Psychology

I PUC - Text book

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Director's Message

Dear Students,

We at the Department of Pre-university Education, Karnataka strive to empower each student to dream big and equip them with the tools that enable them to reach new heights and successfully deal with the challenges of life. As Swami Vivekananda said, "**Real education is that which enables one to stand on one's own legs**".

The course contents in this book are designed with the objective of equipping you well for the next level of study.

We wish you well on your journey and look forward to you becoming a responsible citizen of the nation and give back to the betterment of the society.

With best wishes,

Sd/-
C. Shikha, IAS
Director
Department of Pre University Education
Bengaluru

FORE WORD

The purpose of writing this text book is aimed at filling the gap between school learning and living in society. The syllabi and text book attempt to discourage learning without understanding. In writing this text book measures have been taken to suit student-centered system of education as directed by the Pre-University Board, Karnataka. The text book attempts to give scope for students to contemplate and discuss in small groups. Activities are suggested to enhance personal participation in understanding some of the important concepts.

We thank the Director, Dept. PUE, for giving an opportunity for PU Teachers to frame syllabus and wirte the text book.

We thank the principals of various colleges for enabling teachers to attend the periodic meeting for the discussion of various topics to be included, books to be referred and to pool all the materials required in writing the text book.

We also thank the efforts put forth by syllabus approval committee in giving relevant suggestions. Our special thanks to textbook approval committee for their valuable suggestions. Pre-University Board welcomes comments and suggestions to enable the text book committee members to implement the same in further revision and refinement.

Place: Bangalore
Date: 2013.

Chairperson
Pre-University Board

PREFACE

Psychology has emerged as a scientific discipline in the last 135 years. It has a long history and a short past. Human nature has interested both philosophers and psychologists. Recently scientific study of human behavior has attracted many scientists' attention. At present, researches are going on in many areas of psychology with the common focus on understanding human behavior.

The first goal of this book is to make psychology accessible to pre-university students by making it simple and interesting to student population. At the same time the richness and excitement of the theories and empirical findings have been preserved. Best attempts have been made to maintain the interest of students in understanding the subject matter and also apply their knowledge acquired, to everyday lives.

Psychology is a dynamic area with a promising future. This book initiates students to join in the journey of understanding psychology, explore the questions it addresses, and learn about the possible answers to these questions.

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Note to the Teachers

This text book aims to provide enough opportunity for teachers to use interactive approach to make students actively participate and to sustain their curiosity and exploration. Hence, teaching - learning process will be more enjoyable than ever before. Teachers are requested to use strategies such as story telling suiting to our culture, class room discussions, analogies, role play and problem solving situations. We appeal the teachers to encourage students to relate knowledge gained in the class room to their individual life situations. Students can be asked to give examples concerning their physical, social, political and economic environments. In this process, teachers are required to make the students reflect on the application of knowledge of psychology to their personal lives. Teachers are requested to see that students maintain flowcharts of their learning throughout the academic year. This can tap the best potential of the students and can lead to the selection of their career in the field of psychology. Teachers are required to inculcate scientific temper in their students by adopting scientific approach in their explanation and training. Teachers are required to pay attention to objectives, illustrations, tables and activities to facilitate students in better understanding of the concepts. They are also required to sum-up the chapter-end review questions in such a way that the students develop the skill in thinking out of the box.

Note for the students

The goal of this book is to help you to understand psychology. This discipline focuses on enhancing your self-understanding and of understanding others. The best part of studying psychology is its possibility of understanding practical applications in day-to-day life. To do this you need to be an active participant in classroom activities. You must make it a point to focus on learning the objectives, contents and answer the questions by using critical thinking. You need to sincerely focus on the activities in team building and group think. Psychology helps you to become more observant of people who are high achievers and also show concern towards people who have problems in achieving and working towards a goal. You can become a catalyst in helping them to change their attitude for the better.

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CHAPTER I

INTRODUCTION TO PSYCHOLOGY

Meaning:-

Man by nature is curious. He has always wondered why one behaves the way one does. He has often asked questions like – Why does one behave differently from others? What makes one person a criminal and the other a saint? What motivates one to work? What does it take to survive and face competition? How can one learn to handle relationships better? The answers to these are explored by **Psychology,** which attempts to assess behaviour in a scientific manner. Every person who is fascinated by such questions would get answers through **Psychology** in a systematic and objective manner.

These questions can be answered if one enters the world of psychology. This discipline explores the studies on human behaviour, which is full of complexities and contradictions. It studies people, who are brave, wise, intelligent, cowardly, silly and stupid. Psychologists objective is to examine and explain how human beings and animals learn, remember, solve problems, perceive, feel and interact with others. They study every aspect of human behaviour.

When people hear the word **"Psychology"**, they tend to misconceive. They think that mental disorders and abnormal behaviour are the subject matters of psychology. But this is not true. Psychologists do not confine themselves to the study of these extremes of behaviour. They focus on experiences that are common, universal and ordinary. They emphasize on studying experiences like learning, remembering a shopping list, the meaning of dreams, what motivates a person to act and why a person is impelled to acts of violence. **Psychology** also studies cognition, perception, learning, memory, problem solving, decision making and emotion. **Psychology** studies the different factors that influence our behaviour, be it physiological, social or cultural. A knowledge of psychology would equip one with the basic skills of understanding of one's own as well as other's behaviour. It is the study of common man and his behaviour.

Physiological reactions are reactions of the body to different stimuli. These are closely related to our emotions. During certain emotions, there is an increase in the heart rate and blood pressure. The pupils dilate and secretions of the stomach are disturbed. All these phenomena are of great interest to scientific psychologists. Social psychology studies about social relationships we exhibit in our interactions with other people.

Psychology is known to touch every dimension of our lives. In a complex society, psychology has a significant role in solving human problems. The innumerable varieties of problems that psychologists face are both specific and practical in nature. The best treatment for drug addiction, the use of a survey method to measure public opinions, how one can be persuaded to give up, for example, smoking, are studied by psychologists.

On a broader perspective, psychologists study the child rearing methods that produce happy adults, causes of abnormal behaviour, the methods and processes adopted to eliminate race prejudice, and the type of family and social conditions that contribute to aggression and crime. Psychologists work in co-ordination with other experts on these and many more problems.

Psychology has emerged from two major sources, i.e., Philosophy and Science. Ideas about acquisition of new knowledge and the mind-body relations from philosophy on one hand, and progress in scientific field on the other, have combined to create an environment in which the idea of scientific study of behaviour emerged.

Since psychology deals with various aspects of our lives, it is important even for those who do not intend to specialize in the field to know something about its basic facts and methods. An introductory course in psychology should give the individual, a better understanding of why people behave as they do and provide insights into their attitudes and reactions. The main role of psychology is to educate people to learn and think critically; training workers to be more efficient and productive. The psychologists want people to appreciate diversity in human nature and behaviour.

The journey through the field of psychology begins with its definitions.

Derivation of the term and literal meaning :

Psychology is a recent science, when compared to other scientific disciplines. There has been a virtual explosion in psychological research. As a result , psychological theories and concepts have been evolving and changing continuously over a period of time.

There is no single definition of psychology. The multitude of definitions can be attributed to the relatively short history that psychology has and its fast evolving concepts.

1. Study of Soul:

Psychology is derived from two Greek words, “Psyche” meaning “soul” and “Logos” meaning “study”. Accordingly psychology was defined as the ‘study of the soul.’ This definition was one of the oldest and was proposed by Aristotle.

