containing socks, apples and a pair of scissors the list was
memorized by visualizing an apple between buns, a sock stuffed inside a
shoe and a pair of scissors cutting a tree.

iv. **Method of loci**: In the method of loci, one visualizes walking around an
area with distinctive landmarks that one knows well. One then links the
various landmarks to specific items to be remembered. For example you
have four landmarks on your way to office— the old house, a big tree, tall
building and a small bridge. The list of words to be remembered is an apple,
a pair of socks, a bun and a pair of scissors. Then you might imagine an
apple on top of the old house, a pair of socks hanging from the tree, a bun
lying in front of the tall building and a pair of scissors in between the bridge.

v. **Acronym**: In using acronym, one devises a word or expression in which
each of its letters stands for a certain other word or concept. An example is
IQ or USA. The following techniques may be used to improve the memory:

- **Choosing correct method to memorize**: Some people tend to learn
  better if the information is in terms of visuals; they are called as visual
  learners. They prefer to see to memorize the information. Other prefers
  listening; they are termed as auditory learners. They remember the
  information better if they hear the recorded information.

- **Strong determination**: The learner must have a sense of strong will
  and determination in order to memorize the information and later recall
  it when needed. If the learner lacks will then he will not be motivated to
  retain the information and reproduce it later.

- **Using as many senses as possible**: Learning is always better if more
  than one sense organs are used to obtain the information like the
  information about a particular object can be collected by knowing its
  color, touching its texture, smelling it and tasting it. Likewise audio-
  visual information is better received by the learner.

- **Repetition and practice**: Continuous rehearsal and practice of the
  information learned helps in easy recall. The things repeated and practiced
  frequently are remembered for a long time. As goes the saying “practice
  makes a man perfect.”
● Organize information: The new information should be related with what is already known. Grouping and rhyming the information also facilitates the learning process. For example, if a number 267875432 has to be memorized then if we group them as 267 875 432 then it can easily be retained and recalled. Children learn the material easily if it is arranged in the form of a rhyme like 30 days hath September, April, June, and November.’

● Positive attitude: A positive frame of mind increases the learning effectiveness. Sometimes, if we have a negative attitude and we feel that the information is quite lengthy or difficult to learn, then with this attitude, the information is not stored and retained and becomes difficult to recall.

9.2.14 Characteristics of Sharp Memory

A person having a sharp memory displays some distinct characteristics:

1. Acquisition is quick if the learner is able to acquire the information quickly then his memory is considered to be good. If the acquisition is slow then the memory is not considered to be sharp.

2. Retention is long, the quick power of acquisition is not the only condition which characterizes a good memory. There should be long retention of the information also. Some people learn very fast but they also tend to forget very quickly. Thus a person having a good memory power is the one who can store and retain information for long duration.

3. Retrieval is accurate and prompt memory can only be considered to be good if the individual can quickly recollect the correct information when required. Many times it happens that in an interview a question is asked, we might be knowing the answer but we cannot recall it at that very moment. The solution strikes us when the interview is over. This is not the sign of good memory.

4. Relevancy of the information: Sometimes the person is able to recall a lot of information but it is not relevant. For example, the students write all irrelevant matter in response to a question. This is also not a sign of good and sharp memory.

Check Your Progress

1. What do you understand by learning?
2. List the various factors that influence learning.
3. Why is transfer of learning important?
4. State the concept of memory.
5. List the various stages of memory.
6. Enumerate the different types of memory.
9.3 CLASSICAL CONDITIONING

Classical conditioning is a learning process in which a neutral stimulus associates with another stimulus through repeated pairing with that stimulus. The study of classical conditioning began in the 20th century with the work of the Noble Prize winner Russian Physiologist, Ivan Pavlov. In his experiment on a dog, Pavlov observed that just prior to being fed, the dog secreted saliva from its mouth. In his experiment Pavlov daily placed meat powder in the dog’s mouth, causing it to salivate. Pavlov noticed that meat powder was not the only stimulus that causes salivation. The dog salivated in response to a number of stimuli associated with the food. Pavlov identified many key elements that must be responsible for conditioning to take place. They are mentioned as follows:

- **Unconditional stimulus**: Unconditioned denotes unlearned or the naturally occurring stimulus, which leads to the reflex, involuntary response. Food is the unconditioned stimulus here.

- **Unconditioned response**: It is unlearned and occurs because genetic wiring in nervous system. Salivation of the dog is an example of an unconditioned response.

- **Conditioned stimulus**: Stimulus that is able to produce a learned reflex response by being paired with the original unconditioned stimulus. Conditioned stimulus means learned.

- **Conditioned response**: It is a learned reflex response to a condition stimulus. In his experiment, Pavlov used meat powered as the original unconditioned stimulus, which produced salivation in his dog. Pavlov placed the meat powder in the dog’s mouth and rang the bell. Later on, he first rang the bell and little after that he placed the food. He increased the time interval between the sound stimulus (the bell) and the food stimulus (meat powder), and noticed that the sound stimulus produced salivation. After a certain number of such paired administrations of two stimuli, Pavlov presented only the sound stimulus and every time the sound stimulus produced salivation (saliva from the dog’s mouth). He called the original stimulus the unconditioned stimulus (USC) and its response the unconditioned response (UR). He called the new stimulus the conditioned stimulus (CS) and the old response, when attached to the CS, was called conditioned response (CR).

The connection between the CS and CR—the sound stimulus and the salivary response—could be established only when the UCS—the food stimulus—was also subsequently applied. The UCS was therefore called the reinforcement stimulus. CS gained the strength or force from the UCS, which was paired with it, to produce the conditioned response. The paired presentation of the two stimuli could alone establish the new connection. The conditioned reflex principle, when
applied to learning of new responses, came to be called the Conditioning Theory of Learning.

The findings of Pavlov have been tabulated in Table 9.3.

<table>
<thead>
<tr>
<th>Before Conditioning</th>
<th>After Conditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS (Sound)</td>
<td>CR (Salivation)</td>
</tr>
<tr>
<td>No response or irrelevant response.</td>
<td>UCR (Salivation)</td>
</tr>
<tr>
<td>UCS (Food)</td>
<td></td>
</tr>
</tbody>
</table>

### 9.3.1 Working of Classical Conditioning

Classical conditioning works in the following manner:

- **Stimulus generalization**: Generalization in classical conditioning is the tendency of a new stimulus that is similar to the original stimulus to elicit a response that is similar to the conditioned response (Nicholas Jones, Ildiko Kemenes and Paul Benjamin, 2001). Pavlov found that the dog not only salivated to the tone of the bell, but also to other sounds that are similar to the original sound of the bell. The similar the bell sounded, the more the dog salivated.

- **Discrimination**: Stimulus generalization cannot continue for a long period of time. When the dog did not receive only food on hearing the similar bell, real CS was followed. With food appearing only after the real bell, the dog started to differentiate between the fake bells and the real one. This process is called stimulus discrimination; the process of learning to respond to a particular stimuli and not to others (R.A. Murphy, A.G. Baker and N.A. Fouquet, 2001).

- **Acquisition**: The time interval between the CS and UCS is one of the most important aspects of classical conditioning (S. Kotani, S. Kawahara and Y. Kirino, 2002; G. Weidemann, A. Georgillas and E.J. Keoh, 1999). Conditioned responses develop when the CS and UCS occur close together; often optimal spacing is a fraction of a second (G.A. Kimble, 1961). In Pavlov experiment, the bell rang 15 minutes before the presentation of food. The dog probably would not have associated the ringing of the bell with the food.

- **Extinction**: It means learning that the CS no longer predicts the UCS; it is not unlearning like original learning. It involves formation of a new CS-no UCS memory that inhibits expression of the CS-UCS association. Hence, the dog gradually stopped salivating to the sound of the bell. When the CS
(bell) was repeatedly presented in the absence of UCS (food), the salivation (CR) died out.

- **Spontaneous recovery:** It refers to the reappearance of a learned response after extinction has occurred. If Pavlov had followed the ringing of the bell with the food—after the dog had stopped salivating to the sound of the bell—the dog’s spontaneous salivation would have reoccurred. This is called retraining. Retraining is made simpler by the fact that the extinguished response is not gone, just suppressed.

- **Higher order conditioning:** This occurs when a strong conditioned stimulus is paired with a neutral stimulus. The stronger CS can actually play the part of a UCS, and the previous neutral stimulus becomes a second conditioned stimulus. For example, previously the dog was conditioned to salivate at the sound of the bell. If the dog is put in a situation wherein it is exposed to a light followed by the bell on each trial, the light alone will eventually elicit a CR, even though it has never been paired with food. The existence of second-order conditioning greatly increases the scope of classical conditioning especially in human beings, for whom biological significant UCS occurs relatively infrequently.

### 9.3.2 Application of Classical Conditioning

The following are the applications of classical conditioning:

- **Survival value:** Classical conditioning has a great deal of survival value (Vernoy, 1995). Due to classical conditioning, we jerk our hands away before they are burned by fire. Pavlov conducted his experiments and concluded that individuals have been conditioned to respond to the sound of a buzzer, a glimpse of light, a puff of air or the touch of a hand (Woodruff-Pak, 1999).

- **Health problems and mental disorders can be attributed to classical conditioning:** B. Watson and Rosalie Rayner (1920) brought to light the role of classical conditioning in phobias (irrational fear). They conducted the ‘Little Albert’ that included a white rat. They concluded that if we can produce fears through classical conditioning we can eliminate them using conditioning procedure. Counter conditioning is a classical conditioning procedure for weakening a CR by associating a fear-provoking stimulus with a new response incompatible with the fear. Classical conditioning is not restricted to unpleasant emotions. We become conditioned with the pleasure moment of our life. Certain physical complaints can also be partly the products of classical conditioning. Classical conditioning can be involved in certain aspects of drug use.

- **Classical conditioning used by contemporary advertisers:** Many contemporary advertisers use classical conditioning (J. Perner, 2001). For
example, whenever males see a beautiful woman (UCS) their emotion or the UCR is arousal. Therefore, many times a beautiful woman (UCS) is paired with an automobile (not yet a CS). In such a case, the automobile becomes the CS that results in arousal (CR).

Recent research has shown that if the CS is encountered outside the ads, it does not predict the UCS (J.R. Bettman, 2001). Thus, classical conditioning may work best for infrequently encountered products and cases in which the UCS is associated with only one brand. Classical conditioning may work best for infrequently encountered products and cases in which the UCS is associated with only one brand. It also works best when the CS precedes the UCS in ads.

Check Your Progress
7. What is the meaning of classical learning?
8. List the key elements of classical learning.
9. Enumerate the various applications of classical learning.

9.4 INSTRUMENTAL/OPERANT CONDITIONING

Classical conditioning occurs with reflexive, involuntary behaviour. Learning which is due to voluntary behaviour is called operant conditioning. The concept of operant conditioning was developed by the American psychologist B. F. Skinner (1938). Operant conditioning, also known as instrumental conditioning, is a form associative learning in which consequences of behaviour change the probability of occurrence of behaviour. Skinner described the term operant as the behaviour of the organism—the behaviour operates in the environment, and the environment in turn operates on the behaviour. Operant conditioning consists of voluntary behaviour that acts or operates on the environment and produces rewarding or punishing stimuli. Contingency is an important aspect of classical conditioning, the occurrence of one stimulus is dependent on the presence of another one.

9.5 COGNITIVE LEARNING

Cognitive learning is a powerful mechanism that provides the means of knowledge and goes well beyond simple imitation of others. Conditioning can never explain what we are learning at any given time. This learning illustrates the importance of cognitive learning. Cognitive learning is defined as the acquisition of knowledge and skill by mental or cognitive processes—the procedures we have for manipulating information ‘in our heads’. Cognitive processes include creating mental representations of physical objects and events, and other forms of information processing.
9.5.1 Purposive Theory

Edward Tolman (1932) emphasized on the purposiveness of behaviour, in other words, much behaviour is goal directed. Tolman (1948) believed that an organism’s expectations about which actions are needed to attain a goal, take the form of cognitive maps. A cognitive map is an organism’s mental representation of the structure of physical space. His experiments with rats in maze led him to conclude that rat developed mental awareness of physical space and the elements in it and then used these cognitive maps to find the food at the end of the maze, which is their goal.

By conducting experiment in latent learning, cognitive map in learning was obtained. Latent learning is unreinforced learning that is not immediately reflected in behaviour. In one study, three groups of rats in the same maze—one at a time—were studied. In the first group, each rat was placed in the maze and rewarded with food for making its way out the other side. The rat was then placed back in the maze, rewarded every time the maze was solved, until the rat could successfully solve the maze with no errors. The second group of rats was treated exactly like the first, except that they never received any reinforcement upon exiting the maze. They were simply put back in repeatedly, until the tenth day of the experiment. On the tenth day, the rats in the second group began to receive reinforcement for getting out of the maze. The third group of rats, serving as a control group, was also not reinforced and was not given reinforcement for the entire duration of the experiment. A strict Skinnerian behaviourist would predict that only the first group of rats would learn the maze successfully because learning depends on reinforcing consequences. At first, this seemed to be the case. The first group of rats did indeed solve the maze after a certain number of trials, whereas the second and third groups seemed to wander aimlessly around the maze until accidentally finding their way out.

On the tenth day, however, something happened that would be difficult to explain using only Skinner’s basic principles. The second group of rats, upon receiving the reinforcement for the first time, should have then taken as long as the first group to solve the maze. Instead, they began to solve the maze almost immediately. Tolman concluded that the rats in the second group, while wandering around in the first nine days of the experiment, had indeed learned where all the blind alleys, wrong turns, and correct paths were in the maze. They had simply not demonstrated this learning because there was no reason to do so. The learning had remained hidden, or latent, until the rats had a reason to demonstrate their learning by getting to the food. Tolman called this latent learning.

9.5.2 Seligman’s Learned Helplessness

In the mid- to late 1960s, M.E.P. Seligman and his colleagues accidentally discovered an unexpected phenomenon while experimenting on dogs using classical conditioning (M.E.P. Seligman, 1975). Their original intention was to study escape
and avoidance learning. Seligman and colleagues presented a tone followed by a harmless but painful electric shock to one group of dogs. The dogs in this group were harnessed so that they could not escape the shock. The researchers assumed that the dogs would learn to fear the sound of the tone and later try to escape from the tone before being shocked. These dogs, along with another group of dogs that had not been conditioned to fear the tone, were placed into a special box with a low fence that divided the box into two compartments. The dogs, which were now unharnessed, could easily see over the fence and jump over. In fact, these dogs showed distress but did not try to jump over the fence even when the shock began.

Why would the conditioned dogs refuse to move when shocked? The dogs that had been harnessed and then provided the shocks were conditioned and had apparently learned—in the original tone/shock situation—that there was nothing they could do to escape the shock. So when placed in a situation where an escape was possible, the dogs still did nothing because they had learned to be “helpless”. They believed they could not escape, so they did not even try. Seligman extended this theory of learned helplessness, the tendency to fail to escape from a situation because of a history of repeated failure in the past, to explain depression. Depressed people seem to lack normal emotions and become somewhat apathetic, often staying in unpleasant work environments or bad marriages or relationships rather than trying to escape or better their situation. Seligman proposed that this depressive behaviour is a form of learned helplessness. Depressed people may have learned in the past that they seem to have no control over what happens to them (L.B. Alloy and C.M. Clements, 1998). A sense of powerlessness and hopelessness is common to depressed people, and certainly this would seem to apply to Seligman’s dogs as well.

9.5.3 Insight Theory of Learning

Wolfgang Kohler (1887–1967) was a Gestalt psychologist. In one of his more famous studies (Kohler, 1925), he set up a problem for one of the chimpanzees. Sultan, the chimp was faced with the problem of how to get to a banana that was placed just out of his reach outside his cage. Sultan solved this problem relatively easily, first trying to reach through the bars with his arm, then using a stick that was lying in the cage to rake the banana into the cage. As chimpanzees are natural tool users, this behaviour is not surprising and is still nothing more than simple trial-and-error learning.

Then, the problem was made more difficult. The banana was placed just out of reach of Sultan’s extended arm with the stick in his hand. At this point there were two sticks lying around in the cage, which could be fitted together to make a single pole that would be long enough to reach the banana. Sultan first tried one stick, then the other (simple trial-and-error). After about an hour of trying, Sultan seemed to have a sudden flash of inspiration. He pushed one stick out of the cage as far as it would go toward the banana and then pushed the other stick behind the
first one. Of course, when he tried to draw the sticks back, only the one in his hand came. He jumped up and down and was very excited. When Kohler gave him the second stick, he sat on the floor of the cage and looked at them carefully. He then fitted one stick into the other and retrieved his banana. Kohler called this Sultan’s rapid ‘perception of relationships’ insight and determined that insight could not be gained through trial-and-error learning alone (Kohler, 1925). Although Thorndike and other early learning theories believed that animals could not demonstrate insight, Kohler’s work seems to demonstrate that insight requires a sudden ‘coming together’ of all elements of a problem in a kind of ‘aha’ moment that is not predicted by traditional animal learning studies. More recent research has also found support for the concept of animal insight (B. Heinrich, 2000; C. Heyes, 1998; T.R. Zentall, 2000), but there is still controversy over how to interpret the results of those studies (Wynne, 1999).

Check Your Progress
10. What is the significance of operant conditioning?
11. What is the meaning of cognitive learning?
12. Enumerate the Purposive Theory.

9.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Learning is a process rather than a product. Learning involves a learner whose behaviour is changed or modified because of learning and the type of experience and training available for modifying the behaviour.

2. There are two types of factors that influence the process of learning: Learner-related factors and Environment-related factors.

3. Transfer of learning is very important for future development. When we learn to perform a task, we sometimes feel that it is influenced by our previous learning. The skills acquired in one activity is possibly transferred to the next situation. This is called transfer of learning. According to Sorenson, ‘transfer refers to the transfer of knowledge, training and habits acquired in one situation to another situation.’

4. Learning is of no use if we are not able to preserve our past experiences and able to recall them in future when needed. This ability of remembering and later recalling is called memory. It is a representation of actual past events. It has a very important role to play in the behaviour of a person.

5. The four stages of memory are:
   - Learning
   - Retention
6. Based on the Atkinson and Shifrin, model memory are basically three types: immediate or sensory memory, short-term memory and long-term memory.
   a. Sensory memory: This type of memory helps the individual to recall immediately those events or things which have just occurred. The information stored in this type of memory is lost after a very short period of time or after the information is used by the individual.
   b. Short-term memory: This type of memory is also for a very short period of time, but it is not as short as in the case of immediate memory. The impressions do not erase very easily. The sensory impressions retained in the immediate memory are either immediately erased or transferred to the short-term memory.
   c. Long-term memory: Long-term memory has a limitless capacity to store information. The information stored in the long-term memory is permanently retained and does not get erased and that is why it is also called as permanent memory. The duration of the information is up to lifetime.

7. Classical conditioning is a learning process in which a neutral stimulus associates with another stimulus through repeated pairing with that stimulus. The study of classical conditioning began in the 20th century with the work of the Noble Prize winner Russian Physiologist, Ivan Pavlov. In his experiment on a dog, Pavlov observed that just prior to being fed, the dog secreted saliva from its mouth.

8. Key elements that must be responsible for conditioning to take place are mentioned as follows:
   • Unconditional stimulus: Unconditioned denotes unlearned or the naturally occurring stimulus, which leads to the reflex, involuntary response. Food is the unconditioned stimulus here.
   • Unconditioned response: It is unlearned and occurs because of genetic wiring in nervous system. Salivation of the dog is an example of an unconditioned response.
   • Conditioned stimulus: Stimulus that is able to produce a learned reflex response by being paired with the original unconditioned stimulus. Conditioned stimulus means learned.
   • Conditioned response: It is a learned reflex response to a condition stimulus. In his experiment, Pavlov used meat powered as the original unconditioned stimulus, which produced salivation in his dog.

9. The following are the applications of classical conditioning:
   • Survival value: Classical conditioning has a great deal of survival value. Pavlov conducted his experiments and concluded that individuals have
been conditioned to respond to the sound of a buzzer, a glimpse of light, a puff of air or the touch of a hand.

- Health problems and mental disorders can be attributed to classical conditioning. B. Watson and Rosalie Rayner brought to light the role of classical conditioning in phobias (irrational fear). They conducted the 'Little Albert' that included a white rat. They concluded that if we can produce fears through classical conditioning we can eliminate them using conditioning procedure.

- Classical conditioning used by contemporary advertisers: Many contemporary advertisers use classical conditioning. For example, whenever males see a beautiful woman (UCS) their emotion or the UCR is arousal. Therefore, many times a beautiful woman (UCS) is paired with an automobile (not yet a CS). In such a case, the automobile becomes the CS that results in arousal (CR).

10. Operant conditioning consists of voluntary behaviour that acts or operates on the environment and produces rewarding or punishing stimuli. Contingency is an important aspect of classical conditioning, the occurrence of one stimulus is dependent on the presence of another one.