The existence of the soul could not be proved. It was considered as a non material entity that is independent of the body. Hence it was not considered a fit object for study.

2. Study of Mind:

Psychology was then defined as the 'study of mind', a definition that appeared better than the one that said psychology was the study of soul.

Psychologists believed that all they knew of their fellow beings was through their actions, and overt behaviour. They did not know whether the mysterious entity called the mind was behind this activity. Any way there was no meaning in studying it when behaviour could provide us with all that we wanted to know about an individual.

3. Study of Consciousness

Consciousness is defined as awareness of our environment and our mental processes.

Towards the end of the nineteenth century, a group of psychologists under the leadership of **Wilhelm Wundt** defined psychology as the study of "consciousness". He established the first psychology laboratory at **Leipzig** in the year **1879**. He emphasized the fact that man is endowed with consciousness, that is, awareness of his surroundings and of himself.

Wilhelm Wundt

This definition was found to be inadequate because conscious experience is 'subjective' in nature. Each person may have a direct knowledge of the events going on in his consciousness, but other people have no access to it.

4. Study of Behaviour:

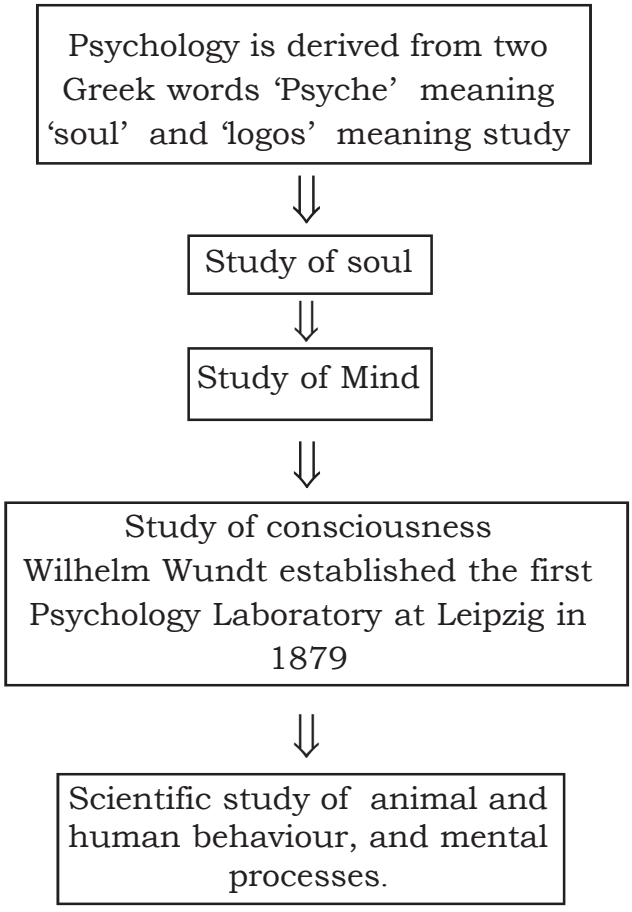
Psychology as the study of mental life, the mind or consciousness came under attack as vague and unscientific.

Between the 1920s and 1950s, psychologists preferred to define their discipline as the study of behaviour as what people do, unlike what they think or feel can be directly observed and measured. Hence psychology was defined as the scientific study of behaviour. Psychologists use the term behaviour to refer to the actions of a person or animal that can be observed and measured by others. Examples of behaviour could range from an infant trying to babble, a child working out on a task, an adult engrossed in an activity to a rat running through a maze. In addition, it also studies how the behaviour is affected by an organism's physical and mental state and external environment. Its subject matter also includes behavioural processes that are observable, such as gestures and speech. Its focus is on the thoughts, feelings and actions of people. It assesses an individual's perception, reasoning process, memory and also the biological activities that maintain bodily functions. Further, the broad perspective of psychology attempts to describe, predict and explain human behaviour. It also helps to change and improve the lives of people and the world in which they live.

Modern Definition–understanding mental process and behaviour:

Cognitive psychology is the Psychological perspective that is primarily concerned with the mental processes or cognition. Cognition is a broad term that refers to the ways we process or transform information about the world around us. Cognition includes the mental processes of thinking, knowing, perceiving, attending, remembering and the like.

Watson launched in 1913 what is known today as "behaviourism", a philosophy of psychological study which holds that only observable behaviour is the proper subject for Psychological investigation.



Schematic representation of definitions of psychology

Psychology as social and natural science:

Psychology deals with human interaction. The interaction may be person to person, person to group, group to person, and group to group. Psychology is interested in how people are influenced by each other. Psychology deals with heredity, environment, nervous system and glands in relation to behaviour. Hence psychology can be referred to as social and natural science.

Some important milestones in the evolution of Psychology:-

1879 **Wilhelm Wundt** establishes the **first psychology laboratory in Leipzig**. Germany.

1890 William James publishes Principles of Psychology.

1895 Functionalism is formulated as a system of psychology.

1900 **Sigmund Freud** develops **Psychoanalysis**.

1904 **Ivan Pavlov** wins the Nobel Prize for his work on **digestive system** that led to understanding of principles of development responses.

1905 **Intelligence test** developed by **Binet and Simon.**

1916 First Psychology Department at **Kolkatta University** is established.

1920 **Gestalt psychology** is born in Germany.

1922 Psychology is included in **Indian Science Congress Association**.

1924 **Indian Psychological Association** is founded.

1924 **John B. Watson** publishes '**Behaviourism'** a book that led to the foundation of behaviourism.

1928 **N.N. Sengupta and Radhakamal Mukerjee** publish the first text book on **Social Psychology** (London : Allen & Unwin).

1949 **Psychological Research Wing of the Defence Science Organisation of India** is established.

1951 **Humanistic psychologist Carl Rogers** publishes **Client-Centred Therapy.**

1953 **B.F. Skinner** publishes **'Science and Human Behaviour'** strengthening behaviourism as a major approach to psychology.

1954 Humanistic psychologist **Abraham Maslow** publishes **'Motivation and Personality'.**

1954 **Bureau of Psychology** is established at **Allahabad.**

1955 **National Institute of Mental Health and Neurosciences (NIMHANS)** is established at **Bangalore.**

1962 **Hospital for Mental Diseases in Ranchi** is established.

1973 **Kanrad Larenz and Niko Tinbergen** win the Nobel Prize for their work on **built-in species specific animal behaviour patterns that emerge without any prior experience / learning.**

1978 **Herbert Simon** wins the Nobel Prize for work on **decision making**

1981 **David Hubel and Torsten Wiesel** win the Nobel prize for their research on **vision cells in the brain.**

1981 **Roger Sperry** wins the Nobel Prize for **split brain research.**

1989 **National Academy of Psychology (NAOP) India** was founded.

1997 **National Brain Research Centre (NBRC)** is established at **Gurgaon, Haryana.**

2002 **Daniel Kahneman** wins the Nobel Prize for research on '**human judgment and decision making under uncertainty'.**

2005 **Thomas Schelling** wins the Nobel Prize for his work in **applying Game Theory to understanding of conflict and co-operation in economic behaviour.**

2011 **Karl Halvar, Teigen** of the University of OSLO, Norway won the Nobel prize **"for trying to understand why, in everyday life, people sigh".**

2012 **Anita Eerland, Rolf zwaan, and Tulio Guadalupe** won the Nobel prize for their study **"leaning to the left makes the Eiffel Tower seem smaller".**

NIMHANS

Development of Psychology in India

- The university of Kolkatta was first to introduce psychology in the year 1905.
- The Indian Psychological association (IPA) was founded in 1925 and launched the Indian Journal of Psychology.
- In 1940, the Lumbini Park Mental Hospital was founded at Kolkatta.
- In 1945, a Psychology wing of defense research was established. It became part of the Defense Science organization in India in 1949.
- 1955, The National Institute of Mental Health and Neurosciences (NIMHANS) was opened at Bangalore.
- In 1962, The Indian academy of applied Psychology (IAAP) was established.
- In 1962, A Mental Hospital was established at Ranchi.
- In 1968, The Indian Association of clinical psychologists was formed
- In 1989, the National Academy of Psychology (NAOP) was founded.

In recent years, Psychology has greatly expanded in scope. Attention is being paid to issues affecting society at large, such as poverty, prejudice and discrimination, socialization and morality. It is also interested in organizational development, gender related problems, leadership style, suffering and healing, health and wellbeing.

Fields of Psychology:

Various fields of specialization in Psychology have emerged over the years. Following are some of the important fields.

1. General Psychology:-

It is concerned with the general principles of human behaviour. It deals with the fundamental ideas and theories of human behaviour. It studies the activities of man such as, attention, perception, drives and motives, emotions, intelligence, learning and remembering, forgetfulness and reasoning. It establishes laws and principles that can be universally applied. Its aim is to discover general principles concerning the working

of the human mind, which are true of all human beings, irrespective of the race, culture or the country to which they belong. General Psychology enjoys the status of being the basis for all other branches of psychology.

2. Developmental Psychology:

This field deals with how people grow and change throughout their lives, right from prenatal stage through childhood, adolescence, adulthood to old age. Developmental psychologists work in a variety of settings like colleges, schools, healthcare settings or business, government and nonprofit agencies. They are also involved in studying disturbed children and in advising parents about helping such children. A great deal of researches are going on in the field of adolescence and its associated problems, the best stage in one's life, that is, adulthood ; and the problems associated with old age like Alzheimer's and Parkinson's diseases. Many researches aim either at preventing these diseases or managing the same, when people are afflicted by these diseases.

3. Social Psychology:-

Social psychology studies the way about how an individual becomes the member of a social group, his socialization processes, inter group and intra group relations. The Psychological aspect of social psychology concerns the person's perception, attitude, emotions and behaviour. The social part concerns the person's group, culture, relationships and their influence on the person's behaviour. Significant research has been done in the fields of the power of roles, attitudes, obedience and

conformity, group decisions, co-operation and competition. The findings from these studies are used to explain forces that divide people, such as prejudices, conflict and war, as well as those that unite people, such as co-operation, altruism and peace. It also studies the effect of social and cultural factors on personal development. Study of Public opinion, propaganda, attitude change, prejudices, social motives, mass and crowd behaviour come under the purview of social psychology. Our behaviour is not the result of just our personality and predispositions. Social and environmental factors, affect the way we think, say and do.

4. Abnormal Psychology:-

It is the study of those persons, whose behaviour is strikingly different from that of normal persons. These abnormal persons exhibit certain symptoms, like acute fear, uncomfortable ideas, lapses in memory, delusions and hallucinations, distortions in thinking, together with incoherent and irrelevant speech. Unconventional behaviour, following the consumption of excess alcohol, addiction to drugs can be studied here. The three major classifications of disease in abnormal psychology are:

(i) Psychoneurosis

(ii) Psychoses &

(iii) Psychophysiological.

Psychoneurosis (neuroses)

This condition refers to disorders where the person develops behaviour patterns that do not help him to cope with problems. He feels inadequate to deal with many every day problems, for example, phobia. This is a condition where a person experiences excessive fears towards objects in the absence of real danger. Sometimes, these fears are out of proportion to the amount of danger that a situation can pose.

Psychoses

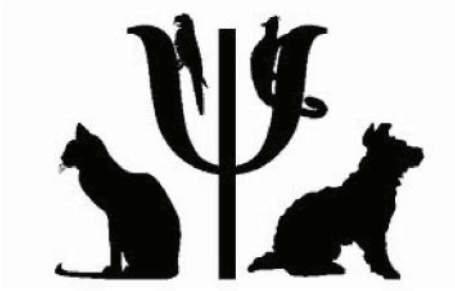
This is a condition where there is serious impairment in mental functioning which interferes with the individual's capacity to cope with daily life. Reality is distorted that may take the form of delusions and hallucinations, for example: Schizophrenia.

Psychophysiological disorders (Psychosomatic)

These are physical illnesses, where psychological factors play a major role. Psychological stress is the causative factor : For example: Ulcers, asthma, migraine headaches, high blood pressure and skin eruptions are related to emotional stress.

Abnormal psychology deals with the causes leading to these disorders, their symptoms, classification, diagnosis, treatment and cure of patients' problems.

5. Animal Psychology



It is the study of behaviour of animals. Just as there has been an evolution of organic structure, there has also been a corresponding parallel evolution of mental processes. It means that mental processes of animals are simpler than those of man and should be easier to understand also. In animal psychology an attempt is made to study the progressive changes that have taken place in the evolution of animal behaviour. Some investigators have made a comparative study of animal and human behaviour. Another reason for the interest in animal psychology is our capacity to control conditions and conduct experiments on animals. In order to understand human behaviour, animal behaviour has to be understood. The similarity of structures between the two makes us infer that there is a similarity in functions also. Studies on learning, reasoning, emotions, drives, localization of cerebral functions are made on animals and the theories and principles arrived at are applied to human beings. The results obtained from animals are simple, direct, dependable, and unaffected by cultural factors. Investigators wish to examine the relative contributions of heredity and environment. One way to gain some insights into the role of heredity is to study how a given trait is passed on over several generations. While some generations of rats can be studied in a few years, the long life span of humans makes such research difficult. The shorter life span of animals allows researchers to learn about the effects of aging, in a much more quicker time-frame than if they studied aging using human beings. In the event of studies

requiring large number of participants, who share similar backgrounds or who have been exposed to particular environment, animals have been very useful. These studies involve no harm or discomfort to the animals.

6. Clinical Psychology

It is now the largest field of specialization . The Principles and theories of abnormal psychology is applied in the diagnosis and treatment of emotional and behaviour problems such as mental disorders, mental

retardation, delinquency, alcoholism and drug addiction. Clinical psychology deals with the study of causes of abnormality. Psychological disorders arise from a person's unresolved conflicts and unconscious motives. Some psychologists maintain that a few of these patterns are merely learned responses, which can be unlearned with training. Other psychologists believe that there are biological bases to certain psychological disorder. These different views have yielded a variety of different treatments.

A clinical psychologist with an advanced specialization in psychology provides therapy to people suffering from psychological difficulties. There are differences in what psychiatrists and clinical psychologists do. Psychiatrists treat severe mental disorders. They tend to be medically oriented, because they have been trained to diagnose physical problems that can cause mental stress. Most important is, psychiatrist can write prescription and psychologist cannot.