11. Cognitive learning is a powerful mechanism that provides the means of knowledge and goes well beyond simple imitation of others. Cognitive learning is defined as the acquisition of knowledge and skill by mental or cognitive processes—the procedures we have for manipulating information 'in our heads'. Cognitive processes include creating mental representations of physical objects and events, and other forms of information processing.

12. Edward Tolman emphasized on the purposiveness of behaviour, in other words, much behaviour is goal directed. Tolman believed that an organism’s expectations about which actions are needed to attain a goal, take the form of cognitive maps. A cognitive map is an organism's mental representation of the structure of physical space. His experiments with rats in maze led him to conclude that rat developed mental awareness of physical space and the elements in it and then used these cognitive maps to find the food at the end of the maze, which is their goal.

9.7 SUMMARY

- The learning process is also influenced by the nature of content. Learning is affected by factors like whether the content is direct or indirect, formal or informal or whether the content is organized or unstructured.

- Learning depends upon the methods and approaches used, like there should be linking of the new learning with the past learning. Past information helps
the learner to understand the new information. For better learning, maximum senses should be used in a given situation.

- Transfer of learning is very important for future development. When we learn to perform a task, we sometimes feel that it is influenced by our previous learning. The skills acquired in one activity is possibly transferred to the next situation.

- Learning is of no use if we are not able to preserve our past experiences and able to recall them in future when needed. This ability of remembering and later recalling is called memory. It is a representation of actual past events. It has a very important role to play in the behaviour of a person.

- Waugh and Norman proposed the model of memory which had two structures, primary memory which holds temporary information currently in use and secondary memory which stores information for a very long period of time or permanently.

- Span of retention in sensory memory is generally eleven to sixteen items for a half a second in short-term memory this span is five to nine items. The information stored in the sensory memory is deleted or completely erased or sometimes it gets transferred to the short-term memory.

- Long-term memory has a limitless capacity to store information. The information stored in the long-term memory is permanently retained and does not get erased and that is why it is also called as permanent memory.

- Schemas are the mental models of different objects in the world in the mind. These schemas are the detailed knowledge structures present in the long-term memory. The schemas are organized in the long-term memory and the schemas of similar information are connected to each other.

- Forgetting occurs because the information stored in the memory cannot be brought to the conscious mind. There can be a number of reasons because of which the information cannot be recalled. Failure of recollection can be partial or temporary forgetting; the failure of retention is complete or permanent forgetting.

- Some parts of the brain have very important role to play in memory. The three areas of the brain which contribute to memory are hippocampus, amygdala and cerebral cortex. The most important part is the hippocampus, which helps in processing the information.

- Mnemonics is a method of remembering items by imposing a structure of organisation on the material to be memorized. This method serves as a set of clues to remember pieces of information by associating the information with a visual image, a sentence, or a word. The three basic principles of mnemonics are imagination, association and location.

- Classical conditioning is a learning process in which a neutral stimulus associates with another stimulus through repeated pairing with that stimulus.
The study of classical conditioning began in the 20th century with the work of the Noble Prize winner Russian Physiologist, Ivan Pavlov.

- Classical conditioning has a great deal of survival value (Vernoy, 1995). Due to classical conditioning, we jerk our hands away before they are burned by fire. Pavlov conducted his experiments and concluded that individuals have been conditioned to respond to the sound of a buzzer, a glimpse of light, a puff of air or the touch of a hand.

- Operant conditioning, also known as instrumental conditioning, is a form of associative learning in which consequences of behaviour change the probability of occurrence of behaviour. Skinner described the term operant as the behaviour of the organism—the behaviour operates in the environment, and the environment in turn operates on the behaviour.

- Cognitive learning is a powerful mechanism that provides the means of knowledge and goes well beyond simple imitation of others. Conditioning can never explain what we are learning at any given time. This learning illustrates the importance of cognitive learning.

- Edward Tolman emphasized on the purposiveness of behaviour, in other words, much behaviour is goal directed. Tolman believed that an organism’s expectations about which actions are needed to attain a goal, take the form of cognitive maps. A cognitive map is an organism’s mental representation of the structure of physical space.

- In the mid- to late 1960s, M.E.P. Seligman and his colleagues accidentally discovered an unexpected phenomenon while experimenting on dogs using classical conditioning. Their original intention was to study escape and avoidance learning.

- Wolfgang Kohler was a Gestalt psychologist. In one of his more famous studies, he set up a problem for one of the chimpanzees. Kohler’s work seems to demonstrate that insight requires a sudden ‘coming together’ of all elements of a problem in a kind of ‘aha’ moment that is not predicted by traditional animal learning studies.

### 9.8 KEY WORDS

- **Metamemory strategy**: High level strategic learning often requires constant self-regulation and error monitoring strategies, metacognition, sometimes specific memory techniques.

- **The ‘Little Albert’ experiment**: This was a famous psychology experiment conducted by behaviorist John B. Watson and graduate student Rosalie Rayner. Watson was interested in taking Pavlov’s research further to show that emotional reactions could be classically conditioned in people.
● **Latent learning**: This is a form of learning that is not immediately expressed in an overt response. It occurs without any obvious reinforcement of the behaviour or associations that are learned.

● **Skinnerian behaviourist**: Follower of B.F. Skinner, a leading American psychologist, Harvard professor and proponent of the behaviourist theory of learning in which learning is a process of ‘conditioning’ in an environment of stimulus, reward and punishment.

### 9.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

#### Short Answer Questions

1. Write a short note on environment-related factors influencing the process of learning.
2. State how the learning process also depends upon the available resources.
3. Write a brief note on the significance of transfer of learning in the learning process.
4. What are the various stages of memory?
5. State the differences between short-term memory and long-term memory.
6. Analyse the role of interference effects on forgetting.
7. Write a brief note on Pavlov’s experiment on his dog to understand the classical conditioning.
8. What is the role of operant conditioning in the process of learning?
9. Write a brief note on Tolman’s Purposive Theory.

#### Long Answer Questions

1. Discuss in detail the various factors which influence the process of learning.
2. Analyse the concept and meaning of memory.
3. Write a comprehensive note on various models of memory.
4. Discuss the difference between sensory memory and short-term memory.
5. Analyse in detail the methods and techniques of memorization.
6. Discuss when does forgetting occur and what causes it.
7. Enumerate the various methods to improve memory.
8. Discuss the application of classical conditioning.
9. Write a comprehensive analysis on the experiment with dog by Seligman and his colleagues to understand classical conditioning.
9.10 FURTHER READINGS


UNIT 10 STATES OF CONSCIOUSNESS

Structure
10.0 Introduction
10.1 Objectives
10.2 Nature of Consciousness: Brain and Consciousness
   10.2.1 Historical Development of the Study of Consciousness
   10.2.2 Normal Waking Consciousness
10.3 Fantasy and Daydreaming
10.3.1 Sigmund Freud and Daydreams
10.4 Stages of Sleep: REM and Non-REM
   10.4.1 Circadian Rhythm
   10.4.2 What are Biological Clocks?
10.5 Answers to Check Your Progress Questions
10.6 Summary
10.7 Key Words
10.8 Self Assessment Questions and Exercises
10.9 Further Readings

10.0 INTRODUCTION

As is commonly explained, consciousness is a state of mind. However, the term is difficult to be defined due to various constraints. It is used with reference to various mental activities as well as the substratum of these activities, some may be absent in certain instances of conscious experience. So, as a phenomenon consciousness is not a definite indication of any particular form or a particular set of forms of manifested experience. Rather it is a collective abstraction of a variety of manifestations. This dichotomy raises the differences in approach towards the concept of mind in various schools of psychology and philosophy and brings forth the difficulties in defining the term consciousness. There are numerous theories and approaches to the phenomenon of consciousness.

The study of consciousness began in the 19th century from the ideas of Sigmund Freud and William James. While Sigmund Freud, in his psychoanalytic theory, likens the mind to an iceberg, William James describes the mind as freely and continuously flowing, referring to it as the stream of consciousness. The conflict between these two fundamental theories on consciousness sparked controversies and interest in consciousness was shunned away in the 20th century when behaviourism dominated the scene of psychological research.

Freud was the first who interpreted dreams and recognized the same as the messages from the unconscious regions of the mind. He says that psychoanalysis is based on the premise that largely unconscious psychological forces determine
States of Consciousness

NOTES

human behaviour. It assumes that psychological problems are a result of unsolved emotional difficulties that occurred in early childhood. A similarly positive view of fantasy was taken by Sigmund Freud who considered fantasy a defence mechanism. Daydreams for Freud were a valuable resource.

This unit aims at discussing the consciousness as a state of mind and analysing the various theories and approaches to the phenomenon of consciousness.

9.1 OBJECTIVES

After going through this unit, you will be able to:

- Define the meaning of consciousness
- Understand the historical development of the study of consciousness
- Analyse Freud’s psychoanalytic theory
- Understand normal waking consciousness (NWC)
- Enumerate fantasy and daydream
- Analyse the stages of sleep
- Explain circadian rhythm

10.2 NATURE OF CONSCIOUSNESS: BRAIN AND CONSCIOUSNESS

Consciousness is defined differently among psychologists. No particular definition of consciousness stands out or is widely accepted in the field of Psychology. However, for the purpose of briefly introducing and explaining a complex phenomenon like consciousness, here is Santrock’s simple and easy-to-understand definition of consciousness: Consciousness is the awareness of external events, internal sensations, the self, and thoughts about experiences. Consequently, the different states of consciousness, as discussed below, correspond to differing qualities of awareness and information-processing.

10.2.1 Historical Development of the Study of Consciousness

The study of consciousness began in the 19th century from the ideas of Sigmund Freud and William James. Sigmund Freud, in his psychoanalytic theory, likens the mind to an iceberg, where a significant portion of the ice is hidden from consciousness. On the other hand, William James describes the mind as freely and continuously flowing, referring to it as the stream of consciousness. Although the conflict between these two fundamental theories on consciousness should have sparked controversies and debates similar to the early scientific approaches to psychology, interest in consciousness was shunned away in the 20th century when behaviourism dominated the scene of psychological research. It was only in the
21st century when psychologists developed renewed interest on the subject of consciousness, particularly sub-consciousness. Today, large bodies of research have been made detailing the complex nature of consciousness.

10.2.2 Normal Waking Consciousness

Normal waking consciousness (NWC) can be loosely defined as the states of consciousness you experience when you are awake and aware of your thoughts, feelings and perceptions from internal events and the surrounding environment. During normal waking consciousness, you experience a real sense of time and place.

10.2.3 Flow of Consciousness/Stream of Consciousness

Stream of consciousness refers to the flow of thoughts in the conscious mind. Research studies have shown that we only experience one mental event at a time as a fast-moving mind stream. William James, often considered to be the father of American psychology, first coined the phrase “stream of consciousness”. The full range of thoughts—that one can be aware of—can form the content of this stream.

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<th>Check Your Progress</th>
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<td>1. What do you understand by consciousness?</td>
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<td>2. When did the study of consciousness begun?</td>
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<td>3. What is Normal Waking Consciousness (NWC)?</td>
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10.3 FANTASY AND DAYDREAMING

A fantasy is a situation imagined by an individual that expresses certain desires or aims on the part of its creator. Fantasies sometimes involve situations that are highly unlikely, or they may be quite realistic. Fantasies can also be sexual in nature. Another, more basic meaning of fantasy is something which is not ‘real,’ as in perceived explicitly by any of the senses, but exists as an imagined situation of object to subject.

In everyday life, individuals often find their thoughts pursue a series of fantasies concerning things they wish they could do or wish they had done... fantasies of control or of sovereign choice... daydreams’. George Eman Vaillant in his study of defence mechanisms took as a central example of ‘an immature defence...fantasy — living in a “Walter Mitty” dream world where you imagine you are successful and popular, instead of making real efforts to make friends and succeed at a job’. Fantasy, when pushed to the extreme, is a common trait of narcissistic personality disorder; and certainly ‘Vaillant found that not one person who used fantasy a lot had any close friends’. 

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*Self-Instructional Material*
Other researchers and theorists find that fantasy has beneficial elements—providing ‘small regressions and compensatory wish fulfillments which are recuperative in effect’. Research by Deirdre Barrett reports that people differ radically in the vividness, as well as frequency of fantasy, and that those who have the most elaborately developed fantasy life are often the people who make productive use of their imaginations in art, literature, or by being especially creative and innovative in more traditional professions.

10.3.1 Sigmund Freud and Daydreams

A similarly positive view of fantasy was taken by Sigmund Freud who considered fantasy (German: Fantasie) a defence mechanism. He considered that men and women “cannot subsist on the scanty satisfaction which they can extort from reality. ‘We simply cannot do without auxiliary constructions,’ as Theodor Fontane once said... [without] dwelling on imaginary wish fulfillments.” As childhood adaptation to the reality principle developed, so too ‘one species of thought activity was split off; it was kept free from reality-testing and remained subordinated to the pleasure principle alone. This activity is fantasizing...continued as day-dreaming. He compared such phantasising to the way a ‘nature reserve preserves its original state where everything...including what is useless and even what is noxious, can grow and proliferate there as it pleases’.

Daydreams for Freud were thus a valuable resource. “These day-dreams are cathected with a large amount of interest; they are carefully cherished by the subject and usually concealed with a great deal of sensitivity... such phantasies may be unconscious just as well as conscious.” He considered “These phantasies include a great deal of the true constitutional essence of the subject’s personality” and that the energetic man “is one who succeeds by his efforts in turning his wishful phantasies into reality,” whereas the artist “can transform his phantasies into artistic creations instead of into symptoms...the doom of neurosis.

Check Your Progress

4. Enumerate the meaning of fantasy.

5. How were daydream a valuable source for Freud?

10.4 STAGES OF SLEEP: REM AND NON-REM

There are two basic types of sleep: rapid eye movement (REM) sleep and non-REM sleep (which has three different stages). Each is linked to specific brain waves and neuronal activity. You cycle through all stages of non-REM and REM sleep several times during a typical night, with increasingly longer, deeper REM periods occurring toward morning.

Stage 1 non-REM sleep is the changeover from wakefulness to sleep. During this short period (lasting several minutes) of relatively light sleep, your heartbeat,
breathing, and eye movements slow, and your muscles relax with occasional twitches. Your brain waves begin to slow from their daytime wakefulness patterns.

**Stage 2 non-REM** sleep is a period of light sleep before you enter deeper sleep. Your heartbeat and breathing slow, and muscles relax even further. Your body temperature drops and eye movements stop. Brain wave activity slows but is marked by brief bursts of electrical activity. You spend more of your repeated sleep cycles in stage 2 sleep than in other sleep stages.

**Stage 3 non-REM** sleep is the period of deep sleep that you need to feel refreshed in the morning. It occurs in longer periods during the first half of the night. Your heartbeat and breathing slow to their lowest levels during sleep. Your muscles are relaxed and it may be difficult to awaken you. Brain waves become even slower.

REM sleep first occurs about 90 minutes after falling asleep. Your eyes move rapidly from side to side behind closed eyelids. Mixed frequency brain wave activity becomes closer to that seen in wakefulness. Your breathing becomes faster and irregular, and your heart rate and blood pressure increase to near waking levels. Most of your dreaming occurs during REM sleep, although some can also occur in non-REM sleep. Your arm and leg muscles become temporarily paralyzed, which prevents you from acting out your dreams. As you age, you sleep less of your time in REM sleep. Memory consolidation most likely requires both non-REM and REM sleep.

### 10.4.1 Circadian Rhythm

Circadian rhythms are physical, mental, and behavioural changes that follow a daily cycle. They respond primarily to light and darkness in an organism’s environment. Sleeping at night and being awake during the day is an example of a light-related circadian rhythm. Circadian rhythms are found in most living things, including animals, plants, and many tiny microbes. The study of circadian rhythms is called chronobiology.

### 10.4.2 What are Biological Clocks?

Biological clocks are an organism’s innate timing device. They’re composed of specific molecules (proteins) that interact in cells throughout the body. Biological clocks are found in nearly every tissue and organ. Researchers have identified similar genes in people, fruit flies, mice, fungi, and several other organisms that are responsible for making the clock’s components.

### Check Your Progress

6. List the various stages of sleep.

7. Explain the meaning of Circadian Rhythm.
10.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

NOTES

1. Santrock’s simple and easy-to-understand definition of consciousness is: Consciousness is the awareness of external events, internal sensations, the self, and thoughts about experiences. Consequently, the different states of consciousness, as discussed below, correspond to differing qualities of awareness and information-processing.

2. The study of consciousness began in the 19th century from the ideas of Sigmund Freud and William James. Sigmund Freud, in his psychoanalytic theory, likens the mind to an iceberg, where a significant portion of the ice is hidden from consciousness.

3. Normal waking consciousness (NWC) can be loosely defined as the states of consciousness you experience when you are awake and aware of your thoughts, feelings and perceptions from internal events and the surrounding environment. During normal waking consciousness, you experience a real sense of time and place.

4. A fantasy is a situation imagined by an individual that expresses certain desires or aims on the part of its creator. Fantasies sometimes involve situations that are highly unlikely; or they may be quite realistic. Fantasies can also be sexual in nature. Another, more basic meaning of fantasy is something which is not ‘real,’ as in perceived explicitly by any of the senses, but exists as an imagined situation of object to subject.

5. Daydreams for Freud were thus a valuable resource. “These day-dreams are cathetted with a large amount of interest; they are carefully cherished by the subject and usually concealed with a great deal of sensitivity ... such phantasies may be unconscious just as well as conscious.”

6. Various stages of sleep are:
   Stage 1 - non-REM sleep is the changeover from wakefulness to sleep. During this short period (lasting several minutes) of relatively light sleep, your heartbeat, breathing, and eye movements slow, and your muscles relax with occasional twitches. Your brain waves begin to slow from their daytime wakefulness patterns.
   Stage 2 - non-REM sleep is a period of light sleep before you enter deeper sleep. Your heartbeat and breathing slow, and muscles relax even further. Your body temperature drops and eye movements stop. You spend more of your repeated sleep cycles in stage 2 sleep than in other sleep stages.
   Stage 3 - non-REM sleep is the period of deep sleep that you need to feel refreshed in the morning. It occurs in longer periods during the first half of the night.
7. Circadian rhythms are physical, mental, and behavioural changes that follow a daily cycle. They respond primarily to light and darkness in an organism’s environment. Sleeping at night and being awake during the day is an example of a light-related circadian rhythm. Circadian rhythms are found in most living things, including animals, plants, and many tiny microbes. The study of circadian rhythms is called chronobiology.

10.6 SUMMARY

- According to Santrock, ‘Consciousness is the awareness of external events, internal sensations, the self, and thoughts about experiences. Consequently, the different states of consciousness, as discussed below, correspond to differing qualities of awareness and information-processing.’

- It was only in the 21st century when psychologists developed renewed interest on the subject of consciousness, particularly sub-consciousness. Today, large bodies of research have been made detailing the complex nature of consciousness.

- Stream of consciousness refers to the flow of thoughts in the conscious mind. Research studies have shown that we only experience one mental event at a time as a fast-moving mind stream.

- A fantasy is a situation imagined by an individual that expresses certain desires or aims on the part of its creator. Fantasies sometimes involve situations that are highly unlikely; or they may be quite realistic. Fantasies can also be sexual in nature. Another, more basic meaning of fantasy is something which is not ‘real,’ as in perceived explicitly by any of the senses, but exists as an imagined situation of object to subject.

- Other researchers and theorists find that fantasy has beneficial elements — providing ‘small regressions and compensatory wish fulfillments which are recuperative in effect’. Research by Deirdre Barrett reports that people differ radically in the vividness, as well as frequency of fantasy, and that those who have the most elaborately developed fantasy life are often the people who make productive use of their imaginations in art, literature, or by being especially creative and innovative in more traditional professions.

- Daydreams for Freud were thus a valuable resource. “These day-dreams are cathexed with a large amount of interest; they are carefully cherished by the subject and usually concealed with a great deal of sensitivity ... such phantasies may be unconscious just as well as conscious.”

- There are two basic types of sleep: rapid eye movement (REM) sleep and non-REM sleep (which has three different stages). Each is linked to specific brain waves and neuronal activity. You cycle through all stages of non-REM and REM sleep several times during a typical night, with increasingly longer, deeper REM periods occurring toward morning.
Most of your dreaming occurs during REM sleep, although some can also occur in non-REM sleep. Your arm and leg muscles become temporarily paralyzed, which prevents you from acting out your dreams. As you age, you sleep less of your time in REM sleep. Memory consolidation most likely requires both non-REM and REM sleep.

Sleeping at night and being awake during the day is an example of a light-related circadian rhythm. Circadian rhythms are found in most living things, including animals, plants, and many tiny microbes. The study of circadian rhythms is called chronobiology.

10.7 KEY WORDS

- **Behaviourism:** This is the theory that human and animal behaviour can be explained in terms of conditioning, without appeal to thoughts or feelings, and that psychological disorders are best treated by altering behaviour patterns.
- **Normal waking consciousness (NWC):** This can be loosely defined as the states of consciousness you experience when you are awake and aware of your thoughts, feelings and perceptions from internal events and the surrounding environment.
- **Rapid eye movement sleep (REM sleep):** This is a unique phase of sleep in mammals and birds, distinguishable by movement of the eyes, accompanied with low muscle tone throughout the body, and the propensity of the sleeper to dream vividly.
- **Circadian rhythm:** This is a roughly 24 hour cycle in the physiological processes of living beings. Circadian rhythms are endogenously generated, although they can be modulated by external cues such as sunlight and temperature.

10.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short Answer Questions**

1. Write a short note on the nature of consciousness.
2. Enumerate the development of the study of consciousness.
3. Write a brief note on normal waking consciousness (NWC).
4. State the concept of stream of consciousness.
5. Enumerate the meaning of fantasy.
6. State the significance of Freud’s daydreams.
**Long Answer Questions**

1. Discuss the contribution of Freud and James in the study of consciousness.
2. Analyse the dominance of behaviourism on the scene of psychological research.
3. Write a comprehensive note on the phenomena of fantasy and daydreams.
4. Discuss the basic types of sleep while explaining the state of consciousness.
5. Analyse the significance of circadian rhythm.

**10.9 FURTHER READINGS**


UNIT 11 NATURE OF CONSCIOUSNESS

11.0 INTRODUCTION

Consciousness is a fascinating but elusive phenomenon. As the state or quality of awareness, it has been defined as ability to experience or to feel, wakefulness, having a sense of selfhood and the executive control system of the mind. Classifications of consciousness into waking, dream and sleep states have been discussed in various books and throw much light on problems of human psychology.

Sigmund Freud defined nature of conscious experience as thinking, feeling, sensation, discrimination memory etc. are of trivial importance on human personality. He stated that the unconscious determines the human behaviour.

Altered states of consciousness include various mental states in which the mind can be aware but is not in its usual wakeful condition, such as during hypnosis, meditation, hallucination, trance, and the dream stage. Although significantly different from a normal waking state, these are relevant to enhancing human performance.
The ensuing social change led to a change of the scientific perspective and recognised altered states of consciousness as valid realms of experience. Various scientists and psychologists focused on seemingly beneficial aspects of altered states of consciousness.

This unit aims at discussing the altered states of consciousness and analyses the various theories associated with different levels of consciousness like sleep stages, dreams, hypnosis, meditation, psychoactive drugs and stimulants’ use.

### 11.1 Objectives

After going through this unit, you will be able to:

- Understand altered and different levels of the state of consciousness
- Discuss the concept of subconscious awareness
- Explain sleep and dream in the process of consciousness
- Understand biological rhythm
- Explain the effects of chronic sleep deprivation
- Describe the concept of sleep disorders
- Understand the application of meditation
- Explain the drug use and abuse
- Understand various stimulants and their users

### 11.2 Altered States of Consciousness

Consciousness is an awareness of external events and internal sensations, including awareness of the self and the thoughts about various experiences. The content of our awareness change from moment to moment. Information moves rapidly in and out of consciousness. William James (1890–1950) described the mind as a stream of consciousness, a continuous flow of changing sensation, images, thoughts and feelings. Our mind can jump from a topic to another.

The flow of sensation, images, thoughts and feelings can occur at different levels of awareness as explained:

- **High-level consciousness**: It represents the most alter states of human consciousness in which individuals actively focus their efforts towards a goal (Cooper and others, 2002; S. Monsell and J. Driver, 2000). Controlled processes require selective attention, the ability to focus on a specific aspect of experience while ignoring others.

- **Low-level consciousness**: It includes automatic processing that requires little attention, as well as day dreaming and does not interfere with other
ongoing activities. Automatic processes require less conscious effort than controlled processes (L.J. Trainor, K.L. McDonald and C. Alain, 2002). Another state of lower-level awareness is daydreaming, which lies somewhere between active consciousness and dreaming while asleep.

- **Altered states of consciousness**: Altered states of consciousness are mental states which can be produced by drugs, trauma, fatigue, hypnosis and sensory deprivation. In some cases, the drug used may create a higher level of awareness. It is believed that caffeine increases alertness. Awareness may also be altered to a lower level.

- **Subconscious awareness**: It can take place while we are awake or while we are asleep (A.R. Damasio, 2001). Csikszentmihalyi, (1995) believes that creative ideas often incubate for some time below the threshold of conscious awareness before they emerge. When an idea is incubating, our mind may be processing information even though we are not aware of it. Subconscious information processing can occur simultaneously along many parallel tracks, e.g., when a man is running down the street we are consciously aware of the event, but not of the subconscious processing of object identity (a man), its height, colour, weight, etc.; whereas, conscious processing is serial.

11.2.1 Sleep and Dream

Sleep and dream could also be viewed as low levels of consciousness, even though our level of awareness is lower than when we day dream (M. Schredl and R. Hoffman, 2003).

Research has also found that when people are clearly asleep (as determined by physiological monitoring devices), they are able to respond to faint tones by pressing a handheld button (Ogilvy and Wilkinson, 1988). The presentation of pure auditory tones to sleeping individuals activated auditory processing regions of the brain, whereas participants’ names activated language areas, the Amy data, the prefrontal cortex (R. Stickgold, 2001).

11.2.2 Unconscious Thought

Unconscious thought is a reservoir of unacceptable wishes, feeling and thoughts that are beyond conscious awareness, said S. Freud (1917). According to Freud, unconscious thoughts are too laden with anxiety and other negative emotions for consciousness to admit them. Freud’s concept of unconscious mind was not accepted by all.

11.2.3 Sleep: A Biological Rhythm

Sleep is the periodic physiological fluctuation in the body. Most of the time we are unaware of most biological rhythms, but they can influence our behaviour. The rhythms are controlled by biological clocks, which includes the following:
Seasonal cycle: Examples of seasonal cycles are migration of birds, the hibernation of bears and seasonal fluctuation of humans eating habit. Other examples are as follows:

i. Twenty-eight-day cycle, such as the menstrual cycle.

ii. Circadian rhythms: Twenty-four-hour cycles, sleep/wake cycle and change in body temperature, blood pressure, etc.

Desynchronizing the biological clock: Biological clock can throw off their regular schedules (Jensen and others, 2003). Circadian rhythms may also become desynchronized when shift workers change their work hours (Ahasan and others, 2001). Problems related to shift work most often affect night shift workers who never fully adjust to sleeping in the day time.

Resetting the biological clock: Strategies for shift workers who need to reset their biological clocks include sleep between after-works morning naps and a nap before they have to work late. Afternoon naps increase the number of hours of sleep, increasing the amount of light in the work place and going to sleep in complete darkness.

### 11.2.4 Importance of Sleep

When we do not get proper sleep, we are not able to function physically or mentally. Following are the important functions of sleep:

- **Restoration:** Sleep is a fundamental mechanism for survival. Researches prepared that sleep restores, replenishes and rebuilds our brain and body, which can feel depleted by the day’s waking activities.

  Many body cells indeed show increased production and reduced breakdown of proteins during deep sleep (National Institute of Neurological Disorder and Stroke, 2001). Protein molecules are the building blocks needed for cell growth and for repair of damages from factors such as stress. Some scientists believe that sleep is essential as it gives neurons used while we are awake a chance to shut down and repair themselves (NINDS, 2001).

- **Adaptation:** In order to protect themselves, animals need to develop sleep when it is dark.

- **Growth:** Sleep is beneficial to physical growth and brain development in infant and children. Deep sleep coincides with the release of growth hormone in children (NINDS, 2001).

- **Memory:** It plays an important role in the storage and maintenance of long-term memory—REM phase of sleep (active). Sleep has been linked with the formation of emotional memories in humans (U. Wagner, S. Gais and J. Born, 2001).
In one study, a good night’s sleep helped the brain to store the memory of what had been learned during the day (R. Stickgold and A. Hobson, 2000).

11.2.5 Effects of Chronic Sleep Deprivation

In a national survey of more than 1,000 American adults, conducted by the National Sleep Foundation (2001), 63 per cent said that they get less than eight hours of sleep a night, and 31 per cent said that they get less than seven hours of sleep a night. Many said they try to catch up on their sleep on the weekend, but they still reported getting less than eight hours on weekend nights. 40 per cent of those surveyed said that they become sleepy during the day per month, and 22 per cent said their work suffer a few days each week; 7 percent said sleepiness in the job is a daily problem for them.

Sleep expert James Mass (1998) argues that the quality of our lives, if not life itself, is jeopardized by sleep deprivation. An increasing number of research studies underscores that optimal performance is enhanced by sleeping more than eight hours a night and reduce by sleeping less. At one sleep-disorder research centre, the alertness of eight-hour sleepers who claimed to be well rested increased when they added two hours to their sleep (T. Roehrs and T. Roth, 1998). In another study, brain scans revealed that sleep deprivation decreased brain activity in the thalamus and the prefrontal cortex (Thomas and others, 2001). Alertness and cognitive performance also declined. In another study, sleep deprivation was linked with an inability to sustain attention (Doran, Van Dongen, and Dinges, 2001).

In yet another study, brain scans of individuals who experienced total sleep deprivation for twenty-four hours revealed a decline in the complexity of brain activity (Jeong and others, 2001). Sleep deprivation can also affect decision-making. A review of studies concluded that sleep deprivation adversely affects aspects of decision-making, such as being able to deal with the unexpected, innovate, and revise plans, and communicate (Harrison and Horne, 2000).

11.2.6 Stages of Sleep

The five stages of sleep are differentiated by the depth of sleep and the wave patterns detected with an EEG. They are as follows:

- **Stage 1 sleep**: This stage is characterized by theta waves, which are slower in frequency and greater in amplitude than alpha waves. The transition from just being relaxed to entering Stage 1 sleep is gradual.

- **Stage 2 sleep**: Theta waves continue, but are interspersed with a defining characteristic of stage 2 sleep, sleep spindles or sudden increases in wave frequency (Gottselig, Bassetti, and Ackermann, 2002). Stages 1 and 2 are both relatively light stages of sleep, and if people awaken during one of these stages, they often report not having been asleep at all.

- **Stage 3 and 4 sleep**: These stages are characterized by delta waves, the slowest and highest-amplitude brain waves during sleep. These two stages
are often referred to as delta sleep. Distinguishing between stage 3 and stage 4 is difficult. Typically, stage 3 is characterized by delta waves occurring less than 50 per cent of the time and stage 4 by delta waves occurring more than 50 per cent of the time. Delta sleep is our deepest sleep, the time when brain waves are least like waking brain waves. Sleepers are most difficult to wake during delta sleep. If awakened during this stage, they usually are disoriented.

- **State 5 sleep**: After going through stages 1 through 4, sleepers drift up through the sleep stages toward wakefulness. However, instead of re-entering stage 1, they enter stage 5, a different form of sleep called REM (rapid-eye-movement) sleep.

### 11.2.7 Sleep Disorders

Each year, at least 40 million Americans suffer from chronic, long-term sleep disorders, and an additional 20 million experience occasional sleep problems (National Institute of Neurological Disorders and Stroke, 2001). Many people suffer from undiagnosed and untreated sleep disorders (National Commission of Sleep Disorders Research, 1993). Following are some of the major sleep problems:

- **Insomnia**: The inability to sleep can involve having trouble falling asleep, waking up during the night, or waking up too early (Harvey, 2001; Mahendran, 2001). Behavioural changes can help insomniacs to increase their sleep time, as well as to awaken less frequently in the night. Sleepwalking or somnambulism occurs during the deepest stages of sleep. For many years, experts believed that somnambulists were just acting out their dreams. However, somnambulism occurs during stages 3 and 4, usually early in the night, at the time when a person is unlikely to be dreaming (Stein and Ferber, 2001).

- **Sleep talking**: It is another night behaviour (Hublin and others, 2001). Although sleep talkers will talk and make fairly coherent statements, they are soundly asleep.

- **Nightmares**: They are frightening dreams that awaken a dreamer from REM sleep. The nightmare’s content invariably involves danger—the dreamer is chased, robbed, raped, murdered, or thrown off a cliff. Nightmares peak at 3 to 6 years of age and then decline.

- **Night terrors**: Night terrors are characterized by sudden arousal from sleep and intense fear. Night terrors are accompanied by a number of physiological reactions, such as rapid heart rate and breathing, loud screams, heavy perspiration, and movement (Thiedke, 2001). Night terrors occur during slow-wave, non-REM sleep. Night terrors peak at 5 to 7 years of age and decline thereafter.
**Nature of Consciousness**

- **Narcolepsy:** It is the overpowering urge to sleep. The urge is so strong that the person may fall asleep while talking or standing up. Narcoleptics immediately enter REM sleep rather than progressing through the first four sleep stages (Mignot, 2001; Mignot and Thorsby, 2001).

- **Sleep apnea:** It is a sleep disorder in which individuals stop breathing because the windpipe fails to open or because brain processes involved in respiration fail to work properly. Untreated, sleep apnea can cause high blood pressure, strokes, and impotence.

### 11.2.8 Dreams and Freud’s Theory

- **Wish fulfilment:** Freud’s concept of dreaming is an unconscious attempt to fulfill needs (especially for sex and aggression) that cannot be expressed or that go ungratified while awake.

- **Manifest content:** In Freud’s view, a dream’s surface content contains symbols that distort and disguise the dream’s true meaning.

- **Latent content:** In Freud’s view, a dream has hidden content (unconscious).

Freud’s theory has largely given way to newer theories of dreams, such as the cognitive theory of dreaming. It proposed that dreaming can be understood by relying on the same cognitive concepts that are used in studying the waking mind. That is, dreaming involves information processing, memory and problem solving. The cognitive theory of dreaming involves little or no search for the hidden, symbolic content of dreams that Freud sought (Foulkes, 1993, 1999).

Neuroscientists address this shortcoming with the view that dreams reflect the brain’s effort to make sense out of neural activity that takes place during sleep (Hobson, 1999). When we are awake and alert, the contents of our conscious experience tend to be driven by external stimuli that result in specific motor behaviour. During sleep, however, conscious experience is driven by internally generated stimuli that have no apparent behavioural consequence. A key source of this internal stimulation is spontaneous neural activity in the reticular formation of the limbic system, at the base of the brain (Hobson, 2000).

### 11.2.9 Hypnosis and Meditation

#### i. Hypnosis

Hypnosis and meditation are psychological states, or possibly a state of altered attention and awareness, in which the individual is unusually receptive to suggestions. Basic hypnotic techniques have been used since the beginning of recorded history in association with various religious ceremonies, magic, the supernatural, and many erroneous psychological theories.

#### ii. The Nature of hypnosis

A common misconception is that the hypnotic state is much like a sleep state. Unlike sleepers, hypnotized individuals are aware of what is happening and
remember the experience later, unless they are instructed to forget what happened. EEG studies document that individuals in a hypnotic state show a predominance of alpha and beta waves, characteristic of person in a relaxed waking state (De Benedetti and Stroni, 1985; Graffin, Ray and Lundy, 1995; Williams and Cruzelier, 2001). However, during hypnosis, individuals show different patterns of brain activity that they do when they are not under hypnosis (Isotani and others, 2001; Jensen and others, 2001).

iv. Explanations of hypnosis

Ernest Hilgard (1977, 1992) proposed that hypnosis involves a special divided state of consciousness, a sort of splitting of consciousness into separate components. One component follows the hypnotist’s commands, while another component acts as a ‘hidden observer’. Some experts are sceptical that hypnosis is truly an altered state of consciousness (Chaves, 2000). They believe that hypnosis is a normal state in which the hypnotized person behaves the way he or she believes a hypnotized person should behave. In this view, the important questions about hypnosis focus on cognitive factors like the attitude, expectations, and beliefs of good hypnotic participants, and on the social context in which hypnosis occurs (Barber, 1969; Spanos and Chaves, 1989).

v. Applications of hypnosis

Hypnosis is widely used in medicine and dentistry, in criminal investigations, and in sports. Hypnosis has also been used in psychotherapy to treat alcoholism, somnambulism, suicidal tendencies, overeating, and smoking (Eimer, 2000; Yapko, 2001). Hypnosis is most effective when combined with psychotherapy (Borckardt, 2002). A long history of research and practice clearly has demonstrated that hypnosis can reduce the experience of pain (Crasilneck, 1995; Langenfeld, Cipani and Borckardt, 2002; Patterson and Jensen, 2003). Hypnosis has sometimes been used in attempts to enhance people’s ability to accurately recall forgotten events (Coleman, Stevens and Reeder, 2001). For example, police departments sometimes eyewitnesses to crimes hypnotize in the hope that their recall of the crime will significantly improve.

vi. Meditation

Meditation refers to achieving an altered state of consciousness by performing certain exercises like regulating breathing, restricting one’s field of attention, eliminating external stimuli, assuming yogi body position, etc. These lead a pleasant, mildly altered subjective state in which the individual feels mentally and physically relaxed. Extensive practice resulted in mystical experiences in which they lose self-awareness and gain a sense of being involved in a wider consciousness. The common techniques of meditation are opening up meditation, in which the person cleans his mind in order to receive new experiences. Another is concentrative meditation, in which the benefits are obtained by actively attending to source object, word or idea.
Nature of Consciousness

- **Opening up meditation**: To relax completely and let go of one’s mind and body—stepping out of the stream of ever-changing ideas and feelings in which your mind is indulged.

- **Concentrative meditation**: The aims of this method are to learn about concentration. The aim is to concentrate on any object. Concentration does not mean analyzing the different parts of the objects; rather, trying to see the object as it exists in itself, without connecting to other things.

  After a few session of concentrative meditation, people typically report a number of effects—an altered, more intense perception of the object, sometimes shortening, particularly in retrospect, conflicting perceptions, as if the object fills the visual field and does not fill it, decreasing effect of external stimuli (less distraction eventually less conscious registration) and an impression of the meditative state as pleasant and rewarding.

  In his study of a centuries old Tibetan Buddhist text, Brown (1977) has described the complex training required to master the technique. He had also mentioned that cognitive changes can be expected at different levels of meditation. (In this type of meditation people proceed through five levels until they reach a thoughtless, perception-less, selfless state known as concentrative Samadhi.) Meditation may reduce arousal (especially in easily stressed individuals) for people suffering from anxiety and tension. Some researches argued that the benefits of meditation come largely from the relaxation of the body (Holmes, 1984).

**vi. Deep muscle relaxation**

An individual is thought to experience both tension and relaxation alternatively in each and every group of muscles in the body. Experience of relaxation and appreciation of difference between tension and relaxation immensely help the individual in maximizing the feelings of calmness. It is also progressive, muscles relaxation follows muscular relaxation.

**11.2.10 Bio-Feedback**

Bio-feedback is based on skin response (GSR), feedback on brain waves (EEG) and feedback in any other physiological parameter. The individual is made to study the internal reactions to stress and relaxation. By giving the individual feedback whether he/she is in a state of stress or relaxation, the individual can be made to alter the reaction in favour of relation which one can maintain as much as possible. Visual or auditory feedback is given. In the visual feedback, when the individual experiences stress, red-light will switch on. The individual then will have to relax and the state of relaxation will be indicated by green light. Hence, the goal is always to keep the green light on when the individual undergo treatment of management of stress through bio-feedback. Once, the individual masters the art of relaxation to any other situation he can gain perfect control over all the situations.
In case of auditory feedback “beep” sound will come whenever the individual is tense. Focus is given by the individual to successfully pull off the beep sound. As the very sound may at times prevent the individual from relaxation, visual feedback is preferred more than the auditory one.

Check Your Progress
1. What do you understand by altered states of consciousness?
2. List the various levels of awareness.
3. What do you mean by unconscious thought?
4. State the concept of biological rhythm.
5. List the important functions of sleep.
6. Enumerate the different stages of sleep.

11.3 ALTERING CONSCIOUSNESS WITH DRUGS

Drugs often make people feel powerful. Drugs endow a user with a false sense of power that, of course, recedes when the artificial high ends. Addiction occurs when a person compulsively attempts to continue that high by taking a drug over and over again. People use drugs for many reasons; for example, adolescents have reported that they experimented with marijuana to enhance sexuality; to feel more confident; for pleasure and relaxation; to make them more comfortable in social situations; to understand themselves better; for acceptance by their peers or to achieve elevated social status, etc. All drugs are dangerous; however, crack cocaine is considered to be one of the most dangerous drugs. Many drug experts suggest that the initial experience of using crack cocaine is so intense that it takes only one use to kick-start an addiction. Furthermore, over time, addicts’ bodies develop a tolerance for a drug, meaning they will eventually have to take more and more of their drug of choice each time they use in order to achieve the same high.