The psychiatrist will prescribe an anti-depressant drug in addition to other kinds of treatment for a depressed patient. A psychologist takes a psychological approach such as helping the person to think differently about his or her problems and encouraging behaviour that raises self esteem. The psychologist's functions are 1) to facilitate diagnosis by administering psychological tests and interpreting the findings 2) to engage in psychotherapy and 3) to perform psychological research on problems of a clinical nature.

7. Educational Psychology

Educational Psychology applies psychological discoveries of teaching to the problems of the class room. The analysis of the process of learning

and of attention have been of great assistance to teachers. In the field of learning, the psychologists have contributed by giving the general laws of learning, the methods to improve memory and knowledge of the causes of forgetting. It involves the study of educational problems related to education, measurement of achievement, improvement of teaching techniques, exceptional children under achievers, student – teacher relations, emotional, intellectual and adjustment problems of students. Its primary concern is educational guidance. Educational psychologists are concerned with classroom motivation, transfer of learning, remembering methods to make learning more effective and permanent. Other major contributions are the introduction of rewards and punishments, feed backs, reinforcements, verbal and non verbal incentives. Problems of the child, both inside and outside the class room are solved by 'school psychologists' in consultation with teachers

and parents. It also studies the effect of personality and behaviour of on the pupils. Some specialists are associated with teaching methods, educational devices and programmed instructions. Some others are concerned with the development of imagination, creative thinking and problem solving ability in students. Still others focus on remedial procedures to be used with retarded or emotionally disturbed pupils.

8. Industrial Psychology

It studies the behaviour of men at work, the problems they face and how they can be solved. The first application of psychology to problems

in industries and organizations was the use of intelligence and aptitude tests in selecting employees. This has enabled the organizations to apply psychology to management and employee training, supervision of personnel to improve communication within the organization, to counselling employees and prevent industrial strike. They are also concerned with group decision making, employee morale, work motivation, job stress, equipment design, productivity, personnel selection, marketing strategies, accident prevention and many other issues. Some psychologists have successfully solved problems connected with the working hours, rest and productivity in industries. Variety of other problems include absenteeism, industrial unrest, incentive system, training programmes and human relation in industries. Psychologists have been of considerable help in the matter of recruitment, improvement of working conditions, elimination of fatigue, monotony, advertising and the general toningup of the morale of the workers. Today, the realization

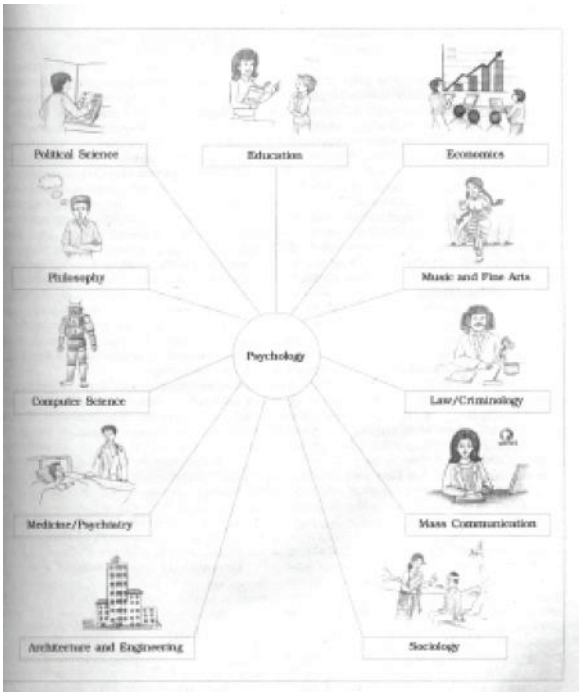
that the employees are more important than machines, has laid emphasis on human relations. Having in mind, the human need and capacity, psychologists ensure maximum ease in operation of equipments by consulting designers. Industrial psychologists have organizations which device descriptions of what people are expected to do at their jobs. This is known as job analysis.

Emerging areas in Psychology

The interdisciplinary focus on research and application of psychology has led to the emergence of varied areas like aviation psychology, space psychology, military psychology, forensic psychology, rural psychology, psychology of women and political psychology, engineering psychology, managerial psychology, community psychology to name a few.

Psychology and other disciplines

Researchers and scholars in science, social science and humanities have felt the significance of psychology as a discipline. The figure clearly shows the relationship of psychology with other disciplines.



In studying brain and behaviour, psychology shares its knowledge with neurology, physiology, biology, medicine and computer science. In studying human behaviour (its meaning, growth and development) in a socio-cultural context, psychology shares its meaning, growth and development) in a socio-cultural context, psychology shares its knowledge with anthropology, sociology, social work, political science and economics. In studying mental activities involved in creation of literary texts, music and drama, psychology shares its knowledge with literature, art and music. Some of the major disciplines linked to the field of psychology are discussed below:

Philosophy:

Until the end of the 19th century, certain concerns that are now part of contemporary psychology such as, what is the nature of the mind 'or how do humans come to know their motivations and emotions' were the concerns of philosophers. In the later part of the 19th century, Wundt and other psychologists adopted an experimental approach to these questions and contemporary psychology emerged. Despite the emergence of psychology as a science, it greatly draws from philosophy, particularly with respect to methods of knowing, and various domains of human nature.

Medicine / Psychiatry

Doctors have realized that the maxim, 'healthy body requires a healthy mind,' is actually true. A large number of hospitals now employ psychologists. The role of psychologists in preventing people from engaging in health hazardous behaviours and in adhering in the prescribed doctors' regimen are some of the important areas where the two disciplines have come together. While treating patients suffering from cancer, AIDS, and the physically challenged, or handling patients in the Intensive Care Unit, and patients during post operative care, doctors have also felt the need for psychological counseling. A successful doctor looks at the psychological as well as physical well-being of the patients.

Economics, Political Science and Sociology:

As sister social science disciplines these three have drawn considerably from psychology and have enriched it as well. Psychology has contributed a great deal to the study of micro-level economic behaviour particularly in understanding consumer behaviour, savings behaviour and in decision making. American economists have used data on consumer sentiments to predict economic growth. Three scholars who have worked on such problems have received the Nobel Prize in Economics, namely H Simon. D, Kahneman and T. Schelling. Like economics, political science too draws considerably from psychology, particularly, in understanding issues related to exercise of power and authority , nature of political conflicts and their resolutions, and voting behaviour. Sociology and psychology come together to explain and understand the behaviour individual within different socio cultural contexts. Issues related to socialization, group and collective behaviour and intergroup conflicts gain from both these disciplines.

Computer Science:

From the very beginning the effort of computer science has been in mimicking the human mind. One can see it in terms of how a 'computer' is structured, its memory organized, sequential and simultaneous (read parallel) processing of information. Computer scientists and engineers are seeking to make computers not only more and more intelligent but also machines which can sense and feel. Developments in both these disciplines have brought about significant advancement in the field of cognitive sciences.

Law and Criminology:- A skilled lawyer and a criminologist requires knowledge of psychology in answering such questions as, How well a witness remembers an accident, a street fight, or a murder? How well can s/ he report such facts when taking the witness stand in the court? What factors influence the decision which is taken by the jury? What are the dependable signs of guilt and falsehood? What factors are held important in holding a culprit responsible for her/his action? What degree of punishment is considered just for a criminal act? Psychologists seek to answer these questions. Currently, a number of psychologists

are involved in research on such issues, the answers to which would help the legal system of the country in the future.