11.3.1 Altered States: Psychoactive Drugs

Drugs that alter thinking, perception, memory, or some combination of those abilities called psychoactive drugs. Although some of these drugs can be useful under certain circumstances, they all pose risks as well. One of the dangers of such drugs is their potential to create either a physical or psychological dependence, both of which can lead to a life-long pattern of abuse as well as the risk of taking increasingly larger doses, leading to one of the clearest dangers of dependence (a drug overdose). Drug overdoses do not have to happen only with illegal drugs, even certain additives in so-called natural supplements can have a deadly effect.
11.3.2 Physical Dependence

Drugs that people can become physically dependent on cause the user’s body to crave for the drug (Abadinsky, 1989; Fleming and Barry, 1992; Pratt, 1991). After using the drug for some time, the body becomes unable to function normally without the drug and the person is said to be dependent or addicted. Following are the signs of drug dependence or addiction:

- **Drug tolerance**: One sign of physical dependence is the development of a drug tolerance (Part, 1991). As the person continues to use the drug, larger and larger doses of the drug are needed to achieve the same initial effects of the drug.

- **Withdrawal**: Another sign of a physical dependence is that the user experiences symptoms of withdrawal when deprived of the drug. Depending on the drug, these symptoms can range from headaches, nausea, and irritability to severe pain, cramping, shaking, and dangerously elevated blood pressure. These physical sensations occur because the body is trying to adjust to the absence of the drug. Many users will take more of the drug to alleviate the symptoms of withdrawal, which worsens the entire situation.

11.3.3 Psychological Dependence

Psychological dependencies can last forever. Some people who gave up smoking pot decades ago still say that the craving returns every now and then (Roffman et al., 1988).

11.3.4 Stimulants and the Users

- **Amphetamines**: Amphetamines are stimulants that are synthesized (made) in laboratories rather than being found in nature. Among the amphetamines are drugs like Benzedrine, Methedrine, and Dexedrine. Truck drivers use amphetamines to stay awake while driving long hours, and many doctors used to prescribe these drugs as diet pills for overweight people. Nausea, vomiting, high blood pressure, and strokes are possible, as is a condition called amphetamine psychosis. This condition causes addicts to become delusional (losing contact with what is real) and paranoid. They think people are out to ‘get’ them. Violence is a likely outcome, both against the self and others (Kratofil, Baberg, and Dimsdale, 1996).

- **Cocaine**: Cocaine is a natural drug found in coca plant leaves. It produces feelings of euphoria (a feeling of great happiness), energy, power, and pleasure. It also deadens pain and suppresses the appetite. Cocaine is a highly dangerous drug, not just for its addictive properties. Some people suffer convulsions and may even die when using cocaine for the first time (Lacayo, 1995). The brain is the part of the body that develops the craving for cocaine because of chemical changes caused by the drug (Hurley, 1989). There are three basic signs of physical dependency that are as follows:
(i) **Compulsive use:** If cocaine is available, the person has to use it. He or she cannot say no to it.

(ii) **Loss of control:** Once people start using it, they cannot stop until it is all gone or they have exhausted themselves to the point where they can no longer function.

(iii) **Disregard for the consequences of use:** Cocaine addicts will lie, cheat, steal, lose their jobs, damage or break up relationships, and use rent money to buy cocaine; nothing else matters to them but the drug.

- **Nicotine:** Nicotine is a relatively mild but nevertheless toxic stimulant, producing a slight ‘rush’ or sense of arousal as it raises blood pressure and accelerates the heart, as well as providing a rush of sugar into the bloodstream by stimulating the release of adrenalin (Rezvani and Levin, 2001). As is the case with many stimulants, it also has a relaxing effect on most people (remember the effect of Ritalin on hyperactivity) and seems to reduce stress (Permerleau and Permerleau, 1994). Women and teenagers are actually smoking more than before (CDC, 2002).

- **Caffeine:** Caffeine is another natural substance, like cocaine and nicotine, and is found in coffee beans, tea leaves, cocoa nuts, and at least 60 others types of plants (Braun, 1996). It is a mild stimulant, helps maintain alertness, and can increase the effectiveness of some pain relievers, such as aspirin. Caffeine is often added to pain relievers for that reason and is the key ingredient in medications meant to keep people awake.

- **Barbiturates or major tranquilizers:** Barbiturates are drugs that have a sedative (sleep-inducing) effect. The effects, depending on dosage levels, range from mild sedation or sleepiness to unconsciousness or coma. Overdoses can lead to death as breathing and heart action are stopped. Barbiturates are highly addictive and users can quickly develop a tolerance. Withdrawal can be as serious as convulsions, which are life threatening (Olin, 1993).

- **Benzodiazepines or the minor tranquilizers:** The minor tranquilizers (drugs having a relatively mild depressant effect) are called benzodiazepines. These drugs used to lower anxiety and reduce stress.

- **Narcotics:** All narcotics are a derivative of a particular plant-based substance, opium.

- **Opium:** Opium, made from the opium poppy, has pain-relieving and euphoria-inducing properties that have been known for at least 2,000 years.

- **Morphine:** Morphine was created by dissolving opium in an acid and then neutralizing the acid with ammonia.

- **Heroin:** Heroin was even more powerfully addictive than morphine or opium. Its use as a medicine has ceased, but it is still used by many people.
**Nature of Consciousness**

- **Hallucinogens**: Hallucinogens fall under the category of psychogenic drugs. They actually stimulate the brain into altering its interpretation of sensations (Olin, 1993) and can produce sensory distortions very similar to the disorder synaesthesia.

- **Marijuana**: One of the best known and most commonly abused psychogenic drugs, marijuana (also call pot or weed), comes from the leaves and flowers of the hemp plant called *Cannabis sativa*. (Hashish is the substance scraped from these leaves, and both marijuana and hashish are called cannabinoids). The active ingredient in marijuana is tetra hydro cannabin (THC). Marijuana is best known for its ability to produce a feeling of well-being, mild intoxication, and mild sensory distortions or hallucinations (Olin, 1993; Tart, 1970). The effects of marijuana are relatively mild compared to the other hallucinogens.

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**Check Your Progress**

7. State the use of drug to enhance the false sense of power.

8. Enumerate the meaning and role of psychoactive drugs.

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**11.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS**

1. Altered states of consciousness are mental states which can be produced by drugs, trauma, fatigue, hypnosis and sensory deprivation. In some cases, the drug used may create a higher level of awareness. It is believed that caffeine increases alertness. Awareness may also be altered to a lower level.

2. Different levels of awareness are:
   - **High-level consciousness**: It represents the most alter states of human consciousness in which individuals actively focus their efforts towards a goal.
   - **Low-level consciousness**: It includes automatic processing that requires little attention, as well as day dreaming and does not interfere with other ongoing activities.
   - **Altered states of consciousness**: Altered states of consciousness are mental states which can be produced by drugs, trauma, fatigue, hypnosis and sensory deprivation. In some cases, the drug used may create a higher level of awareness.
   - **Subconscious awareness**: It can take place while we are awake or while we are asleep. When an idea is incubating, our mind may be processing information even though we are not aware of it.
3. Unconscious thought is a reservoir of unacceptable wishes, feeling and thoughts that are beyond conscious awareness, said S. Freud. According to Freud, unconscious thoughts are too laden with anxiety and other negative emotions for consciousness to admit them. Freud’s concept of unconscious mind was not accepted by all.

4. Sleep is the periodic physiological fluctuation in the body. Most of the time we are unaware of most biological rhythms, but they can influence our behaviour. The rhythms are controlled by biological clocks.

5. Following are the important functions of sleep:
   - Restoration: Sleep is fundamental mechanism for survival. Researches prepared that sleep restores, replenishes and rebuilds our brain and body, which can feel depleted by the day’s waking activities. Some scientists believe that sleep is essential as it gives neurons used while we are awake a chance to shut down and repair themselves.
   - Adaptation: In order to protect themselves, animals need to develop sleep when it is dark.
   - Growth: Sleep is beneficial to physical growth and brain development in infant and children. Deep sleep coincides with the release of growth hormone in children.
   - Memory: It plays an important role in the storage and maintenance of long-term memory—REM phase of sleep (active). Sleep has been linked with the formation of emotional memories in humans. 6. The five stages of sleep are differentiated by the depth of sleep and the wave patterns detected with an EEG. They are as follows:
     - Stage 1 sleep: This stage is characterized by theta waves, which are slower in frequency and greater in amplitude than alpha waves.
     - Stage 2 sleep: Theta waves continue, but are interspersed with a defining characteristic of stage 2 sleep, sleep spindles or sudden increases in wave frequency. Stages 1 and 2 are both relatively light stages of sleep.
     - Stage 3 and 4 sleep: These stages are characterized by delta waves, the slowest and highest-amplitude brain waves during sleep. These two stages are often referred to as delta sleep. If awakened during this stage, they usually are disoriented.
     - State 5 sleep: After going through stages 1 through 4, sleepers drift up through the sleep stages toward wakefulness. However, instead of re-entering stage 1, they enter stage 5, a different form of sleep called REM (rapid-eye-movement) sleep.

7. Drugs often make people feel powerful. Drugs endow a user with a false sense of power that, of course, recedes when the artificial high ends. Addiction
8. Drugs that alter thinking, perception, memory, or some combination of those abilities are called psychoactive drugs. Although some of these drugs can be useful under certain circumstances, they all pose risks as well. One of the dangers of such drugs is their potential to create either physical or psychological dependence, both of which can lead to a lifelong pattern of abuse as well as the risk of taking increasingly larger doses, leading to one of the clearest dangers of dependence (a drug overdose).

11.5 SUMMARY

- Altered states of consciousness are mental states which can be produced by drugs, trauma, fatigue, hypnosis and sensory deprivation. In some cases, the drug used may create a higher level of awareness. It is believed that caffeine increases alertness. Awareness may also be altered to a lower level.
- Subconscious information processing can occur simultaneously along many parallel tracks, e.g., when a man is running down the street we are consciously aware of the event, but not of the subconscious processing of object identity (a man), its height, colour, weight, etc.; whereas, conscious processing is serial.
- Sleep is the periodic physiological fluctuation in the body. Most of the time we are unaware of most biological rhythms, but they can influence our behaviour. The rhythms are controlled by biological clocks.
- In a national survey of more than 1,000 American adults, conducted by the National Sleep Foundation, 63 per cent said that they get less than eight hours of sleep a night, and 31 per cent said that they get less than seven hours of sleep a night.
- The five stages of sleep are differentiated by the depth of sleep and the wave patterns detected by an EEG.
- Each year, at least 40 million Americans suffer from chronic, long-term sleep disorders, and an additional 20 million experience occasional sleep problems. Many people suffer from undiagnosed and untreated sleep disorders.
- Freud’s theory has largely given way to newer theories of dreams, such as the cognitive theory of dreaming. It proposed that dreaming can be understood by relying on the same cognitive concepts that are used in studying the waking mind.
- Hypnosis and meditation are psychological states, or possibly a state of altered attention and awareness, in which the individual is unusually receptive.
to suggestions. Basic hypnotic techniques have been used since the beginning of recorded history in association with various religious ceremonies, magic, the supernatural, and many erroneous psychological theories.

- Hypnosis is widely used in medicine and dentistry, in criminal investigations, and in sports. Hypnosis has also been used in psychotherapy to treat alcoholism, somnambulism, suicidal tendencies, overeating, and smoking.

- Meditation refers to achieving an altered state of consciousness by performing certain exercises like regulating breathing, restricting one’s field of attention, eliminating external stimuli, assuming yogi body position, etc. These leads a pleasant, mildly altered subjective state in which the individual feels mentally and physically relaxed.

- In his study of a centuries old Tibetan Buddhist text, Brown has described the complex training required to master the technique. He had also mentioned that cognitive changes can be expected at different levels of meditation.

- Bio-feedback is based on skin response (GSR), feedback on brain waves (EEG) and feedback in any other physiological parameter. The individual is made to study the internal reactions to stress and relaxation. By giving the individual feedback whether he/she is in a state of stress or relaxation, the individual can be made to alter the reaction in favour of relation which one can maintain as much as possible.

- Drugs often make people feel powerful. Drugs endow a user with a false sense of power that, of course, recedes when the artificial high ends. Addiction occurs when a person compulsively attempts to continue that high by taking a drug over and over again.

- Drugs that alter thinking, perception, memory, or some combination of these abilities called psychoactive drugs. Although some of these drugs can be useful under certain circumstances, they all pose risks as well. One of the dangers of such drugs is their potential to create either a physical or psychological dependence.

- Another sign of a physical dependence is that the user experiences symptoms of withdrawal when deprived of the drug. Depending on the drug, these symptoms can range from headaches, nausea, and irritability to severe pain, cramping, shaking, and dangerously elevated blood pressure.

- Psychological dependencies can last forever. Some people who gave up smoking pot decades ago still say that the craving returns every now and then.

- Cocaine is a natural drug found in coca plant leaves. It produces feelings of euphoria (a feeling of great happiness), energy, power, and pleasure. It also deadens pain and suppresses the appetite. Cocaine is a highly dangerous drug, not just for its addictive properties.
• Barbiturates are drugs that have a sedative (sleep-inducing) effect. The effects, depending on dosage levels, range from mild sedation or sleepiness to unconsciousness or coma. Overdoses can lead to death as breathing and heart action are stopped.

11.6 KEY WORDS

• The Galvanic Skin Response (GSR): This is the measure of the continuous variations in the electrical characteristics of the skin, i.e. for instance the conductance, caused by the variation of the human body sweating.
• Cannabis sativa: This is a flowering plant indigenous to eastern Asia but now is cultivated widely. It is used as a source of industrial fibre, seed oil, food, recreation, religious and spiritual moods and medicine.
• Tetrahydrocannabinol (THC): This is one of cannabinoids identified in cannabis. THC is the principal psychoactive constituent of cannabis and is one of the oldest hallucinogenic drugs known.

11.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions
1. Write a short note on altered states of consciousness.
2. Enumerate the different levels of awareness.
3. Write a brief note on the functioning of biological clocks.
4. What is the concept of sleep and dream?
5. State the significance of hypnosis and meditation.
6. Write a short note on deep muscle relaxation.

Long Answer Questions
1. Discuss the meaning and effect of low-level consciousness.
2. Analyse the importance of sleep with relevant data.
3. Write a comprehensive note on effect of chronic sleep deprivation.
4. Discuss the numerous undiagnosed and untreated sleep disorders that many people suffer from.
5. Analyse the significance of Freud’s theory on dream.
6. People use drugs even if all are dangerous to a great extent. Discuss it with relevant references.
7. Enumerate various stimulants and their uses.

### 11.8 FURTHER READINGS


UNIT 12 ATTENTION IN PSYCHOLOGY

Structure
12.0 Introduction
12.1 Objectives
12.2 Attention: Types, Factors and Characteristics
   12.2.1 Types of Attention: Overt and Covert
   12.2.2 Factors Influencing Attention
   12.2.3 Characteristics of Attention
   12.2.4 Spotlight of Attention
   12.2.5 Assessment and Determinants of Attention
12.3 Answers to Check Your Progress Questions
12.4 Summary
12.5 Key Words
12.6 Self Assessment Questions and Exercises
12.7 Further Readings

12.0 INTRODUCTION

Attention refers to an active processing of specific information present by an individual. It is one of the most consequential of all the tasks human brain performs. Perceiving, thinking, learning, deciding and acting deliberately, all depend on attention. It is the means by which one actively processes a limited amount of information from a vast amount of information.

There is no consensus on defining the exact meaning of attention. However, most psychologists and researchers refer to attention as the set of processes enabling and guiding the selection of perceptual information. It is a selective mental process in which the person by adopting certain bodily posture is set to bring certain stimuli into focus of consciousness. It includes both conscious and unconscious processes. It is believed that conscious processes are relatively easy to study and unconscious processes are harder to study simply because one is not conscious of them.

On the basis of its status, attention has been categorised as overt and covert attention. While the former is the act of directing sense organs toward a stimulus source, the latter is the act of mentally focusing on one of several possible sensory stimuli. Like most psychological concepts, attention is not a unitary phenomenon, but refers to a variety of mechanisms.
This unit aims at discussing the interpretation of attention in Psychology, its types and characteristics and analyses the various theories associated with the application of attention.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the concept of attention in Psychology
- Discuss the types of attention
- Explain the various factors and characteristics of attention
- Understand the determinants of attention
- Analyse the various aspects of external determinants

12.2 ATTENTION: TYPES, FACTORS AND CHARACTERISTICS

Let us first discuss the types of attention.

12.2.1 Types of Attention: Overt and Covert

1. Overt orienting

Overt orienting is the act of selectively attending to an item or location over others by moving the eyes to point in that direction. Overt orienting can be directly observed in the form of eye movements. Although overt eye movements are quite common, there is a distinction that can be made between two types of eye movements; reflexive and controlled. Reflexive movements are commanded by the superior colliculus of the midbrain. These movements are fast and are activated by the sudden appearance of stimuli. In contrast, controlled eye movements are commanded by areas in the frontal lobe. These movements are slow and voluntary.

2. Covert orienting

Covert orienting is the act to mentally shifting one’s focus without moving one’s eyes. Simply, it is changes in attention that are not attributable to overt eye movements. Covert orienting has the potential to affect the output of perceptual processes by governing attention to particular items or locations (for example, the activity of a V4 neuron whose receptive field lies on an attended stimuli will be enhanced by covert attention) but does not influence the information that is processed by the senses. Researchers often use “filtering” tasks to study the role of covert attention of selecting information. These tasks often require participants to observe a number of stimuli, but attend to only one.

The current view is that visual covert attention is a mechanism for quickly scanning the field of view for interesting locations. This shift in covert attention is linked to eye movement circuitry that sets up a slower saccade to that location.
12.2.2 Factors Influencing Attention

An object must possess certain characteristics so that it may be able to draw our attention. The objects attended to have one or more of the following characteristics, which increase their attention value. These characteristics are as follows:

i. **Intensity**: A strong or prominent object is likely to attract our attention quickly and easily than a weak stimulus. For example, a scream or loud cry, full beam of light, heavy rain, thundering, heightening or flashing, all are intense stimuli, so they catch our attention easily.

ii. **Extensibility**: Like intensive, extensive objects will also capture our attention. Bigger stimulus is more striking than the little ones. Huge billboards, full-page advertisement in a newspaper is more likely to be noticed than a small one.

iii. **Colour**: Colourful stimuli are more attractive than the simple one. Different beautiful colours are used in advertisements just to grasp our attention.

iv. **Movement**: Moving objects are more attractive than the static one. Movement is the fundamental objective condition of attention.

v. **Duration**: If the duration of stimulation is longer, then it will catch our attention. Short termed or stimuli having minimum duration will not attract us.

vi. **Contrast**: It is the basic factor which is used by those companies who want to attract the consumers. If contrast is produced in a nice manner, it definitely will catch the attention. All advertising agencies depend on this technique. Contrast can be of colour, size, shape or movement also.

vii. **Change**: It is also a form of contrast. A continuous or steady stimulus or object may lose our attention, but a sudden change can catch it again. When moving objects stop, static object starts moving, they definitely catch our attention. Alarm, call bell, knocking, or sudden change in light at once catches our attention.

viii. **Novelty**: A novel or unusual object attracts more easily than a familiar one. A familiar object loses its strength of attraction. Any stimulus, to which we become habitual, remains no more attractive to us. Unique dresses, styles, colours and fashion grasp our attention. Striking quality of the objects definitely capture our attention.

ix. **Location**: We can see its application in advertisements. Advertising agencies select important location for the bill boards. Same strategy is adopted while advertising in newspapers. Ads between news bulletins or just before become more attention catching.

x. **Repetition**: Repeated object or incident catches our attention. The more it stimulates us the more it will become attractive for us. The advertising agencies give their message repeatedly on T.V. or radio so they catch our
attention. But there is a limit for repetition. Sometimes, we become fed up with repetition also.

12.2.3 Characteristics of Attention
Our past experiences, special interests, particular skills carry with our attention. All these give us not just expanded knowledge base, but a greater sensitivity to particular stimuli, events, and relationships. Students usually notice that teachers say “attention please”, but most of the teachers are already aware that attention occurs to unexpected stimuli and ceases to occur to repeated stimuli. Most of the time, we are bombarded with many stimuli at once. We are unable to perceive all of them. But some stimuli intrude on our consciousness no matter what we do, but often we are able to select what we perceive.

We select one or some of the stimuli to attend to from the shower of sensation. While sitting in a class, you are supposed to attend to the lecture and you are really doing that, but you can notice many other stimuli constantly reaching you, e.g. tightness of your shoe, whispers from the back row, odour from close by, a stiffness of your seat and many others. You, probably, were not aware of those stimuli, until you attended to them. In every act of attention, there are objects attended to and the objects attended from. As attention is a selective process, without the ability to select, we would be overwhelmed by all these stimuli. Usually what we select depends on what is important to us at the moment, but certain salient stimuli are always perceived. We say that they “capture our attention”.