Psychologists in different professional fields:-

Educational and School Psychology:

Educational psychologists are concerned with all aspects of education. These include the study of motivation, intelligence, personality, use of rewards and punishments, size of the class, expectations of the teacher. They are concerned with designing tests to evaluate student performance. They help in designing the curriculum to make learning more interesting and enjoyable to children.

Educational psychology is used in elementary and secondary schools, in planning and supervising special education, in training teachers, in counseling students with problems, in assessing students with learning difficulties due to poor reading and writing skills and poor concentration.

Treatment of Abnormal behaviour:

This field of study deals with diagnosis and treatment of abnormal behaviour. Clinical psychologists are employed in hospitals, clinics and private practice. They often work closely with two other specialists namely social workers and psychiatrists in the field of mental health – the psychotherapy. Psychiatrists first earn a M.D. after completing a medical degree. Then they receive specific training in the treatment of psychological disorders. They can prescribe drugs that clinical psychologists cannot. Some psychiatrists go onto become psychoanalysts. They practice the form of therapy originally developed by Freud. Psychiatric Social Workers help to collect the details of client's background by contacting relatives, friends and other important people.

Counseling Psychology:

The helping relationship is the foundation on which the process of counseling rests. This field focuses primarily on helping educational, social and career adjustments of the concerned person. Counseling psychologists promote the growth, development and coping skills of students. They enhance the effective study habits in learning situation,

strive to promote the potential of the persons involved ; and provide help concerning milder problems of social and emotional adjustment. They make use of tests to measure aptitudes, interests and personality characteristics, for career counseling. They also deal with marriage and family counseling.

Organizational behaviour:

The first application of psychology to problems of industries and organizations was the use of intelligence and aptitude test in selecting employees. Today the private and public organizations apply psychology to management and employee training, supervision of personnel, to improve communication within the organization, to counseling employees and to alleviate industrial strikes. Psychologists are playing important role in industries with regard to recruiting right person for the right job. They are helping to build a strong bond between the employer and the employee. They do the job analysis and are trying to see that the worker is able to bring out the best in him/her.

Military Psychology:-

The application of psychology to military affairs began with the introduction of psychological tests for classification of army personnel during First World War in America. Selection and classification of recruits were made on the basis of results of psychological tests to various ranks and grades. Tests are used to detect problem cases which may prove to

be a handicap at the time of danger and tension. The intelligence tests were administered to over 1,700,000 soldiers in the US army during World War I. The results were published in 1921 and became known as the army report. Army Alpha and Army Beta tests were developed by army psychologists who were working under considerable time pressures to select large number of military recruits.

Providing leadership is the primary function of an army officer. This branch offers the officers a deep understanding of human motivation, group dynamics and the use of power and influence. With the study of psychology, officers are prepared for complex challenges, with an emphasis placed on the importance of personal integrity, ethical behavior and professional responsibility. These courses are mandatory for all officers and cadets during their years at college.

Officers in the army may not have the privilege of recognizing mentally dull individuals. They may encounter an individual who may be more of a burden than an asset to the army. Such individuals are tested by a psychologist to determine whether his mental ability is truly as poor as it appears. Psychologists also take care of the special psychological problems of these service men after war, like vocational adjustment, managing feelings of hostility developed within oneself, psychological disturbances caused by warlike restlessness, and disturbed sleep. These are called post traumatic stress disorders.

Military psychology

Psychology in everyday life:

Psychology offers solutions to a variety of problems, such as:

1. Personal problems, such as a daughter having to face an alcoholic father, a mother dealing with a problem child.
2. Family problems such as lack of communication and interaction among family members.
3. Problems relating to community settings, for example: terrotists group or minority groups.
4. Problems of national and international dimensions. For example: cross – cultural marriages, legal and illegal immigrations.
5. Problems relating to education, health, environment, social justice, women development, intergroup relations etc.,

The solution to these problems may involve political, economic and social reforms. Interventions at the individual levels are also needed in order to solve the problems. Many of these problems are largely of psychological nature and are the result of people's unhealthy thinking, negative attitude towards other people and undesirable patterns of behaviour. A psychological analysis of these problems helps us in having a deeper understanding of these problems and also finding effective solutions.

Psychology has high potential in solving the problems of life. Media is playing a vital role in this respect. Television programmes project counselors and therapists suggesting solutions to a variety of problems relating to children, adolescence, adults and the elderly people. They are also analyzing vital social problems relating to social change and development, population, poverty, interpersonal or intergroup violence, and environmental degradation. Many psychologists play an active role in designing and executing intervention programmes in order to provide people with a better quality of life. Hence, we find psychologists working in diverse settings such as schools, hospitals, industries, prisons, business organizations, military establishments, and in private practice, as consultant helping people solve problems in their respective settings.

The knowledge of psychology is also relevant in day–to-day life. The principles and methods of psychology help in analyzing and understanding our relation to others. Knowledge of psychology helps us in understanding ourselves. Also Students can acquire good habits of study, learn about strategies for improving memory, and for solving their problems by using appropriate decision-making strategies. Knowledge of psychology helps us in developing psychological well - being.

ACTIVITIES

Activity – 1.1:

Find-out from five girls and five boys of your class, not belonging to psychology section, what they think psychology is about. Compare their responses with text book explanation of psychology. Discuss the differences between the two.

Activity – 1.2:

Following are some of the areas in psychology: Rank them according to your liking. Find out from five of your classmates their rankings and discuss the differences in liking of various areas of psychology.

1) Developmental Psychology
2) Social Psychology
3) Health Psychology
4) Industrial Psychology
5) Educational Psychology
6) Sports Psychology

Points to remember:

- Psychology is a modern discipline aimed at understanding the complexities of mental processes, experiences and behaviour of individuals in different contexts. It is treated as a natural as well as a social science.
- Scientific study of behaviour — The term refers to the actions of the person or animal that can be observed and measured by others.

❖ Psychology as a science	Psychology fulfills the requirements of a science by possessing characteristics like objectivity, prediction and control.
❖ **Scope of psychology**	Means the area covered by the subject matter. This is studied from two view points, pure and applied.
❖ **Branches of Psychology**	
❖ General psychology	Is concerned with the general principles of human behaviour.
❖ Developmental sychology	Studies the growth and development of human being.
❖ Social psychology	Studies about the way an individual becomes the member of a social group and his socialization processes.
❖ Abnormal psychology	Studies those people whose behaviour is strikingly different from that of normal persons.
❖ Animal Psychology	Studies the behaviour of animals.
❖ Clinical Psychology	Deals with the study of causes of abnormality. Clinical Psychologist provides therapy to people suffering from Psychological difficulties.
❖ Educational Psychology	Applies psychological discoveries of teaching tothe problems of the class room.
❖ Industrial Psychology	Studies the behaviour of men at work, the problems they face and how they can be resolved.
❖ Military Psychology	Applies knowledge of psychology to military affairs like selection of recruits, with the help of testing, screening individuals with problems and deals with post traumatic stress disorder.

❖ Today psychologists work in many specialized fields which have their own theories and methods. They make efforts to develop theories and solve problems in specific domains. Some of the major fields of psychology are : developmental psychology, social psychology, educational and school psychology, clinical and counseling psychology, Military, industrial / organizational psychology, Law and criminology.

QUESTIONS

1. Write the derivation of the term psychology.
2. Explain the modern definition of Psychology.
3. When and where was the first Psychological Laboratory established?
4. When and where was NIMHANS established?
5. When was the Indian psychological Association founded?
6. When did Kolkatta University introduce Psychology?
7. Mention the different branches of Psychology.
8. What is the relationship between Philosophy and Psychology?
9. What kind of medical problems require psychological help?
10. What is the job of a school Psychologist?
11. Write about Industrial Psychology.
12. What is the role of Psychologists in helping law and criminology?

* * * * * *

CHAPTER – II

Methods of study in Psychology

GOALS OF PSYCHOLOGICAL ENQUIRY

Like any scientific research psychological enquiry has the following goals: **description, prediction, explanation** and **control** of behaviour, and **application** of knowledge so generated in an objective manner. Let us try to understand the meaning of these terms.

Description: In a psychological study, we attempt to describe a behaviour or a phenomenon as accurately as possible. This helps in distinguishing a particular behaviour from other behaviours. For instance, the researcher may be interested in observing study habits among students. Study habits may consist of diverse range of behaviours, such as attending all the classes regularly, submitting assignments on time, planning the study schedule, studying according to the set schedule, revising the work on a daily basis.

Prediction: The second goal of scientific enquiry is prediction of behaviour. Such as, on the basis of study a researcher is able to establish a positive relationship between the amount of study time and achievement in different subjects. Later if we come to know that a particular child

devotes more time for study, we can predict that the child is likely to get good marks in the examination.

Explanation : The third goal of psychological enquiry is to know the causal factors or determinants of behaviour. Psychologists are primarily interested in knowing the factors that make behaviour occur. Also, what are the conditions under which a particular behaviour does not occur. For example, what makes some children more attentive in the class? Why some children devote less time for study as compared to others ? Thus, this goal is concerned with identifying the determinants or antecedent conditions (i.e., conditions that led to the particular behaviour) of the behaviour being studied.

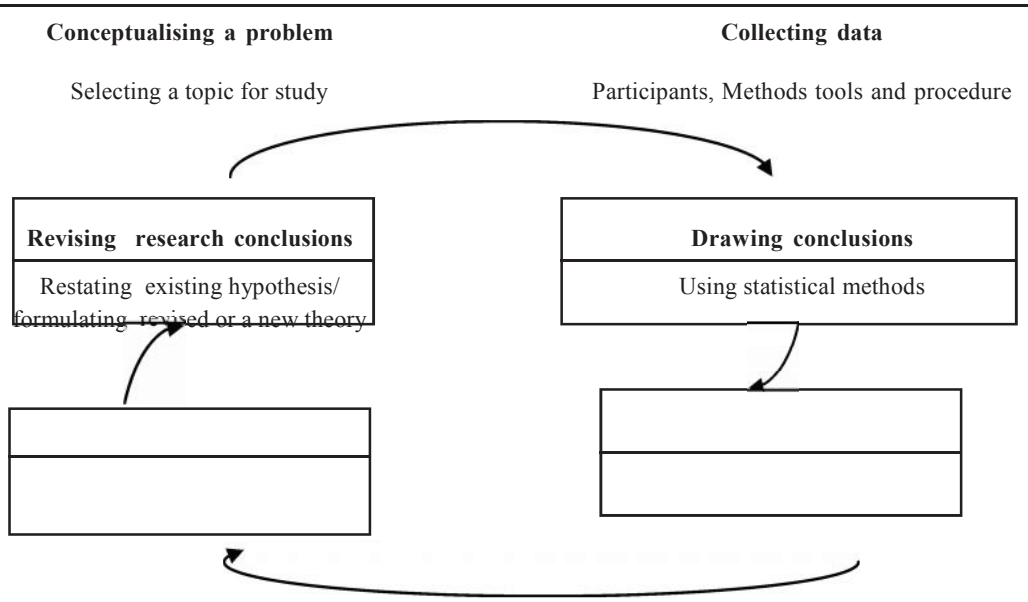
Control refers to three things : making a particular behaviour happen, reducing it, or enhancing it. For example: We can allow the number of hours devoted to study to be the same or we can reduce them or there may be an increase in the study hours. The change brought about in behaviour by psychological treatment in terms of therapy in persons, is a good example of control.

Application : The final goal of the scientific enquiry is to bring out positive changes in the lives of people. Psychological research is conducted to solve problems in various settings. Because of these efforts the quality of life of people is a major concern of psychologists. For example, applications of yoga and meditation help to reduce stress and increase efficiency. Scientific enquiry is also conducted to develop new theories or constructs, which leads to further research.

Steps in conducting Scientific Research

Science is defined by **'how'** it investigates. The scientific method attempts to study a particular event or phenomenon in an objective, systematic and testable manners. The **objectivity** refers to the fact that if two or more persons independently study a particular event, both of them, to a great extent, should arrive at the same conclusion.

The second characteristic of scientific research is that it follows **systematic procedure** or steps of investigation. It includes the following steps : conceptualization of a problem, collection of data, drawing conclusions, and revising research conclusions and theory.

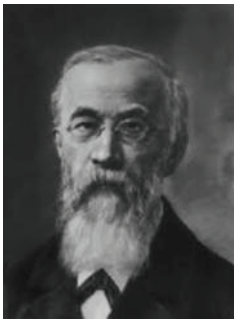


Steps in Conducting Scientific Enquiry

Methods:

All science is an attempt to describe and explain objects and events in the real world. Scientists observe something, propose theories to explain it and then test their theories. Because the focus of the science is something in the real world, the basic test of any scientific proposition is 'observation'. They look to see whether things happen the way the theories claim they should. The problems psychologists face and how they solve them can be understood with the help of examples such as why do students feel anxious during examination and perform poorly. Psychologists refer to anxiety and poor performance as variables and find out the relationship between the two. Following are the methods used in psychology to accomplish their goals in finding the answers to differences in behaviour.

1. Introspection / Self observation



To understand how basic sensations combine to produce our perception of the world, Wilhelm Wundt and others used a procedure called introspection to study the mind. It is 'self observation' / looking within', to report what is going on in one's mind and how one feels about it. For example, people were presented with a stimulus, such as a bright coloured object, or a word printed on a card. They were asked to describe it in their own words and in as much detail as they could , what they were experiencing. Wundt believed that by analyzing the report, in terms of their reactions, psychologists could come to a better understanding of the structure of the mind. Introspection is not a casual report but a disciplined description of experiences. It is an effective method of studying phenomena that cannot be experimented upon. The main purpose here is to find out what exactly happens to the human mind, when it reacts to the outside world. Here we are concerned with the nature of the experience itself and the laws of the mental processes that govern self examination. The goal of introspection is to learn about the basic building blocks of experience and the principles by which they combine to give us our everyday consciousness. Thus, introspection deals with the contents of consciousness.

Advantages

1. It was a good beginning to study experiences.
2. Mental activities that cannot be observed or experimented upon can be studied through introspection.
3. It can be used along with other methods to provide supplementary data.
4. The best way of gaining knowledge of mental process is by looking within oneself.
5. Our mind is our only means of interpreting thoughts at the given moment.
6. Introspection leads the way for better actions.

Disadvantages

1. Introspection deals with experiences, but experiences are not consistent. Fluctuations of the mind question the authenticity of introspection.

2. The object that causes experience would be an obstacle in the observation and in reporting of the experience itself. For example, if a person is angry, he has to examine his own condition and experience it. He also has to attend to the person with whom he is angry. In doing so, the mind withdraws from the object, and the anger disappears. Introspection defeats its purpose here. 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 the mental operation is directed.