12.2.4 Spotlight of Attention
Of all the things that happen around us, of which we could be aware of, we actually become aware only of those on which we focus our attention. Attention is like a spotlight that illuminates certain portions of our surroundings. When we focus our attention on something and become conscious of it, we can begin to process it cognitively i.e. converting sensory information or perceptions and memories or developing ideas through analysis, judgement, reasoning and imagination. When the spotlight of attention shifts to something else, conscious processing of the earlier material ceases and processing of the new content begins.

When we select something to attend to because of its striking characteristics, we inevitably ignore many other possibilities. Only a small portion of the information constantly being taken in by our senses can be attended to. Attention has been the focus of research because of its importance for consciousness and, thus, for higher level mental processing. In his book, “Perception and Communication” (1958), Broadbent outlined a number of ideas that were novel and exciting to other researchers and provided an empirical basis for investigation of attention.

12.2.5 Assessment and Determinants of Attention
One cannot react in a similar manner to all the things that are present around one. One focusses on only few things. This selective focus is called as attention.
It is a fact that some stimuli affect more than other. Everyone selects certain stimuli present in the environment based on his/her interests, needs and attitudes.

There are two types of determinants of attention:

A. **External determinants**

1. **Nature of stimulus**: By nature of stimulus, one means the type of stimulus that is whether the stimulus is visual, auditory, olfactory, tactile or olfactory. Various experiments on perception have confirmed that colored things like pictures attract more attention than the colorless ones. Beautiful things attract more attention.

2. **Intensity of the stimulus**: Intense stimulus attracts more attention of the subject than the weak stimulus. High sounds, bright colors are more attention seeking.

3. **Size of the stimulus**: Though big things attract more but sometimes very small things also gain attention because of their background. Thus the attraction does not only depend upon the size but the background as well.

4. **Location of the stimulus**: The location of the stimulus also affects attention. In the visual stimuli the most effective location is just in front of the eyes. Many experimental studies have reflected the fact that upper half page of the advertisement in newspapers attracts the attention most.

5. **Contrast of the stimulus**: Contrast of the stimulus is also an important determinant of attention. For example, presence of one white skinned man in a group of blacks.

6. **Change of the stimulus**: No one can concentrate our attention for a long time on a particular thing. Attention can be gained by the change in the stimulus.

7. **Isolation of stimulus**: Isolation is an important determinant of attention. This assumption is based on the fact that isolated individuals or things do not mix with others and so they are seen in own background.

8. **Duration of stimulus**: The stimulus shown for a long period of time will seek more attention from the subject.

9. **Repetition of the stimulus**: Another important determinant of attention is the repetition of the stimulus. It is a common knowledge that if the teacher is trying to draw the attention of the students towards a particular topic then she is likely to repeat it quite a number of times.

10. **Movement of stimulus**: Moving stimuli attract more attention than the static ones. That is why moving sign boards are used to attract the customers.
B. Internal Determinants

Besides the external determinants, some internal determinants present within the subject are also helpful in attracting attention. These are:

1. **Interest**: Every individual has different set of interests. People are more attracted to things which are of their interest and would like to perceive only those things which interest them.

2. **Basic drives**: The perception of an organism also depends upon his basic drives of hunger, thirst and fear etc. Hungry people will always be looking for food in every situation but a person who has a full belly will not like to even look to good food. Gardner, Murphy and Chein presented eighty different objects one at a time, behind a ground-glass screen to a group of college students who had been deprived of food for varying periods of time. Through the ground glass screen the students were able to see shadowy outlines of the objects. The study showed that as hunger increased the students tended more and more to interpret the indistinct forms as items of food.

3. **Mental set**: Mental set means the attitude of the subject. Only the stimulus which is there in the mind set will be perceived by the subject. For example during examinations even small things related to examination attract the attention of the students.

4. **Personal values**: Person perception also depends upon the values of the perceiver. For example, it was studied by Bruner and Goodman (947) in an experiment conducted on poor children and children from rich families that poor children over estimated the size of coins because both had different set of values.

5. **Meaning**: Meaningful objects attract more attention than the meaningless ones. For example, if two people are talking in some other language which is not known to you, then you are not likely to pay attention to it because it has no meaning for you.

6. **Habit**: Habit is also an important determinant of attention. The attention is diverted towards things which are habitual

7. **Past experience**: Past experiences also guide us in our perception. Most of the times people attend to those things with which they associate positive memories and would like to avoid situations which are associated with negative experiences.

8. **Emotion**: Emotions also have an impact on our attention process. A person who is very happy will find everything singing and dancing around him. Feeling and emotions influence one’s capacity for accurate or objective perceptions. People who are emotionally excited will never be able to perceive the events and objects correctly. In courtroom murder trials where emotions run high, two or more witnesses with no reason to lie have been known to give completely contradictory testimony to same events.
9. **Suggestion**: Suggestion given by others causes errors in perception. For example, it was found that in rope trick, under the influence of the performer’s vivid and persuasive description, the members of the audience see a rope uncurl and stand upright unsupported in space.

In hypnotism, our senses are deceived by what the mind is directed to see, feel or hear in an extreme state of suggestibility. It is generally believed that hypnotic suggestibility can distort our perception.

**Neural Correlates of Attention**

Attention is a cognitive selection mechanism that allocates the limited processing resources of the brain to the sensory streams most relevant to our immediate goals, thereby enhancing responsiveness and behavioural performance. The underlying neural mechanisms of orienting attention are distributed across a widespread cortical network. While aspects of this network have been extensively studied, details about the electrophysiological dynamics of this network are scarce.

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<thead>
<tr>
<th>Check Your Progress</th>
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<tr>
<td>1. State the meaning of attention in Psychology.</td>
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<tr>
<td>2. List the various types of attention.</td>
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<td>3. Explain the characteristics of attention.</td>
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<td>4. List the features of external determinants.</td>
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### 12.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. There is no consensus on defining the exact meaning of attention. However, most psychologists and researchers refer to attention as the set of processes enabling and guiding the selection of perceptual information. It is a selective mental process in which the person by adopting certain bodily posture is set to bring certain stimuli into focus of consciousness.

2. There are two types of attention. These are:
   
   i. Overt orienting: Overt orienting is the act of selectively attending to an item or location over others by moving the eyes to point in that direction. Overt orienting can be directly observed in the form of eye movements.
   
   ii. Covert orienting: Covert orienting is the act to mentally shifting one’s focus without moving one’s eyes. Simply, it is changes in attention that are not attributable to overt eye movements. The current view is that visual covert attention is a mechanism for quickly scanning the field of view for interesting locations.
3. These characteristics are as follows:

i. Intensity: A strong or prominent object is likely to attract our attention quickly and easily than a weak stimulus. For example, a scream or loud cry, full beam of light, heavy rain, thundering, lightning or flashing, all are intense stimuli, so they catch our attention easily.

ii. Extensity: Like intensive, extensive objects will also capture our attention. Bigger stimulus is more striking than the little ones.

iii. Colour: Colourful stimuli are more attractive than the simple one. Different beautiful colours are used in advertisements just to grasp our attention.

iv. Movement: Moving objects are more attractive than the static one. Movement is the fundamental objective condition of attention.

v. Duration: If the duration of stimulation is longer, then it will catch our attention. Short termed or stimuli having minimum duration will not attract us.

vi. Contrast: It is the basic factor which is used by those companies who want to attract the consumers.

vii. Change: It is also a form of contrast. A continuous or steady stimulus or object may loosen our attention, but a sudden change can catch it again.

viii. Novelty: A novel or unusual object attracts more easily than a familiar one. A familiar object loses its strength of attraction.

ix. Location: We can see its application in advertisements. Advertising agencies select important location for the bill boards. Same strategy is adopted while advertising in newspapers. Ads between news bulletins or just before become more attention catching.

x. Repetition: Repeated object or incident catches our attention. The more it stimulates us the more it will become attractive for us. The advertising agencies give their message repeatedly on T.V. or radio so they catch our attention.

4. Some of the features of external determinants are:

i. Nature of stimulus: By nature of stimulus, one means the type of stimulus that is whether the stimulus is visual, auditory, olfactory, tactile or olfactory. Various experiments on perception have confirmed that coloured things like pictures attract more attention than the colourless ones. Beautiful things attract more attention.

ii. Intensity of the stimulus: Intense stimulus attracts more attention of the subject than the weak stimulus. High sounds, bright colours are more attention seeking.
iii. Size of the stimulus: Though big things attract more but sometimes very small things also gain attention because of their background. Thus the attraction does not only depend upon the size but the background as well.

iv. Location of the stimulus: The location of the stimulus also affects attention. In the visual stimuli the most effective location is just in front of the eyes. Many experimental studies have reflected the fact that upper half page of the advertisement in newspapers attracts the attention most.

vi. Contrast of the stimulus: Contrast of the stimulus is also an important determinant of attention. For example, presence of one white skinned man in a group of blacks.

vi. Change of the stimulus: No one can concentrate our attention for a long time on a particular thing. Attention can be gained by the change in the stimulus.

vii. Isolation of stimulus: Isolation is an important determinant of attention. This assumption is based on the fact that isolated individuals or things do not mix with others and so they are seen in own background.

viii. Duration of stimulus: The stimulus shown for a long period of time will seek more attention from the subject.

### 12.4 SUMMARY

- Overt orienting can be directly observed in the form of eye movements. Although overt eye movements are quite common, there is a distinction that can be made between two types of eye movements; reflexive and controlled.

- The current view is that visual covert attention is a mechanism for quickly scanning the field of view for interesting locations. This shift in covert attention is linked to eye movement circuitry that sets up a slower saccade to that location.

- Like intensive, extensive objects will also capture our attention. Bigger stimulus is more striking than the little ones. Huge billboards, full-page advertisement in a newspaper is more likely to be noticed than a small one.

- Our past experiences, special interests, particular skills carry with our attention. All these give us not just expanded the knowledge base, but a greater sensitivity to particular stimuli, events, and relationships. Students usually notice that teachers say “attention please”.

- Of all the things that happen around us, of which we could be aware of, we actually become aware only of those on which we focus our attention. Attention is like a spotlight that illuminates certain portions of our surroundings.
• When we select something to attend to because of its striking characteristics, we inevitably ignore many other possibilities. Only a small portion of the information constantly being taken in by our senses can be attended to.
• By nature of stimulus, one means the type of stimulus that is whether the stimulus is visual, auditory, olfactory, tactile or olfactory. Various experiments on perception have confirmed that coloured things like pictures attract more attention than the colorless ones. Beautiful things attract more attention.
• Isolation is an important determinant of attention. This assumption is based on the fact that isolated individuals or things do not mix with others and so they are seen in own background.
• The perception of an organism also depends upon his basic drives of hunger, thirst and fear etc. Hungry people will always be looking for food in every situation but a person who has a full belly will not like to even look to good food.
• Past experiences also guide us in our perception. Most of the times people attend to those things with which they associate positive memories and would like to avoid situations which are associated with negative experiences.

12.5 KEY WORDS

• Reflexive movement: It occurs immediately in response to something that happens.
• Superior colliculus: This is a paired structure of the mammalian midbrain. The superior colliculus forms a major component of the midbrain.
• Hypnotism: The study or act of inducing hypnosis.

12.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the meaning of attention in Psychology.
2. What happens when we focus on attention?
3. Enumerate the role of determinants in attention.

Long Answer Questions

1. Discuss the significance of overt orienting.
2. Analyse the current view of visual covert orienting.
3. Write a comprehensive notes various characteristics that influence attention.
4. Discuss the significance of external and internal determinants.
12.7 FURTHER READINGS

NOTES


UNIT 13 PERCEPTION IN PSYCHOLOGY

Structure
13.0 Introduction
13.1 Objectives
13.2 Perception
   13.2.1 Perceptual Illusion
   13.2.2 Determinants of Perception
   13.2.3 Extra Sensory Perception (ESP)
13.3 Answers to Check Your Progress Questions
13.4 Summary
13.5 Key Words
13.6 Self Assessment Questions and Exercises
13.7 Further Readings

13.0 INTRODUCTION

Perception is the process of organizing and interpreting sensory information to give it meaning. Perception includes all those processes by which an individual receives information. It is the process whereby stimuli are received and interpreted by the individual and translated into a response. It can also be defined as a process by which individuals organize and interpret their sensory impression in order to give meaning to their environment. Sensory information travels rapidly through the brain because of parallel processing, the simultaneous distribution of information across different neural paths. Gestalt contends that a whole object cannot be predicted simply by adding up our perceptions of the parts. The parts may become unobservable when combined with other parts. The Gestalt theory holds that we perceive form above all else. Gestalt psychology postulates that the whole is different from the sum of its parts.

According to figure-ground concept, perceived objects stand out as separable from their general background. The figure seems to be well defined, at a definite location, solid, and in front of the ground. In contrast, the ground seems to be indefinite, shapeless and continuous behind the figure. The common outline of the figure and the ground appears to belong to the figure rather than to the ground. Though learning has a bearing on what will be perceived as the figure and what as ground, the tendency to organize their perceptions into figure and ground is inborn, natural and inherent in people. Figure-ground segregation is essential for the perception of shape.

This unit aims at discussing the perception and principles of perceptual organization and analyses this with figure-ground model in psychology.
13.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the concept of perception
- Enumerate sensory information
- Explain the figure-ground relationship
- Understand the characteristics of visual perception
- Enumerate the principles of perceptual organization
- Understand factors influencing perception
- Explain the role of learning in perception
- Enumerate various types of illusion
- Understand extra sensory perception

13.2 PERCEPTION

Most psychologists describe perception as interpretation of sensation. Perception is the process of organizing and interpreting sensory information to give it meaning. The brain automatically perceives the information it receives from the sense organs. For this reason most psychologists refer to sensation and perception as a unified information processing system (Goldstein, 2002). According to the expert A. David (1982) the purpose of perception is to represent information from the outside world internally.

Sensory information travels rapidly through the brain because of parallel processing, the simultaneous distribution of information across different neural pathways (Beauchamp and other, 2002). Sensory system designed to process information about sensory qualities one at a time (such as the shapes of image, their colours, their movements their location and soon) would be too slow to keep us current with a rapidly changing world.

Perceiving visual stimuli means organizing and interpreting the fragments of information that the eye send to the visual cortex. Information about the dimension of what we see are critical to this process. Shape and form are critical to perception. The term shape and form are often used interchangeably. There are many questions before us related to the perception of shape such as how do we perceive shape and form innate, or how do we segregate figure from ground.

The shape or form is defined as one of visual field that is set off from the rest of the field by visible cortex. The figure-ground relationship is the principle by which we organize the stand out (figure) and those that are left over (background) (refer Figure 13.1).
Reversible Figure-Ground Pattern

Some figure-ground relationships are highly ambiguous, and it may be hard to tell between the figure and the ground. In our visual field (whatever we look out in the environment around us), some area is segregated to form figure and the rest is relegated to the background. Figure ground segregation is essential for the perception of shape. It is not only the characteristics of visual perception but comes under sense modalities. The following are the difference between figure and backgrounds.

- The ground seems to extend behind the figure.
- The figure has a shape, while the ground is relatively shapeless.
- The figure is more impressive, meaningful and better remembered.
- The figure usually tends to appear in front, the ground behind.
- The figure has some of the characteristics of a thing, whereas the background appears like uniformed material.

Principles of Perceptual Organization

The Gestalt psychologists, Kohler, Koffka and Wertheimer (1886–1941) proposed that the brain has the innate capacity for organizing perception. According to them, people naturally organize their perceptions according to certain patterns. The main principles of Gestalt psychologist is that the whole is different from the sum of its part, e.g., thousands of tiny dots (parts) make up an image (whole) in print or on computer screen. Similarly, when we watch a film, the frame moves a light source at a high rate, and we perceive the whole that is very different from the separate frames that are the film’s part. Following are the factors that influence perception:

- Proximity: Tendency to perceive objects that are close to one another as a part of the same grouping (refer Figure 13.2).
NOTES

Fig. 13.2 Proximity of Figures

In Figure 13.2, A is perceived as three pairs of vertical lines, not six vertical lines. The set of dots in B may be perceived as a triangle.

- **Similarity**: Similarity stimuli are more likely to be perceived as one whole than dissimilar stimuli (refer Figure 13.3).

Fig. 13.3 Similar and Dissimilar Stimuli

In Figure 13.3, A and B have the same number and arrangements of parts. A is perceived as one whole. B contains dissimilar parts and is perceived as dots and squares.

- **Good figure (Law of Pragnanz)**: This law states that a perceptual organization will always be as good as the prevailing conditions allow. The simplest organization requiring the least cognitive effort will always emerge. Pragnanz means that we perceive the simplest organization that fits the stimulus pattern (refer Figure 13.4).
In Figure 13.4, A is perceived as a triangle of dots with another triangle. However, it fails to operate in B as the system parts have no symmetry. They do not form a good figure in B.

- **Closure**: It is the tendency to complete figure that are incomplete as it yields subjective contours (refer Figure 13.5).

In Figure 13.5, the triangle does not exist, still it is compelling to perceive a triangle.

- **Continuation common direction**: Stimuli that have a common direction are organized in perception as a separate object from those stimuli that have different direction (refer Figure 13.6).
In Figure 13.6, we perceive A as a set of dots forming an arc and another set of dots forming a straight line with a different direction. In B, we perceive two figures; one is superimposed on other. Each figure has different continuation. In C, we perceive a square and a circle.

- **Contiguity**: It involves nearness in space and time. Contiguity is the tendency to perceive two things that happen close together in time as being related. Usually, the first occurring event is seen as causing the second event.

- **Common region**: The coloured background defines a visible common region and tendency is to perceive objects that are in common area or region (refer Figure 13.7).

![Perception of Common Region](image)

The stimuli sharing a common set of characteristics are likely to be organized as one object in perception. Apart from some factors are within the perceiver that account for organization in perception.

- **Past experience**: Past experience plays an important part in a person’s perception. When a person already perceived a group of stimuli as one object, he is more likely to perceive it as the same object in future. If a child has been bitten by a dog, he perceives all dogs as dangerous and run away at their sight. His perception of dog becomes organized in the same way. Another child who has no such experience has a different perception of dogs.
● **Need and motives**: Need and motives are very powerful internal factors that influence perception organization. If a man is hungry, he is more likely to perceive the food object whereas a man having full meal is more likely to perceive objects in the shop other than food objects.

● **Depth perception**: The ability to see the world in three dimensions is called depth perception. The problem emerge from the fact that how the image of three dimensional world is projected on the two dimensional retina. The retina directly reflects height and width, but depth information is lost and reconstructed on the brain of depth cues, different kind of visual information that logically provide information about some object’s depth. There are various cues for perceiving depth in the world, some are as follows:

   a. **Aerial perspective**: Distant mountains often look fuzzy and building far in the distance is blurring than those that are close. However, the further away an object is the hazier the objects will appear. This is called aerial perspective.

   b. **Linear perspective**: When parallel lines appear to be converging at a distance, it is called linear perspective. The converging line means a great distance away from where they start.

   c. **Relative size**: When objects that people expect to be of certain size appear to be small and are, therefore assumed to be much farther away.

   d. **Light and shadow**: We are often aware of the source and direction of light. It is generally from above, as sunlight. The shadow cast by one object on another can indicate which object is farther away.

   e. **Interposition**: If one object seems to be blocking another, people assume that the blocked object is behind the first one and therefore farther away. This is also known as overlap.

   f. **Texture gradient**: The object lying on a surface that look fine and smooth is texture and is perceived at a greater distance than those objects on a rough surface. The pebbles or bricks that textured, but as you look farther off into distance, their texture become smaller and finer.

   g. **Motion parallax**: The discrepancy in motion of near-far objects is called motion parallax.

   h. **Accommodation**: Accommodation makes use of something that happens inside the eye. The brain can use this information about accommodation as a cue for distance. Accommodation is also called muscular cue.
The Role of Learning In Perception

The older question about the role of learning in perception had to do with the nativism-empiricism problem. To what extent is perception natively given by way of our inherited structures and capacities, and to what extent is it the result of our experiences with the world of objects? However, a new question is now being asked about the reciprocal relationship between learning and perception. This new and contemporary question is: To what extent is learning, merely reorganized perception?

Learning brings about a qualitative change in regard to adaptation, the most generic and simple form of optimization at an individual scale. It implies the idea of new knowledge, in the sense that the organism links what formerly appeared as an undistinguished whole. In other words, it means the capability to change its own codes of meaning. Finally, we outline some basic ideas for modelling an adaptive sensor embedded in a (partially) autonomous system, which implies the former distinction between adaptation and learning. Cognition transfers progressively the functions of phylogenetic adaptation to the spatial and temporal scale of the lifetime of an organism (plasticity and structural change as learning in the cognitive subsystem). It establishes a new relation in the activity of the organism in its environment. This process appears internally as a functional hierarchisation, where the cognitive system operates as a function for the general regulation of the rest of them. Both aspects—the relation of the organism with its environment and the organization of its functions—are coupled in the development of a rich and versatile universe.