3. Extreme emotions do not give way for introspection e.g., when one is very sad/ happy one cannot stop to think about the feeling.

4. Verbalizing the experience and conveying it effectively, to another person is difficult.

5. Certain experiences and feelings may not find the right expression through language.

6. There are experiences that cannot be studied through introspection mainly in the area of child psychology, abnormal psychology, and animal psychology

7. The subject may fake experiences and their reports of feelings cannot be verified. There are no ways that an outside observer could confirm the accuracy of other's introspection.

8. History remembers Wundt's research strategy of introspection as complicated and unwieldy. The problem that experimental psychologists encountered was in resolving disagreements. Theoretically, the immediate experience of all individuals is composed of the same elements and introspection by different individuals should yield the same results. What actually happened in practice, however, was disagreement, which questioned Wundt's research. Ultimately, this early approach to psychology was found to be unscientific.

9. In reality, however, it is not possible to introspect on an experience as and when it occurs. It is more of a retrospection that is generally done, when we start analyzing the actions and behavior that took place during the experience, much after the experience is over.

Retrospection

It is the report of a conscious experience that has already occurred. It is the mental process of reliving the incidents of the day. An average individual passing through the experiences of daily life is partly aware of the significance of passing events. Valuable lessons generally go unnoticed. Sometimes we may fail to observe, discriminate and be thoughtful. As a result we are deprived of conscious experience of action. By means of retrospection, we may impartially view the incidents that have already occurred. It is possible to see in greater perspective the intimate relationship between cause and effect. Hence, retrospection enriches life, resulting in greater thoroughness in thinking and feeling. In retrospection, a person may set himself as a sort of judge over his own actions. He reviews the incidents and events of the day and attempts to rationalize each of them. He subjects his thoughts and emotions to a series of mental rewards and punishments. He regrets the mistakes he has made and acknowledges his own commendable accomplishments.

If properly used, this method is advantageous for the individual in knowing himself. The disadvantage is that it does not offer itself to scientific study of behaviour.

Such drawbacks led to the evolution of new approaches, which largely replaced both introspection and retrospection.

2. Objective observation

Observation is a very powerful tool of psychological enquiry. It is an effective method of describing behaviour. In our daily life, we remain busy with observing numerous things throughout the day. Many times, we do not take notice of what we are seeing or what we have seen. We see but we do not observe. We remain aware of only a few things that we see daily. A scientific observation differs from day-to-day observation in many respects. These are:

(a) Selection : Psychologists do not observe all the behaviour that they encounter. Rather they **select** a particular behaviour for observation. For example we may be interested in knowing how children studying in Class XI spend their time in school. Two things are possible at this stage. As researchers we might think that we have a fairly good idea about what happens in school. We may prepare a list of activities and go to the school with a view of finding out their occurrences. Alternatively we might think that we do not know what happens in the school and by our observation we would like to discover it.

(b) Recording: While observing, a researcher **records** the selected behaviour using different means, such as marking tallies for the already identified behaviour whenever they occur, taking notes, describing each activity in greater detail, using short hand or symbols, photographs, video recording etc.,

(c) Analysis of Data : After the observations have been made, psychologists **analyse** whatever they have recorded with a view to derive some meaning out of it.

It is important to know that making good observation is a skill. A good observer knows what s/he is looking for, whom s/ he wants to observe, when and where the observation needs to be made, in what form the observation will be recorded and what methods will be used to analyse the observed behaviour.

Types of observation:-

Observation can be of the following types:-

(a) Naturalistic Vs. controlled observation. When observations are done in a natural or real – life settings (in the above example, it was a school in which observation was made), it is called **naturalistic observation.** In this case the observer makes no effort to control or manipulate the situation for making an observation. This type of observation is conducted in hospitals, homes, schools, day care centers, etc., However , many a times we may need to control certain factors that determine behaviour as they are not the focus of our study. For this reason, many of the studies in psychology are

conducted in the laboratory which is called controlled observation or systematic observation. This method of observation can be applied to many practical problems for example, studying public opinion and the factors influencing it, predicting success in college and so on.

(b) Non – Participant Vs Participant Observation: Observation can be done in two ways. One, we may decide to observe the person or event from a distance. Two, the observer may become part of the group being observed. In the first case, the person being observed may not be aware that s/ he is being observed. For example, we want to observe the pattern of interaction between teachers and students in a particular class. There are many ways of achieving this goal. we can install a video camera to record the classroom activities which we can see later and analyse. Alternatively, we may decide to sit in a corner of the class without interfering or participating in their everyday activities. This type of observation is called **non-participant observation.** The danger in this type of set up is that the very fact that someone (an outsider) is sitting and observing may bring a change in the behaviour of students and the teacher.

In **participant observation,** the observer becomes a part of the school or the group of people being observed. In participant observation, the observer takes some time to establish a rapport with the group so that they start accepting her/him as one of the group members. However, the degree of involvement of the observer with the group being observed would vary depending upon the focus of the study.

The advantage of the observation method is that it enables the researcher to study people and their behaviour in a naturalistic situation, as it occurs. However, the observation method is labour intensive, time consuming, and is susceptible to the observer's bias. Our observation is influenced by our values and beliefs about the person or the event. We are familiar with the popular saying: " We see things as we are and not as things are". Because of our biases we may interpret things in a different way than what the participants may actually mean. Therefore, the observer should record the behaviour as it happens and should not interpret the behaviour at the time of observation itself.

3. Experimental Method

Experiments are generally conducted to establish cause - effect relationship between two sets of events or variables in a controlled setting. It is a carefully regulated procedure in which changes are made in one factor and its effect is studied on another factor, while keeping other related factors constant. In the experiment, cause is the event being changed or manipulated. Effect is the behaviour that changes because of the manipulation.

The concept of variable

In the experimental method, a researcher attempts to establish causal relationship between two variables. Any stimulus or event which varies, that is, it takes on different values (or changes) and can be measured is a **variable.** An object by itself is not a variable. But its attributes are. For example, the pen that we use for writing is NOT a variable. But there are varieties of pens available in different shapes, sizes, and colour. All of these are variables. The room in which we are sitting is NOT a variable but its size is-as there are rooms of different sizes. The height of the individuals (5' to 6') is another variable. Similarly, people of different races have different colours. Young people have started dyeing their hair in different colours. Thus, colour of hair becomes a variable. Intelligence is a variable (there are people with varying levels of intelligence – high, moderate, low). Presence or absence of persons in the room is a variable.

Variables are of two types, namely independent and dependent variables. **Independent variable** is that variable which is manipulated or altered. The variables on which the effect of independent variable is observed is called **dependent variable.** Dependant variable represents the phenomenon the researcher desires to explain. It is expected that change in the dependent variable will ensue from changes in the independent variable.

We must remember that independent and dependent variables are interdependent. Neither of them can be defined without the other. Also, independent variable chosen by the researcher is not the only variable that influences the dependent variable. Any behavioural event contains many variables. It also takes place within a context. Independent and dependent variables are chosen because of the researcher's theoretical interest. However, there are many other relevant or extraneous variables that influence the dependent variable, but the researcher may not be interested in examining their effects. These extraneous variables need to be controlled in an experiment so that a researcher is able to pin-point the cause and effect relationship between independent and dependent variables.