13.2.1 Perceptual Illusion

Perpetual illusions are misconceptions resulting from misinterpretation of sensory information. Sensory illusions are also known as false perception, e.g., in a dark night a rope is perceived as a snake. Illusion is a normal phenomenon perceived by all human beings.

Illusion of Motion

Sometimes pupils perceive an object as moving when it is actually still. This is called the auto kinetic effect. A small stationary light in a darkened room will appear to move or drift because there are no surrounding due to indicate that the light is not moving. Another is the stroboscopes motion seen in motion picture. Another illusion related to stroboscope motion is the phi-phenomenon, in which light turned on and off in a sequence appear to move theatre marquee signs. For example, the best example of movement illusion is a series of blinking lights indicating direction.

Geometrical Illusion

There are quite a few illusions that can be demonstrated by drawing some lines. Muller layer illusion is the most important example of that. In Figure 13.8, the two
lines are exactly the same lengths and they are identical, but one looks longer than the other.

![Geometrical Illusion](image)

**Moon Illusion**

The moon on the horizon looks far bigger than moon in the zenith. The retinal image is the same for both the horizon. This happens due to size distance relationship.

13.2.2 Determinants of Perception

There are many different stimuli in the world which will catch our attention and result in perceptual organization. The stimulus characteristics are important as our own initial needs.

**Content**

A given stimulus may provide radically different perception because of the immediate content. The content creates an expectation in our brain that influences our perception at a particular movement. For example, suppose in a noisy condition we hear a sentence, ‘eel is moving.’ We will perceive the word ‘eel’ as ‘wheel’ because of the content provided by the later part of the sentence. Similarly, verbally provided a stimulus, ‘eel the orange’, one will perceive ‘eel’ as ‘peel’. This is because the later word ‘orange’ provides an expectation for the perception of earlier word.

**Perceptual Set**

Perceptual set refers to our mental expectancies and predisposition to perceive one thing and not another. Our education, social and cultural experiences shape our perception. Our learnt assumptions and beliefs help us in organizing our perception. Similarly, stereotypes (a generalized belief about a group of people)
help us to perceive people we meet first time. Much of our social interaction is determined by the stereotypes we hold about individuals and groups.

**MOTES and Needs**

Personal views matters a lot in perceiving things available in the environment.

**Socio and Cultural Factors**

Our perceptions reflect the effect of past learning and, therefore, if learning and socialization takes place in a particular socio-cultural background it will be reflected in our perception.

**13.2.3 Extra Sensory Perception (ESP)**

The perception without the involvement of series is called ESP. It is perception without stimulation. It includes phenomena like telepathy, clairvoyance and telekinesis, which are as follows:

- **Telepathy**: It refers to transfer of thought between two persons at different places.
- **Clairvoyance**: Perceiving objects and events without the involvement of senses.
- **Telekinesis**: Controlling objects without touching them.

ESP is considered a para-psychological phenomenon. Psychologists with scientific attitude are generally sceptical about the phenomena of ESP.

**Check Your Progress**

1. What is the meaning of perception in psychology?
2. Why does sensory information travel rapidly?
3. What is the role of learning in perception?
4. What do you mean by perceptual set?
5. What is extra sensory perception?
6. List the phenomena associated with ESP.

**13.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS**

1. Most psychologists describe perception as interpretation of sensation. Perception is the process of organizing and interpreting sensory information to give it meaning. The brain automatically perceives the information it receives from the sense organs. For this reason most psychologists refer to sensation and perception as a unified information processing system.
2. Sensory information travels rapidly through the brain because of parallel processing, the simultaneous distribution of information across different neural path ways. Sensory system designed to process information about sensory qualities one at a time (such as the shapes of image, their colours, their movements their location and soon) would be too slow to keep us current with a rapidly changing world.

3. Learning brings about a qualitative change in regard to adaptation, the most generic and simple form of optimization at an individual scale. It implies the idea of new knowledge, in the sense that the organism links what formerly appeared as an undistinguished whole. In other words, it means the capability to change its own codes of meaning.

4. Perceptual set refers to our mental expectancies and predisposition to perceive one thing and not another. Our education, social and cultural experiences shape our perception. Our learnt assumptions and beliefs help us in organizing our perception. Similarly, stereotypes (a generalized belief about a group of people) help us to perceive people we meet first time. Much of our social interaction is determined by the stereotypes we hold about individuals and groups.

5. The perception without the involvement of series is called ESP. It is perception without stimulation.

6. ESP includes phenomena like telepathy, clairvoyance and telekinesis, which are as follows:
   - Telepathy: It refers to transfer of thought between two persons at different places.
   - Clairvoyance: Perceiving objects and events without the involvement of senses.
   - Telekinesis: Controlling objects without touching them.

   ESP is considered a para-psychological phenomenon. Psychologists with scientific attitude are generally sceptical about the phenomena of ESP.

**13.4 SUMMARY**

- Most psychologists describe perception as interpretation of sensation. Perception is the process of organizing and interpreting sensory information to give it meaning. The brain automatically perceives the information it receives from the sense organs.

- Perceiving visual stimuli means organizing and interpreting the fragments of information that the eye send to the visual cortex. Information about the dimension of what we see are critical to this process. Shape and form are
critical to perception. The term shape and form are often used interchangeably.

- Some figure-ground relationships are highly ambiguous, and it may be hard to tell between the figure and the ground. In our visual field (whatever we look out in the environment around us), some area is segregated to form figure and the rest is relegated to the background.
- The main principles of Gestalt psychologist is that the whole is different from the sum of its part, e.g., thousands of tiny dots (parts) make up an image (whole) in print or on computer screen.
- The ability to see the world in three dimensions is called depth perception. The problem emerge from the fact that how the image of three dimensional world is projected on the two dimensional retina.
- The object lying on a surface that look fine and smooth is texture and is perceived at a greater distance than those objects on a rough surface. The pebbles or bricks that textured, but as you look farther off into distance, their texture become smaller and finer.
- Learning brings about a qualitative change in regard to adaptation, the most generic and simple form of optimization at an individual scale. It implies the idea of new knowledge, in the sense that the organism links what formerly appeared as an undistinguished whole. In other words, it means the capability to change its own codes of meaning.
- Sometimes pupils perceive an object as moving when it is actually still. This is called the auto kinetic effect. A small stationary light in a darkened room will appear to move or drift because there are no surrounding due to indicate that the light is not moving.
- A given stimulus may provide radically different perception because of the immediate content. The content creates an expectation in our brain that influences our perception at a particular movement. For example, suppose in a noisy condition we hear a sentence, ‘eel is moving.’ We will perceive the word ‘eel’ as ‘wheel’ because of the content provided by the later part of the sentence.
- Perceptual set refers to our mental expectancies and predisposition to perceive one thing and not another. Our education, social and cultural experiences shape our perception. Our learnt assumptions and beliefs help us in organizing our perception.
- Our perceptions reflect the effect of past learning and, therefore, if learning and socialization takes place in a particular socio-cultural background it will be reflected in our perception.
- The perception without the involvement of series is called ESP. It is perception without stimulation. It includes phenomena like telepathy, clairvoyance and telekinesis.

13.5 KEY WORDS

- **Hierarchisation**: It refers to the categorization or arrangement of a group of people or things into such ranks or grades.
- **Geometrical illusion**: When an illusion involves properties that fall within the purview of geometry.
- **The Moon illusion**: This is an optical illusion which causes the Moon to appear larger near the horizon than it does higher up in the sky.
- **Parapsychological phenomenon**: Any of several types of events that cannot be accounted for by natural law or knowledge apparently acquired by other than usual sensory abilities. The discipline concerned with investigating such phenomena is called parapsychology.

13.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short Answer Questions**

1. Enumerate the role of sensory system.
2. Analyse the figure-ground relation in a perceptual organization.
3. Write a brief note on reversible figure-ground pattern.
4. Enumerate the main principles of Gestalt psychologist.
5. What role does cognition play in learning?
6. Write a short note on illusion of moon.

**Long Answer Questions**

1. Discuss the role of sensory information in a perceptual organization.
2. ‘People naturally organize their perceptions according to certain patterns.’ Analyse this statement with reference to Gestalt psychologists.
3. Write a comprehensive note on the various factors that influence perception.
4. Discuss the application of Law of Pragnanz in a perceptual organization.
5. Analyse the nativism-empiricism problem in the context of the role of learning in perception.
6. Enumerate the phenomenon of illusion of motion.
7. Discuss the application of extra sensory perception (ESP).
13.7 FURTHER READINGS

NOTES


UNIT 14 APTITUDES

Structure
14.0 Introduction
14.1 Objectives
14.2 Intelligence Testing
   14.2.1 Group Test of Intelligence
   14.2.2 Performance Tests of Intelligence
14.3 Measuring Aptitude and Interest
   14.3.1 Tests of Interest
14.4 Answers to Check Your Progress Questions
14.5 Summary
14.6 Key Words
14.7 Self Assessment Questions and Exercises
14.8 Further Readings

14.0 INTRODUCTION

Psychologists have defined aptitude in different ways. Its meaning varies from one user to the other and is used loosely by laymen, psychologists and counsellors. Aptitude, moreover, connotes more than potential ability in performance. It seems to be indicative of a person’s power to acquire specified behavioural pattern of interest, knowledge and skill. In short, aptitude embraces any characteristic which predisposes to learning – including intelligence, achievement, personality, interests and special skills. Professionals in the testing field employ the term aptitude when prediction of future success is the primary purpose for use in the test. The first quarter of the twentieth century witnessed the development of the tests called as ‘aptitude tests’. One of the earliest and the best known of these tests the Stenquist Test of General Mechanical Ability. Historical development of intelligence testing can be classified into three distinctive periods namely pre-Binet, Binet and post-Binet period.

The history of emergence of group tests can be traced back to the First World War when the USA was compelled to join the war. The constancy of IQ has received a great deal of attention from educational psychologists because of its usefulness in modern education. Then there is the performance test in which the subject has to perform something or to manipulate some concrete material without much use of the language ability. In the meantime, tests of interest have been developed by psychologists to improve vocational selection in various jobs and to provide vocational guidance for selecting appropriate vocation keeping into consideration the individual’s future success.

There is evidence that the development of the future is likely to be along the line of test for specific aptitude rather than tests of general intelligence.
This unit aims at discussing the nature and measurement of aptitude and presents an in-depth analysis of various tests to gauge the level of aptitude in individuals or groups.

### 14.1 OBJECTIVES

After going through this unit, you will be able to:
- Understand the meaning of aptitude
- Enumerate the development of mental testing
- Enumerate the performance test of intelligence
- Understand the limitation of intelligence tests
- Discuss the measurement of aptitude
- Describe the different tests of interest
- Understand the various forms of Kuder interest test

### 14.2 INTELLIGENCE TESTING

Men have always been interested in measuring the abilities and capabilities of their fellowmen. Primitive men largely employed crude methods of measuring intelligence by means of physical strength and solving puzzles. With the advancement of civilization and with the development of scientific inquiry, the method of measuring intelligence was also improved.

The emergence of mental testing in the present form is hardly seventy years old. Historical development of intelligence testing can be classified into three distinctive periods. These are as follows:

1. Pre-Binet period
2. Binet period
3. Post-Binet period

#### 1. Pre-Binet Period

The development of intelligence testing may be attributed to the study of individual differences. The first experimentation on individual differences arose from the difference in reaction time (RT) among astronomers in 1776 in the observatory of Greenwich. Kinner Brook. An assistant, was engaged in recording time of the movement of stars when they crossed the field of telescope. He took more time than his officers. His services were terminated on this account. After twenty years, studies proved that differences in time of recording were due to individual differences among people. Mental measurement did not really get underway until the turn of the present century. The measurement started with psycho-physics. In the 19th century, there was a good deal of interest in the field of psycho-physics,
in which attempts were made to develop general rules of sensory judgement. Unlike differential measurement, which is concerned with individual differences, psychophysics is concerned with the functioning of sensory mechanism of the typical individual. One procedure developed was the method of limits which was intended to measure the extent to which people were able to differentiate between degrees of intensity of a stimulus or to notice a minimal difference between two stimuli termed ‘just noticeable difference’ (JND). It is evident that these experiments, in general sensory behaviour, were contaminated by individual differences. It was not possible to draw accurate generalization on the basis of these experiments. Interest in individual differences began to grow.

Sir Francis Galton (1822-1911) was the first psychologist who devoted his time to study whether individual characteristics are inherited. He took great interest in individual differences. He studied the lives of prominent Englishmen and in his book *Hereditary Genius*, he demonstrated that personal characteristics are inherited. These characteristics include mental as well as physical abilities and other aspects of personality. He developed a series of tests to measure human characteristics. The first laboratory of experimental psychology was established by Wundt in 1879, in Leipzig. He mainly employed physiological method and introspection as the major technique to study vision, hearing, reaction-time and psycho-physical problems. He developed mental tests which measured keenness of vision and hearing, muscular strength, reaction-time and other sensorimotor functions.

### A. Galton’s Influence on Cattell

James McKeen Cattell, an American psychologist, studied in Europe and brought many of Galton’s ideas back to USA with him. Cattell believed, as did Galton, that intellectual functions can best be measured through tests of reaction-time and sensory discrimination.

Needless to mention that a certain amount of intellectual ability is required for academic success in schools. The problem of intelligence has always been one of importance for educators. Whereas individuals have probably always made some type of evaluation of the intellectual ability of their fellow men, but a systematic attempt at such an appraisal was not forthcoming until the later part of the 19th century. When psychological laboratories came into existence and psychologists demonstrated interest in evaluating individual differences in mental ability. Thus, intelligence and intelligence testing received enough attention from psychologists and educators both.

Some of these early attempts grew out of an awareness of the apparent differences among pupils exemplified by the investigations of individual differences in reaction time. The word mental test was first used by Cattell in 1890 but had reference to different types of tests than those currently used. The mental tests, which Cattell and other experimental psychologists used, were tests of sensory discrimination, speed of motor responses and similar types. In those days intellectual
Aptitudes

NOTES

ability was identified as sensory acuity of an individual. But these types of mental functions bore little relationship to academic ability or to what most people view today as intellectual ability. These early attempts to evaluate intelligence were doomed to failure and it remained for Binet to come up with the first really usable test of mental ability.

B. Weaknesses of Pre-Binet Period

1. The major weakness of pre-Binet period was that psychologists failed to identify the nature of intelligence. Intelligence was identified as the acuity of senses.

2. Complex functions were not measurable.

3. Tests were too simple and limited to measure intelligence.

4. Fine mental abilities were not measured with the help of physical sensory tests.

2. Binet Period

In the beginning of present century in France, a high percentage of students failed in the examination. Teachers blamed students and vice versa. The superintendent of Public Instruction appointed a committee to devise some measures to screen and select slow learners in school in Paris. Binet and Simon were appointed as the members of the committee. They collected and developed a variety of paper-pencil test items which they administered to children varying in age. In contrast to the attempts of other psychologists who utilized tests of sensory reactions, Binet experimented with tests of more complex mental functions including judgement, reasoning, memory and arithmetic reasoning, etc.

In addition to evaluating more complex mental phenomena, Binet and Simon decided upon a novel way of arranging or grouping their test items which was of great practical importance. In giving their tests to children of different ages, they were able to categorize the test items in terms of the age-level where they seemed most appropriate. For example, a given item might correctly be responded to by most eight years old but be incorrectly responded to by a majority of seven years old. By arranging the items in terms of age-level, an age scale was developed. Furthermore, if the assumption is made that the average eight-year-old child functions intellectually at a level commensurate with his chronological age (CA), the age scale can be viewed as a mental age scale and judgements can be made concerning the intellectual level of an individual in terms of his performance on the scale. By means of such a scale, one can make some estimate of the intelligence of an individual expressed in terms of mental age. If an individual, regardless of age, can satisfactorily pass items on the 12-year-old level, he can be presumed to have the ability of the average 12-year-old or, in other words, a mental age of 12 years. The mental age scale and the concept of mental age were Binet’s great contributions to the field of intelligence testing. He provided a means whereby some standardized appraisal of mental ability could
be carried out. The first scale was produced by Binet and Simon in 1905. The
1905 scale consisted of thirty items arranged in order of increasing difficulty.
Sample items of the scale are given below:

2. Recognition of food.
3. Naming of objects designated in a picture.
4. Suggestibility.
5. Definition of familiar objects.

A. The 1908 Binet-Simon Scale
The defects of the first scale were identified and removed in the revised scale of
1908. The scale was revised on more representative sample of children. The items
have been grouped at the appropriate age levels from 3 to 13 years. Test-items of
age 3 and 8 years are given below:

Age 3 years
1. Points to nose, eyes and mouth.
2. Repeats two digits 3, 5.
3. Repeats sentences of six syllables.
4. Enumerates objects in a picture.
5. Gives family name.

Age 8 years
1. Reads a passage and remembers two items.
2. Adds up the value of five coins.
3. Names four colours.
4. Counts backward from twenty to zero.
5. Writes short sentences from dictation.
6. Gives differences between two objects.

B. The 1911 Revision of the Binet Scale
The 1908 revision created interest among psychologists of the USA, England and
Switzerland. They adopted the scale in their countries and gave valuable suggestions
for the improvement of the scale. Binet incorporated the suggestions in the revised
scale of 1911. He died the same year. Some sample items of 1911 scale are as follows:

Age 6 years
1. Distinguishes between morning and afternoon.
2. Defines names of familiar objects in terms of their use.
3. Copies a diamond.
Aptitudes

5. Distinguishes between pictures of ugly and pretty faces.

Age 8 years

NOTES
1. Gives differences between two objects.
2. Counts backward from 20 to 0.
3. States omissions from unfinished pictures.
4. Knows the date.
5. Repeats the digits.

Age 10 years

1. Arranges five blocks in order of weight.
2. Reproduces two geometric designs from memory.
3. Criticizes absurd statements.
4. Comprehends and answers difficult problem questions.
5. Uses three given words in two sentences.

C. Distinguishing Features of Binet’s Scale

Although successive revisions differed from one another and from the original Binet-Simon scale but there is a body of features that characterize all versions of the revised scales of Binet-Simon scale. Following are important features:

First, they are scales. This means that the items and tasks are grouped on the basis of their difficulty beginning with easy items. The tester asks harder and harder items as the test proceeds. A child’s score chiefly depends on how far up this ladder he can go rather than how fast or fluent he is.

The second feature of the revised Binet’s scales is that they yield a general global measure of intelligence rather than an analysis of special abilities.

The third is that they are grouped by age-levels and measure mental growth of the subject.

The fourth characteristic is that they are given individually by a skilled examiner and requires high standard of proficiency; and finally, the system of scoring in all Binet’s tests is tied to the age norms. A child’s mental age (MA) indicates the age group for which his performance would be typical.

D. Stanford Revision of Binet’s Scale

L.M. Terman of Stanford University revised and refined the original Binet-Simon scale in America according to the needs of American culture in 1916. This revision had the greatest impact on the field of testing and became most widely used and influential test of intelligence in America. No new principles were introduced except the concept of intelligence quotient (IQ) developed by Stern. L.M. Terman and his co-workers conducted research for a number of years on normal, defective
and superior children and adults. The 1916 scale includes 90 items, ranging from 3 years to 14 years of age. Of these 90 items, 54 were adopted from 1911 Binet scale, 5 from earlier Binet scale, 4 from other American tests, and 27 new items were added. Some items of 1916 Stanford scale are as follows:

**Age 3 years**
1. Points to parts of body.
2. Names familiar objects.
3. Enumerates objects in pictures.
4. Gives his/her sex.
5. Gives last name.
6. Repeats six to seven syllables.
A1. Repeats three digits.

**Age 7 years**
1. Knows number of fingers on each and both hands.
2. Describes pictures.
3. Repeats 5 digits.
4. Ties a bow-knot.
5. Gives differences between paired objects.
6. Copies a diamond.

A1. 1. Names days of week in correct order.
A1. 2. Repeats 3 digits backward.

After a few years of use, certain defects became obvious such as the weakness of the scale at the upper and lower age levels.

### Distribution of IQ on Stanford Revision

<table>
<thead>
<tr>
<th>IQ</th>
<th>Per cent</th>
<th>Classification</th>
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</thead>
<tbody>
<tr>
<td>160-169</td>
<td>0.3</td>
<td>Very superior</td>
</tr>
<tr>
<td>150-159</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>140-149</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>130-139</td>
<td>3.1</td>
<td>Superior</td>
</tr>
<tr>
<td>120-129</td>
<td>8.2</td>
<td>High average</td>
</tr>
<tr>
<td>110-119</td>
<td>18.1</td>
<td></td>
</tr>
<tr>
<td>100-109</td>
<td>23.5</td>
<td>Average</td>
</tr>
<tr>
<td>90-99</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>80-89</td>
<td>14.5</td>
<td>Low average</td>
</tr>
<tr>
<td>70-79</td>
<td>5.6</td>
<td>Borderline defective</td>
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</table>
### Aptitudes

<table>
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</tr>
<tr>
<td>40-49</td>
<td>2</td>
</tr>
<tr>
<td>30-39</td>
<td>103</td>
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</tbody>
</table>

**Mentally defective**

### Notes

*Source: Terman and Merrill*

The 1937 revision offers certain refinement. The new test was developed in two forms L and M starting from 2 years of age and provides materials designated as “Average adult and superior adult I, II and III.” The two sets roughly measure the same functions with an expected correlation. In the 1916 revision, there were 90 items but in 1937 revision, the number of items goes to 129 in each form. Now the test provides contact with wider range of testing for bright children. A new change has been introduced by a new method of computing the chronological age. Between ages 13 and 16 years, the CA is taken to mean 13 years plus two-thirds of the additional age, but no chronological age is assigned to exceed 16.

Krugman remarked on form of 1937 revision as: “General reaction of the clinicians was one of almost complete disappointment. Difficulties in scoring or interpretation were also reported by field workers.” This revision had the greatest impact on the field and became the most widely used and influential test of intelligence in America. The Stanford revision (1916) since then has been twice revised in 1937 and 1960 and remains one of the most popular tests of its kind.

**Mental age.** The concept of mental age was developed by Binet. It is determined by the performance of the child on the test. W. Stern suggested the idea of introducing the term intelligence quotient (IQ) and Terman introduced the concept to indicate the ratio of mental age to chronological age. Supposed a child’s chronological age is five years and he successfully completes the test items of seven years of age. His IQ will be:

\[
IQ = \frac{MA}{CA} \times 100
\]

\[
= \frac{7}{5} \times 100
\]

\[
= 140.
\]

**E. The Wechsler Scales, 1939**

The 1937 Stanford-Binet scale, in spite of its merits, was not particularly well-suited for work with adults. It was not standardized on any individual over 18 years of age in obtaining the IQ. It used the same CA as the divisor for all individuals over 16 years, instead of having separate age norms. With an increasing use of intelligence tests with adults, there was a great need for an individual test standardized and constructed for adults. The Wechsler-Bellevue scale was published in 1939 for this purpose. The scale was revised in 1955 and the new version was named as WAIS—Wechsler Adult Intelligence Test. The WAIS retains the same
format and many of the items of the original scale but was standardized in a much more careful fashion. The age ranges from 16 to 64 years.

The scale consists of the following sub-tests which fall into two broad categories: (a) verbal tests, and (b) non-verbal performance tests.

(a) The verbal test contains the following type of items:

(i) Vocabulary, a straight-forward vocabulary test.
(ii) Information.
(iii) Arithmetic.
(iv) Comprehension.
(v) Similarities.
(vi) Digit span.

(b) The non-verbal tests:
(i) Block design.
(ii) Picture arrangement.
(iii) Object assembly.
(iv) Mazes.
(v) Picture completion.

There are some differences between WAIS and Stanford-Binet.

1. WAIS is a point scale rather than a mental age scale. The items are not grouped in terms of mental age. Points are given for correct responses.

<table>
<thead>
<tr>
<th>Comparison Between Age-Scale and Point-Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binet test</td>
</tr>
<tr>
<td>1. It is multiple group, age or year, scale.</td>
</tr>
<tr>
<td>2. Selection is made by relation of success by age.</td>
</tr>
<tr>
<td>3. Test items are varied, unrelated and ungraded.</td>
</tr>
<tr>
<td>4. The test is internally standardized and inflexible.</td>
</tr>
<tr>
<td>5. All or non-adjustment.</td>
</tr>
<tr>
<td>6. It is qualitative evaluation.</td>
</tr>
<tr>
<td>7. Measurement only slightly amenable to statistical treatment</td>
</tr>
<tr>
<td>8. Tests weigh equally.</td>
</tr>
<tr>
<td>10. Measurements for different ages relatively incomparable.</td>
</tr>
</tbody>
</table>
2. Second difference is that in Stanford-Binet scale certain types of test-items are interspersed throughout the test, occurring on different age-levels. But items of like kinds are grouped together on the WAIS to form sub-tests. For example, on the Stanford-Binet test, repeating digits consists of two digits at 2½ years and increasing in difficulty found at various age levels until 9 digits are required at the superior adult level. In contrast, on the WAIS all the memory tests for digit are grouped together as one sub-test.

3. The third difference is that WAIS has separate age-norms for adults. On the SB, all individuals above the age 18 would be treated in similar manner in terms of computing IQ. Thus people of various age-levels would be treated with 18 year olds. If mental age reached a peak at this age and then remained constant, perhaps no harm would be done by this procedure. But this does not seem to be the case. Several studies have indicated some rise in mental ability at various age levels after 18.

The WAIS consists of 11 sub-tests which are grouped into two scales. The verbal scale has 6 sub-tests. The second scale, called performance scale, consists 5 tests.

14.2.1 Group Test of Intelligence

A group test is one that can be given to a number of subjects at the same time by a single examiner. Group tests and their use were made later than individual tests. The history of emergence of group tests can be traced back to the First World War when the USA was compelled to join the war. A great necessity was felt to construct and devise such measures of intelligence testing that can be given to a large number of prospective soldiers and officers for their classification for various jobs, consistent with their mental ability. The army asked the American psychologists to develop tests for classifying recruits.

One of Terman’s students, Arthur O. Otis, and his colleagues began to experiment with methods by which tests of mental ability can be given to a group of subjects. The Army Alpha and Army Beta were developed in a short period. Army Alpha is a verbal group test of intelligence and is meant for literate persons. Army Beta is a non-verbal group test of intelligence and is meant for illiterate persons. These two group tests proved remarkably successful in screening recruits. After the World War I, several psychologists devoted themselves to develop group tests of intelligence.

A. Characteristics of group tests

- All group tests have been developed on the assumption that intelligence is a general capacity and can be measured by sampling a variety of mental activities.
- In almost all group tests, the items are placed together in separate sub-tests or parts, beginning with the easier and progressing by intervals to the most difficult.
● Every group test is standardized for a special range of ages or school grades.
● Group tests are scored more rigidly and more objectively than individually administered tests.
● Most group tests impose time limits for each of the several sub-tests or parts. Some group tests are entirely non-verbal in content and others are entirely verbal.

B. Representative Non-verbal Group Tests

1. Pintner Cunningham primary mental test: This is one of the earliest and well-known group scale. It is meant for kindergarten, first and second grade of children.

2. The Chicago non-verbal examination: This is another early and well-known scale. It was designed for use from 6 years through adulthood. The types of items in the scale are similar in most respects to those in other scales.

3. The Pressey-Primer scale: This scale consists of four tests, requiring in all four the same type of response, namely, the crossing out of some superfluous member.

4. Locke-Thorndike grade: This scale is meant for grades 2 and 3. The item consists of identification of animal and human figures, classification of pictured objects shown to the child and association of similar objects shown in the pictures.

5. The Haggerty delta 1: This test is meant for grades 1 to 3. It consists of 12 exercises, out of which six are meant to give orientation to the infants and the other six are the tests.

   The Haggerty delta 2: This is designed for grades 3 to 9. It is an adaptation of the army intelligence test.

6. Dearborn intelligence scale: This scale has been designed especially for grades IV to XII. It consists of seven sub-tests.

7. The Raven progressive matrices tests: This test was developed in England. It is a widely used test which consists of geometric figures and designs. The subject apprehends relationship between figures and selects appropriate part for completion of each pattern or system of relations.

C. The Cattell Culture Free Test

Some psychologists attempted to develop group scales which may not be influenced by verbal material and form or acquired skills and experiences in the environment of different cultures. These scales have been developed with the intention of universal use in all cultures.

D. IPAT. This test is available for three levels: scale 1 for ages 4 to 8 and for mentally deficient; scale 2 from 8 to 12 years and for unselected adults; and scale 3 from the range of high school through superior adults.
Table 14.1 Comparison of Individual Test and Group Test of Intelligence

<table>
<thead>
<tr>
<th>Individual test</th>
<th>Group test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is administered to one individual at a time.</td>
<td>1. It is administered to many individuals at the same time.</td>
</tr>
<tr>
<td>2. It is costly in terms of administration and time factor.</td>
<td>2. Group test is not costly in terms of administration and time.</td>
</tr>
<tr>
<td>3. It requires a trained tester to administer.</td>
<td>3. No trained examiners are required to administer the test.</td>
</tr>
<tr>
<td>4. The examiner can study the behaviour of the individual thoroughly as there is face to face interaction.</td>
<td>4. There is no face to face interaction and behaviour of individuals cannot be studied.</td>
</tr>
<tr>
<td>5. Individual test is more reliable. We can provide guidance to the individual on the basis of his scores on individual test.</td>
<td>5. Group test may be influenced by reading ability and speed of the individual.</td>
</tr>
<tr>
<td>6. Individual test is most suitable for children who cannot read or write.</td>
<td>6. Temporary poor health, lack of motivation, poor vision may affect test scores.</td>
</tr>
<tr>
<td>7. Individual test provides qualitative performance of the individual.</td>
<td>7. They are suitable for older children and adults who can read, write and co-operate.</td>
</tr>
<tr>
<td>8. The examiner can adapt to the needs of the individual child, finding the level at which he can succeed. The examiner can motivate by means of praise and encouragement.</td>
<td>8. We examiner cannot adapt to the needs of individual students. Cheating is possible.</td>
</tr>
<tr>
<td>9. There is absence of competition in individual testing.</td>
<td>9. There is competition in group testing situation. Speed and reading ability influence the test scores.</td>
</tr>
<tr>
<td>10. There is greater informality of administration.</td>
<td>10. There is formality in administration.</td>
</tr>
<tr>
<td>11. It is possible to eliminate a lot of errors as it is not possible in group testing.</td>
<td>11. A child may become bored and spend time gazing outside.</td>
</tr>
<tr>
<td>12. Instructions are made clear before starting.</td>
<td>12. Instructions may not be understood by group of students.</td>
</tr>
</tbody>
</table>

NOTES

They are influenced by cultural environment, by schooling and to some extent by the subject test-wise.

**Constancy of IQ**

The constancy of IQ has received a great deal of attention from educational psychologists because of its usefulness in modern education. There are two opinions: one group of psychologists holds the opinion that IQ remains relatively constant over the years changing only very slowly. Another assumption which is generally sustained by majority of the psychologists is that if a determined effort is made, change in IQ can be effected. There is considerable empirical as well as theoretical evidence to indicate that such constancy is far from absolute. They put forth empirical evidences to prove their point of views.

Honzikie (1948) conducted studies to see the change of IQ over a period of years. He reported that between 6 to 18 years of age considerable change occurs in IQ; 60% of the group changed 15 or more IQ points and 9% changed 30 or more points. Dearborn (1938) also reports lack of constancy of IQ over the years in the study conducted at Harvard University.
The IQ does not remain constant over years. Fluctuation can be expected to occur for a number of reasons, ranging from the unreliability of the tests, the effects of practice or other factors operating from one test to another, differences in the content of the tests in relation to the various abilities of the testee. The latter is of particular importance when the results of the childhood tests with their emphasis on sensorimotor tasks are compared with those of later tests where the emphasis is on abstract reasoning.

Jones (1954) pointed out that correlation of IQ of infants and their IQ a few years later is typically negative. It is not until the age of 12 months that this correlation reaches 0 and then begins to become positive. It is not until the fourth year that any degree of stability in the IQ is attained.

Bayley (1955) points out, eventually, investigators ran across the hard reality that infants exhibit a very limited range of behaviour beyond sensorimotor functioning upon which to base an estimate of intellectual ability. She suggests that instead of continuing to think of intelligence as an integrated or simple capacity which grows through childhood by steady accumulation, intelligence is better seen as a dynamic succession of developing functions with the more advanced and complex functions in the hierarchy on the prior maturing of the earlier and simpler ones.

A good part of the fluctuation occurring in the IQ stems from the fact that no test is completely reliable. Thus we would expect one-third of the testees on average test to gain upon retest up to 5 IQ points and another third to lose up to 5 IQ points, another 14 per cent would lose from 5 per cent to 10 per cent points and other 2 per cent at each end would gain or lose more than 10 IQ points. These fluctuations can be expected on the basis of chance alone and have nothing whatsoever to do with any change, occurring as a result of an increased or decreased rate of intellectual growth. They simply reflect fluctuations to be expected as a result of the limitations of the measuring instruments, the carelessness of the psychometrist, and fluctuations within the testee arising from fatigue, loss of motivation distractibility and other personal factors. It is also possible that mental growth, like physical growth, goes by spurts and stops.

In addition, directional shifts in IQ may result from exposure to special environmental influences. Thus, since most IQ tests include vocabulary questions, one might raise his IQ if he were to be subjected to intensive vocabulary drill. Whether such directional shifts in IQ actually represent a shift in intelligence or just an invalidation of the norms of the test is a crucial question around which the whole controversy of the constancy of IQ revolves. To use an extreme example, coaching on the items of the test would certainly result in increased IQ but would not imply a corresponding increase in intelligence since we could hardly assume its applicability to a wide variety of situations calling for intelligent behaviour.
A significant study by Sontag (1958), on concomitant factors in IQ from infancy to 10 years, reports that twice as many boys as girls were among the top gainers in IQ while twice as many girls were in the group of greatest decline in mental growth rate. Emotional dependence upon the parents during the age from 3 to 6 was found to be detrimental to intellectual growth, many of the girls revealed what Sontag called 'slide into femininity', an adoption of the adult female role in which achievement is important only in the area of being more feminine and charming. In contrast, the child who learns to meet some of his needs through aggressive competitive problem-solving is apparently laying the ground-work for a high need for achievement which in turn, relates to an accelerated mental growth rate. The traits associated with gains in IQ included aggressiveness, self-initiation, competitiveness and interest in problem-solving, all of which are masculine traits. Of special significance is the growing belief that intellectual development can be promoted through early stimulation. The curve showed a sharp straight line increase in score from 10 to 16 years than an abrupt inflection and a slow, steady decline involving a recession by the age of 55.

These findings have been confirmed in later cross-sectional studies by Raven in 1948 and Wechsler in 1958. Psychologists are still busy in conducting studies to know the definite nature of the curve of the growth of intelligence.

The intelligence quotient (IQ) is one of the most common expressions used in mental testing which has been picked up and passed by all. The constancy of IQ is an important concept which must be used with caution. Some conclusions have been drawn by psychologists which are listed as follows:

1. A given IQ indicates the same relative ability at different ages.
2. A subject’s IQ score, ignoring errors of measurement, remains the same from one age to all other unless there is a change in ability level.
3. A given change in IQ indicates the same amount of change in relative standing regardless of the ability level of the subject.

14.2.2 Performance Tests of Intelligence

A performance test is one in which the subject has to perform something or to manipulate some concrete material without much use of the language ability. There are some categories of people and children who cannot be tested with the help of verbal tests of intelligence. Performance tests are similar to non-verbal tests of intelligence. Performance tests are useful for the following categories of children and people:

1. **Deaf and dumb:** Those children or people who cannot hear or speak, can be tested with the help of performance tests. The directions can be given in pantomime with a minimum use of language.
2. **Illiterates:** Illiterate adults and children who cannot write or whose language development is deficient may be tested with the help of performance tests of intelligence.
3. **Shy and withdrawn children**: Children who are shy or fear for face to face interaction with the tester may be tested.

4. **Educationally deficient**: Children who are educationally deficient take interest in concrete material and its manipulation can be tested.

5. **Foreign children**: Children of foreign countries who do not understand the language may be tested with performance tests.

   Generally, performance tests are used to supplement other tests of intelligence. Performance tests provide more reliable data for an individual’s capabilities. They are more useful in clinical work. These tests provide an opportunity for close observation of the behaviour of testee in test situation and his method of solving problems.

A. **Some Performance Tests**

1. **Healy-Fernald group of tests**: It was the first measuring tool to test the intelligence by performance.

2. **The Pintner-Paterson scale**: This performance scale is the first organized scale. This scale was standardized in 1917. It consists of Healy-Fernald performance tests and several other tests developed by earlier psychologists. The scale includes fifteen sub-tests. The tests are administered without the use of language either by the examiner or examinee. The tests are useful for deaf, dumb and those who lack in language ability. They have been found very valuable supplement to verbal tests of intelligence.

3. **Form boards**: There are several performance tests in which form boards are used. The Ferguson form board was developed in 1920 and revised in 1939. It consists of six form boards which increase in difficulty. These tests were standardized on children and college seniors who had some educational problems. They are currently used for children who come for clinical guidance.

4. **The Kent-Shaknow form board series**: This performance scale was developed in 1928. It is a widely used and known scale. It has two forms. One for clinical use and the other for industrial. Basically, the scale was developed and standardized on clinical population. The scale provides an insight into the analytic-synthetic and manipulative skills of the subject. It also provides close observation of the behaviour of the subject and his mode of tackling a problem.

5. **The Goodenough drawing test**: This test was developed by Florence Goodenough in 1926. It is the most widely used test to measure the intelligence of children from 3½ to 13½ years. The child is asked to draw a picture of a man as best as he can, without any time limit. ‘Draw a man’ is a very popular test of intelligence. It requires no training and no specific material for administration. It has been adopted in Indian conditions by several research workers. This test is a useful device as an adjunct to verbal tests when mental retardation in children is suspected.
B. Advantages of Performance Tests

i. Performance scales are most useful with older children and adults who are mentally retarded. They have clinical significance in case of older children.

ii. Since the performance tests do not require use of language, individuals do not ‘block’ as a result of feeling of inadequacy resulting from lack of schooling.

iii. Children proceed on performance tests with confidence, since the material is visually present in a concrete form. Performance tests provide an opportunity to observe the qualitative aspect of behaviour of the individual under standardized condition in a variety of test situations.

iv. Performance scales are useful and provide valuable information when supplemented with verbal tests of intelligence.

v. They are useful for those with language handicap.

C. Weakness of Performance Tests

1. Performance scales are more susceptible to practise effect and chance success is more frequent than in verbal tests. Hence their reliability coefficient is low.

2. They are limited in range of mental functioning tested. They fail to differentiate among above-average children.

3. The conventional performance scales fail to test fine mental abilities such as ability to make abstraction or concept formation.

D. Uses of Intelligence Tests

1. For measuring general learning readiness: We know that intelligence tests are correlated with school achievement, so intelligence tests can be used to indicate the level of capacity at which the pupil has arrived. Numerous investigations have been made to discover the relationship between intelligence tests and school marks at different levels of schooling. All researches have proved, beyond doubt, that intelligence tests can be used to measure the readiness for learning at different levels.

2. For indicating the extent of differences of IQ among the children of same chronological age: There are great differences in IQ of pupils of same age. These differences indicate the need for providing teaching materials at differing levels of difficulty. At various levels of education, we can use the tests for educational guidance, i.e., we can advise students to select subjects keeping into consideration their intellectual abilities.

3. Defining more accurately the degree of mental retardation or defect: Since the development of intelligence tests, we have been using intelligence tests to define more accurately the levels of feeble-mindedness. Using the intelligence tests we may define the level of feeblemindedness.
We can classify children weak in mind so that proper arrangement can be made for their schooling. It is intelligence test that can aid us in knowing just which children will probably remain in the special class.

4. **For identifying gifted children:** Since 1921, when Terman used both individual and group tests of intelligence to identify the gifted, intelligence tests have been used for this purpose. Tests of intelligence have given us an accurate definition of brightness in terms of IQ. Teacher’s judgement has been found inaccurate in identifying gifted children as reported by Terman, Whipple and Coy in their separate studies of gifted children.

5. **For educational and vocational guidance:** The essence of educational guidance resides in providing for all children materials for instruction both interesting in content and suitable to their level of intellectual development. When we contemplate the magnitude of individual differences, psychological testing can be very useful in ensuring that children’s educational progress is in accord with their abilities and can be helpful in discovering those children who need vocational guidance. Vocational guidance means finding the right man for the job. Tests can be used to provide vocational guidance at different age levels in various vocations. At present in our country vocational guidance is not adequately provided. It is unfortunate that we have not yet developed a system of sound vocational guidances services. We need to develop intelligence tests, interests and aptitude tests suiting to the needs of our country. The vocational guidance programme will have considerable social consequences in our country which is developing socially, economically and technologically.

For making decisions about going to college, intelligence tests can be used to predict the subsequent success of high school or inter-college students. Teachers can use intelligence tests to make decision for individual students regarding their success in college or university.

6. **For study of mental growth:** Mental abilities develop in a sequential order from birth onward. We can use intelligence tests for studying mental growth and direction of individual and group curve.

Intelligence tests have made it clear that the mental development of children is a steady consistent process from one year to the next. Use of intelligence test in consecutive measurement has thrown the old idea that there are periods of rapid mental growth at the time of adolescence followed by periods of slow growth. Mental growth continues until at least 18 years of age.
7. For homogeneous grouping: Teachers, in the past, have experienced great difficulties inherent in attempting to teach pupils or students who are widely different in their capacities to learn. In average classroom, bright and dull children are the losers. As remedy to the problems of traditional classroom, homogeneous grouping of students has been suggested and tried out in many schools of western countries with encouraging results with the help of intelligence tests.

8. Use in research: Intelligence tests are used for conducting research in different areas of human abilities.

Limitations of Intelligence Tests

We know that in India very few tests have been developed or standardized. Generally, we use tests developed in foreign countries.

An intelligence test permits a person to show what he can do at a certain time with a certain carefully selected, but small, set taken from all the possible items which test intelligence. No one should suppose that this small set can tell as much about him as if 100 times as many items were available. Nonetheless, it tells a great deal and inordinate increase in length of tests, suffer the usual consequences of the law of diminishing return. Similarly, we know that one person may be more fatigued than another when we take the test, possibly reducing his scores. They tell us what a person can do right now, handicapped or favoured as he may be by his inherent characteristics, his home and school background, better sensorimotor or bodily states. They do not tell us how he would have done if tested ten years ago or if tested ten years hence, with or without ideal conditions during those ten years. Consequently, it is always possible to second-guess such a test and conclude that it does not tell what we really want to know.

Jensen reports that he has often had cause to believe that the first intelligence tests given to certain children underestimate their IQ after 2 to 4 days of getting acquainted with such children. He typically found that a retest on a different form of the same test yielded an IQ of 8 to 10 points higher. Children may be so frightened in a testing situation with a tester they are unfamiliar with and when confronted with tasks that are completely novel that they do not exhibit nearly the intellectual capacity one would expect from other evidence about them. Particularly with young children, it would be important to spend much more time-building rapport for testing than few minutes that are sometime employed before formal testing begins.

One of the major defects of present-day testing is that it is unable to get below the surface of the mind. It measures what a child knows rather than how far he can go in the pursuit and discovery of ideas. It has almost no bearing on originality, on the mobilization of many ideas toward a single concept or on the ability to devote his attention over a period of time to a single line of thought. A
A smattering of knowledge in many fields will lead to a score equal to that of the child who could do marvellously well along certain lines, but whose accredited performance is cut off far below his mental levels. For example, a child with a 30,000 words vocabulary can scarcely get more mental credit than a child with 10,000 words vocabulary, although the differences in mental accomplishment are tremendous.

Some Misconceptions Regarding Use of Intelligence Tests in Education

The following are the misconceptions regarding the use of intelligence tests in education:

1. The first misconception is the notion that intelligence tests measure something called ‘native ability,’ something fixed and immutable within the individual that determines his level of expectation for all time. No doubt, genetic studies of identical twins reared separately under different conditions have proved that an individual inherits intellectual abilities, but intelligence tests do not measure such an entity, at least not directly. Intelligence tests measure the individual’s performance on certain type of mental tasks. The type of mental tasks included in intelligence tests are influenced by experiences in school and home. The experiences depend on many factors as the education of parents, availability of books in home, socio-economic condition and a variety of experiences the child gets in his surroundings. Thus, the notion that intelligence tests measure inherent ability is absurd.

2. The second misconception about intelligence tests is the notion that prediction made from test scores is or should be perfectly accurate.

3. The third misconception is that standardized test scores are perfectly reliable.

4. The fourth misconception regarding intelligence tests is that a battery of tests can tell all one needs to know in making a judgement about a student’s competence, present and potential, and about his effectiveness as a human being. The fact is otherwise that no test or battery of tests can give a total picture of a child. No doubt, tests can illuminate many areas of a child’s development. They can suggest something about his strengths and weaknesses. They can show in certain respects, how he stands among his peers. But there are many areas of learning where we must still rely upon the observation and judgement of teachers if we want to get a complete description of a child as functioning individual. Any evaluation of a child that depends solely on mental test scores is bound to be misleading and incomplete. There are subtle and supremely important human elements in the teaching-learning situation that no combination of tests yet devised is able to capture.
### 14.3 MEASURING APTITUDE AND INTEREST

Let us discuss the meaning and nature of aptitude.

**Meaning and nature of aptitude**

Someone’s aptitude for a particular kind of work or activity is their ability to learn it quickly and to do it well. An aptitude may be physical or mental. The innate nature of aptitude is in contrast to skills and achievement, which represent knowledge or ability that is gained through learning.

Bingham defines aptitude as “A condition symptomatic of a person’s fitness, of which one essential aspect is his readiness to acquire proficiency—his potential ability and another is his readiness to develop an interest in exercising his ability.”

**Implications of Aptitude For Teachers**

1. Aptitude includes both inborn capacity and the effects of environment on the individual.
2. Learning in any area is conditioned by the learner’s readiness to learn.
3. A specific aptitude in the form of talent may show itself early and respond readily to training in future.

**Measuring Aptitude**

An aptitude is a combination of characteristics indicative of an individual’s capacity to acquire some specific knowledge, skill or set of organized responses such as the ability to become an artist or to be a mechanic. An aptitude test may be defined as a test which measures a person’s potential ability in an activity of a specialized kind and within a restricted range. Aptitude means an individual’s aptitude for a given type of activity, the capacity to acquire proficiency under appropriate conditions, that is, his potentialities at present as revealed by his performance on selected tests have predictive value. It reveals an individual’s promise or essential teachability in a given area. Several aptitude tests have been developed by psychologists in the last fifty years. Following are some tests of aptitude in different areas:

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**Check Your Progress**

1. List the distinctive periods which witnessed the emergence of mental testing in the present form.
2. List the weaknesses of Pre-Binet Period of mental testing.
3. What are the distinguishing features of the Binet’s Scale?
4. What is the role of the Wechsler Scales, 1939 in mental testing?
5. List the main characteristics of group tests.
(1) Motor and Manual Tests

(i) Strength of grip: One of the oldest instrument to measure strength of grip was developed by Whipple. The instrument called dynamometer consists of an inner and outer handle, a dial and a pointer. The subject grips the handle and presses it hard. The strength is measured in kilograms. It is used to measure the degree of handedness and rate of fatigue.

(ii) Manual dexterity: This test has been designed to measure the hand movements in terms of speed, coordination and manual rhythm. The test consists of small metal pins or wooden pegs of different shape. The subject places them in the wholes of a tray with the help of tweezers. This test measures the accuracy with which a subject places the metal pins into holes of small diameter cut in metal and electrically connected plate. The mistakes are recorded. The test is the measure of manual dexterity of the individual.

(2) The Purdue-Pegboard Test
This test measures the gross movements of hands, fingers and arms as well as fingertips dexterity required in small assembly jobs. The material consists pins, collars and washers that are to be assembled using each hand separately and then both hands in coordination.

(3) Test of Mechanical Aptitude

The assembly test of general ability: This test was devised by J.L. Stenquist. It was the first test to measure mechanical aptitude of individuals. The material of the test consists the various parts of mechanical devices such as bicycle bell, a double action hinge, a door lock and a mouse trap. This test was designed to measure the mechanical aptitude covering the age range from children in the lower grade through adulthood. The tests developed by Stenquist have been revised and made comprehensive at the University of Minnesota and now they are known as the Minnesota Mechanical Assembly Test.

(4) Clerical Assembly Test

Clerical aptitude test is not a unitary function. The test consists several kinds of items which bear relation and are significant in clerical occupation. All the clerical tests developed so far have much in common.

(5) Detroit Clerical Aptitude Test
This test is the most comprehensive test of clerical aptitude and includes the following items:

2. Simple arithmetic.
3. Checking.
5. Knowledge of simple commercial terms.
6. Disarranged pictures.
7. Classification.
8. Alphabetical filing.

**NOTES**

(6) **Aptitude in Music**
Psychologists in order to measure aptitude in music developed tests to measure musical aptitude. The earliest of these tests was designed by Seashore Measures of ‘Musical Talents’. This test is meant for Grade 4 through college level. The test consists the following aspects of hearing:
1. Pitch discrimination.
2. Intensity of loudness discrimination.
3. Time discrimination.
4. Discrimination of timbre.
5. Judgement of rhythm.
6. Total memory.

Total scores, for the six parts of the test, are used to develop a profile of the individuals.

(7) **The Drake Musical Aptitude Test**
This test measures two aspects of musical aptitude—musical memory and rhythm. This test is used with subsets of 8 years and elders.

(8) **The Meier Art Judgement Test**
This test measures aesthetic judgement of the individual in a global manner. The material of the test consists of one hundred pairs of representational pictures in black and white. One member of each pair is a reproduction of a recognized masterpiece, while the second member has been altered from the original in an important aspect so as to make it inferior to the original. Subjects are informed as regards the alteration made (shape, angles) but they are not told which one is the original. The subject is required to indicate his preference in the pair. Meier believes that aesthetic judgement is the most significant index to talent in art and success in a career in art.

Aptitude tests have been developed almost in all areas of life as law, medicine, teaching, engineering and military services in recent years.

**Uses of Aptitude Tests**
1. **Guidance**: Aptitude tests can be used for the purpose of guidance in selecting subjects for studying in schools and colleges. They can be used for helping the individual to select the profession of his choice. The psychologist and the counsellor must supplement the results of aptitude tests with intelligence tests, school records, interview and interest tests.
2. **Selection for jobs:** The employer can use aptitude tests for selecting persons for different jobs.

3. **Admission:** Aptitude tests can be used for admission of candidates into various types of professional training as teaching, medicine, engineering, etc. Aptitude tests should be used only as one source of information in a total picture.

**14.3.1 Tests of Interest**

Tests of interest have been developed by psychologists mainly for two practical purposes: to improve vocational selection in various jobs and to provide vocational guidance for selecting appropriate vocation keeping into consideration the individual’s future success.

The most important and widely used test of interest is the Strong Vocational Interest Blank (SVIB). This test has been used in selection of vocational interest for the last forty years. The test consists of 400 items indicating various activities. The subject has to give his preference indicating like, neutral or dislike. The test takes an hour to complete for an average reader. The making scheme is the critical point in this test. A subject scores are compared, in principle, with the scores of a huge number of occupational groups: school teachers, accounts, electrical engineers and so on. Those occupational groups whom the subject most resembled were the ones in which he was interested. The reliability of SVIB is about as good as can be expected from interest tests. The validity studies of SVIB are impressive. The follow-up studies of the occupational success have been conducted and all studies report satisfactory index of validity.

**Kuder Interest Tests**

There are three forms of Kuder interest tests. These are as follows:

(a) **Vocational form:** This form measures ten interest category of individuals and is popularly known as Kuder General Interest Survey.

(b) **The occupational form:** This, like the Strong Test, is keyed against a large number of specific occupations including occupation like teaching.

(c) **The personal form:** It is just like a personality test consisting of traits considered useful in discrimination of occupations. The test consists of 100 items, each consisting of three activities to which subjects indicate by pressing a pin through the relevant holes of an answer sheet, the most liked and least liked. It is suitable for fourteen-year-olds and older ones. It measures ten important interests, as outdoor, mechanical, scientific, clinical, social science, occupational, persuasive, artistic, literary and musical. The test is very useful for counselling purposes. The studies of reliability and validity of this test indicate that the test can predict occupational success.
Aptitudes

Check Your Progress

6. What is the Meier Art Judgement Test?
7. What are the uses of aptitude tests?
8. What do you mean by tests of interest?
9. List the three forms of Kuder interest test.

14.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The emergence of mental testing in the present form is hardly seventy years old. Historical development of intelligence testing can be classified into three distinctive periods. These are as follows:
   i. Pre-Binet period
   ii. Binet period
   iii. Post-Binet period

2. These were the weaknesses of Pre-Binet Period:
   (i) The major weakness of pre-Binet period was that psychologists failed to identify the nature of intelligence. Intelligence was identified as the acuity of senses.
   (ii) Complex functions were not measurable.
   (iii) Tests were too simple and limited to measure intelligence.
   (iv) Fine mental abilities were not measured with the help of physical sensory tests.

3. Although successive revisions differed from one another and from the original Binet-Simon scale but there is a body of features that characterize all versions of the revised scales of Binet-Simon scale. Following are important features:
   First, they are scales. This means that the items and tasks are grouped on the basis of their difficulty beginning with easy items. A child’s score chiefly depends on how far up this ladder he can go rather than how fast or fluent he is.
   The second feature of the revised Binet’s scales is that they yield a general global measure of intelligence rather than an analysis of separate special abilities.
   The third is that they are grouped by age-levels and measure mental growth of the subject.
The fourth characteristic is that they are given individually by a skilled examiner and requires high standard of proficiency, and finally, the system of scoring in all Binet’s tests is tied to the age norms.

4. With an increasing use of intelligence tests with adults, there was a great need for an individual test standardized and constructed for adults. The Wechsler-Bellevue scale was published in 1939 for this purpose. The scale was revised in 1955 and the new version was named as WAIS—Wechsler Adult Intelligence Test. The WAIS retains the same format and many of the items of the original scale but was standardized in a much more careful fashion. The age ranges from 16 to 64 years.

5. The main characteristics of group tests are:
   - All group tests have been developed on the assumption that intelligence is a general capacity and can be measured by sampling a variety of mental activities.
   - In almost all group tests, the items are placed together in separate sub-tests or parts, beginning with the easier and progressing by intervals to the most difficult.
   - Every group test is standardized for a special range of ages or school grades.
   - Group tests are scored more rigidly and more objectively than individually administered tests.
   - Most group tests impose time limits for each of the several sub-tests or parts. Some group tests are entirely non-verbal in content and others are entirely verbal.

6. The Meier Art Judgement test measures aesthetic judgement of the individual in a global manner. The material of the test consists of one hundred pairs of representational pictures in black and white. One member of each pair is a reproduction of a recognized masterpiece, while the second member has been altered from the original in an important aspect so as to make it inferior to the original. Subjects are informed as regards the alteration made (shape, angles) but they are not told which one is the original.

7. Some uses of aptitude test are:
   - Guidance: Aptitude tests can be used for the purpose of guidance in selecting subjects for studying in schools and colleges. They can be used for helping the individual to select the profession of his choice.
   - Selection for jobs: The employer can use aptitude tests for selecting persons for different jobs.
   - Admission: Aptitude tests can be used for admission of candidates into various types of professional training as teaching, medicine,
Aptitudes

8. Tests of interest have been developed by psychologists mainly for two practical purposes: to improve vocational selection in various jobs and to provide vocational guidance for selecting appropriate vocation keeping into consideration the individual’s future success.

The most important and widely used test of interest is the Strong Vocational Interest Blank (SVIB). This test has been used in selection of vocational interest for the last forty years. The test consists of 400 items indicating various activities.

9. There are three forms of Kuder interest tests: These are as follows:
   (a) Vocational form: This form measures ten interest category of individuals and is popularly known as Kuder General Interest Survey.
   (b) The occupational form: This, like the Strong Test, is keyed against a large number of specific occupations including occupation like teaching.
   (c) The personal form: It is just like a personality test consisting of traits considered useful in discrimination of occupations. The test consists of 100 items, each consisting of three activities to which subjects indicate by pressing a pin through the relevant holes of an answer sheet, the most liked and least liked. It is suitable for fourteen-year-olds and older ones. The studies of reliability and validity of this test indicate that the test can predict occupational success.

14.5 SUMMARY

- Mental measurement did not really get underway until the turn of the present century. The measurement started with psycho-physics. In the 19th century, there was a good deal of interest in the field of psycho-physics, in which attempts were made to develop general rules of sensory judgement.

- Sir Francis Galton was the first psychologist who devoted his time to study whether individual characteristics are inherited. He took great interest in individual differences. He studied the lives of prominent Englishmen and in his book *Hereditary Genius*, he demonstrated that personal characteristics are inherited.

- James McKeen Cattell, an American psychologist, studied in Europe and brought many of Galton’s ideas back to USA with him. Cattell believed, as did Galton, that intellectual functions can best be measured through tests of reaction-time and sensory discrimination.
• In addition to evaluating more complex mental phenomena, Binet and Simon decided upon a novel way of arranging or grouping their test items which was of great practical importance. In giving their tests to children of different ages, they were able to categorize the test items in terms of the age-level where they seemed most appropriate.

• The defects of the first scale were identified and removed in the revised scale of 1908. The scale was revised on more representative sample of children. The items have been grouped at the appropriate age levels from 3 to 13 years.

• The 1908 revision created interest among psychologists of the USA, England and Switzerland. They adopted the scale in their countries and gave valuable suggestions for the improvement of the scale. Binet incorporated the suggestions in the revised scale of 1911.

• L.M. Terman of Stanford University revised and refined the original Binet-Simon scale in America according to the needs of American culture in 1916. This revision had the greatest impact on the field of testing and became most widely used and influential test of intelligence in America.

• A group test is one that can be given to a number of subjects at the same time by a single examiner. Group tests and their use were made later than individual tests. The history of emergence of group tests can be traced back to the First World War when the USA was compelled to join the war.

• The IQ does not remain constant over years. Fluctuation can be expected to occur for a number of reasons, ranging from the unreliability of the tests, the effects of practice or other factors operating from one test to another, differences in the content of the tests in relation to the various abilities of the testee.

• A significant study by Sontag, on concomitant factors in IQ from infancy to 10 years, reports that twice as many boys as girls were among the top gainers in IQ while twice as many girls were in the group of greatest decline in mental growth rate.

• The intelligence quotient (IQ) is one of the most common expressions used in mental testing which has been picked up and passed by all. The constancy of IQ is an important concept which must be used with caution.

• Generally, performance tests are used to supplement other tests of intelligence. Performance tests provide more reliable data for an individual’s capabilities. They are more useful in clinical work.

• Performance scales are most useful with older children and adults who are mentally retarded. They have clinical significance in case of older children.

• One of the major defects of present-day testing is that, it is unable to get below the surface of the mind. It measures what a child knows rather than
how far he can go in the pursuit and discovery of ideas. It has almost no bearing on originality, on the mobilization of many ideas toward a single concept or on the ability to devote his attention over a period of time to a single line of thought.

- Bingham defines aptitude as “A condition symptomatic of a person’s fitness, of which one essential aspect is his readiness to acquire proficiency—his potential ability and another is his readiness to develop an interest in exercising his ability.”

- An aptitude is a combination of characteristics indicative of an individual’s capacity to acquire some specific knowledge, skill or set of organized responses such as the ability to become an artist or to be a mechanic. An aptitude test may be defined as a test which measures a person’s potential ability in an activity of a specialized kind and within a restricted range.

- One of the oldest instrument to measure strength of grip was developed by Whipple. The instrument called dynamometer consists of an inner and outer handle, a dial and a pointer. The subject grips the handle and presses it hard. The strength is measured in kilograms. It is used to measure the degree of handedness and rate of fatigue.

- Clerical aptitude test is not a unitary function. The test consists several kinds of items which bear relation and are significant in clerical occupation. All the clerical tests developed so far have much in common.

- Aptitude tests can be used for the purpose of guidance in selecting subjects for studying in schools and colleges. They can be used for helping the individual to select the profession of his choice.

- Tests of interest have been developed by psychologists mainly for two practical purposes: to improve vocational selection in various jobs and to provide vocational guidance for selecting appropriate vocation keeping into consideration the individual’s future success.

### 14.6 KEY WORDS

- **The Pressey-Primer scale**: It is the primary classification test by L.W. Pressey.

- **The Cattell Culture Free Test**: The Culture Free Test, a perceptual test, was published by Raymond B. Cattell in 1949 and 1950. It consists of three levels of test.

- **The Goodenough drawing test**: This test was developed by Florence Goodenough in 1926. It is the most widely used test to measure the intelligence of children from 3½ to 13½ years.
• The Purdue Pegboard Test: This is a neuropsychological test. The test involves two different abilities: gross movements of arms, hands, and fingers, and fine motor extremity, also called “fingerprint” dexterity. Poor Pegboard performance is a sign of deficits in complex, visually guided, or coordinated movements that are likely mediated by circuits involving the basal ganglia.

14.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions
1. Write a short note on the emergence of mental testing in pre-Binet period.
2. Discuss the role of Sir Francis Galton in developing a series of tests to measure human characteristics.
3. Discuss the contribution of Binet and Simon in evaluating complex mental phenomenon.
4. Write a brief note on Stanford Revision of Binet’s Scale.
5. List the main differences between WAIS and Stanford-Binet.
6. Discuss the characteristics of group tests.
7. Write a brief note on constancy of IQ.
8. List some of the performance tests and their efficacy.
9. Write a brief note on limitations of intelligence test.
10. What is the significance of Kuder interest test?

Long Answer Questions
1. Discuss the historical development of intelligence testing.
2. “The 1937 Stanford-Binet scale was not particularly well-suited for work with adults.” Analyse this statement.
3. Write a comprehensive note on non-verbal group tests.
4. Discuss the various studies conducted by psychologists and scientists to see the change of IQ over a period of years.
5. Analyse the main uses of performance test.
6. Discuss in detail the misconceptions regarding the use of intelligence tests in education.
7. Analyse the application of test of mechanical aptitude by Stenquist.
8. Write a comprehensive analysis on the uses of aptitude test.
14.8 FURTHER READINGS