Experimental and Control Groups

Experiments generally involve one or more experimental groups and one or more control groups. An experimental group is a group in which members of the group are exposed to independent variable manipulation. The **control group** is a comparison group that is treated in every way like the experimental group except that the manipulated variable is absent in it.

It should be noted that in an experiment, except for the experimental manipulation, other conditions are kept constant for both experimental and control groups. One attempts to control all those relevant variables which can influence the dependent variable.

In order to control relevant variables, experimenters use several control techniques. Some illustrations are given below.

- Since the goal of an experiment is to minimise extraneous variables the best way to handle this problem is to eliminate them from the experimental setting. For example, the experiment may be conducted in a sound proof and air conditioned room to eliminate the effect of noise and temperature.
- Elimination is not always possible. In such cases, effort should be made to hold them constant so that their effect remains the same throughout the experiment.
- For controlling organismic (eg., fear, motivation) and background variables (such as rural/urban, caste, socio-economic status) matching is also used. In this procedure the relevant variables in the two groups are equated or are held constant by taking matched pairs across conditions of the experiment.

A well designed experiment can provide, relatively speaking, a convincing evidence of a cause-effect relationship between two or more variables. The limitation of the laboratory experiment is that it is not always feasible to study a particular problem experimentally. For example, an experiment to study the effect of nutritional deficiency on intelligence level of children cannot be conducted as it would be ethically wrong to starve anyone. The other problem is that it is difficult to know and control all the relevant variables.

Field Experiments and Quasi Experiments

If a researcher wants to have high generalisability or to conduct studies which are not possible in laboratory settings, s/he may go to the field or the natural setting where the particular phenomenon actually exists. In other words, s/he may conduct a **field experiment.** For example, a researcher may want to know which method would lead to better learning among students – lecture or demonstration method. For this, a researcher may prefer to conduct an experiment in the school. The researcher may select two groups of participants, teach one group by demonstration method another group by the normal teaching method for sometime. s/he may compare their performance at the end of the learning session. In such types of experiments, the control over relevant variables is less than what we find in laboratory experiments. Also, it is more time consuming and expensive.

Many variables cannot be manipulated in the laboratory settings. For example, if we want to study the effect of an earthquake on children who lost their parents, we cannot create this conditions artificially in the laboratory. In such situations, the researcher adopts the method of **quasi** (the Latin word meaning "as if") **experimentation.** In such types of experiments, the independent variable is selected rather than varied or manipulated by the experimenter. For example in the experimental group we can have children who lost their parents in the earthquake and in the control group children who experienced the earthquake but did not lose their parents. Thus, a quasi experiment attempts to manipulate an independent variable in a natural setting using naturally occurring groups to form experimental and control groups.

4. Case History Method

Scientific biographies known as case histories are important sources of data for psychologists studying individuals. This method is used by clinical psychologists for diagnostic purposes. Case history method comes into use when a person suffers from emotional or nervous disorder and seeks the help of a psychologist.

A case history is a detailed indepth investigation of a single case concerning a person. By focusing on a single case at a time, a greater understanding of the individual is obtained. Information regarding the patient's past, significant incidents, family history, friends and occupation are usually obtained. Case studies also involve the use of psychological testing, a procedure in which a carefully designed set of questions is used to gain some insight into the personality of the individual. Tests may also be used to measure his intelligence and emotional stability. The psychologist compiles the case history, based on all details, often in co-operation with a social worker. This helps him to lay his fingers on the cause of the trouble. Past records and events are used in reconstructing the biography of a person. Case studies are usually carried out on children with development problems. Sometimes they focus on exceptional, well adjusted youngsters also. For example, this method has been used on prodigies - extremely gifted children to find out the factors that contribute to their accomplishments.

Advantages

1. A case history can be a rich source of information for future research.
2. Case histories illustrate psychological principles, where abstract generalizations fail.
3 This method offers to produce a detailed picture of an individual than other methods do.

Disadvantages

1 Since case histories depend on people's memories of the past, such memories may be inaccurate and selective.
2. The psychologists who want to generalize about human behaviour cannot do so because case histories focus on single individuals.
3. Most case histories are sources rather than tests of hypotheses.
4. It is a very time consuming and expensive method.

5. Surveys / field investigation / self-report technique

This involves asking large numbers of individuals to complete questionnaires and interviewing people directly about their experiences,

attitudes or opinions. Examples include survey on health care reform or economic reform, voting preferences prior to elections, consumer reactions to various products, health practices, and public compliance with safety regulations and so on.

Surveys are often repeated over long periods of time in order to trace shifts in public opinions. For example some surveys on job satisfaction, individual's attitudes toward their jobs have continued for several decades. The Kinsey Institute for instance, has tracked changing patterns of sexual behaviour and sexual attitudes, (1940).

The survey method offers valuable results. And when conducted carefully, surveys can provide highly accurate predictions with respect to outcome of the election results like Gallop poll. But the biggest trouble is getting a 'sample' or group of subjects that is the representative of the larger population that the researcher wishes to describe.

Special selection procedures can be used to ensure that this sample will be representative i.e., it will contain the same proportion of women and men, young and old, poor and rich and so on. A small but representative sample can yield accurate results. In contrast, surveys and tools that fail to use proper sampling methods may yield questionable results. A newspaper that asks its readers to vote 'yes' or 'no' by telephone on a controversial question is hardly conducting a scientific poll. Only those who feel quite strongly about an issue and read the newspaper are likely to call in and those who feel strongly may be likely to take a particular side. A psychologist or statistician would say that the poll suffers from volunteer bias. Those who volunteer probably differ from those who stay silent. Another problem with surveys is that people sometimes lie. This is especially likely when the survey is about a touchy topic. The likelihood of lying is reduced, when respondents are guaranteed anonymity. Also, there are some ways to check for lying, for example, by asking a question several times in different ways. But not all surveys use these techniques. Still if surveys are conducted and interpreted carefully they can be informative.

ACTIVITIES

Activity – 2.1:

Watch five students sitting in the library and studying for half an Hour. Give a report of their behavior. (Specify the time of the day and the nature of books, for example: journals, magazines, general reading books or text books).

Activity - 2.2:

Name the variables in the following situations:

1) Hunger & eating behavior
2) Examination performance and anxiety.
3) Leisure time and T.V. viewing.

Activity - 2.3:

Find out from your five friends the time they spend browsing the internet in a week's time. Write a report on why they surf the internet and the kind of information they want to collect.

Points to remember:

Introspection	Is self observation or looking within. It is the reporting of what is going on in one's mind and how one feels about it.
Retrospection	Is the report of a conscious experience that has already occurred.

Observation

i) Naturalistic observation	Is the observation of behaviour as it occurs natural settings.
ii) Laboratory observation	Is the observation of the behaviour in a setting planned by the researcher earlier.
Experimental method	Enables us to determine whether there is a causal relationship between variables. The components of all experiments are called

	variables. A variable is a characteristic of behaviour, events or experiences that can vary or change in some way. There are two types of variables.
Independent variable	Is one that the experimenter intentionally manipulates to see how the other variable in the study will be affected.
Dependent variable	Is the behaviour and the reaction of the subject that the researcher tries to predict. Usually two groups are used in an experiment.
Experimental group	Is introduced to changes.
Control group	Is not subjected to any changes
Case history method	Is a detailed in-depth investigation of a single case concerning a person.
Survey method	Is asking large number of individuals questions about their experiences, attitudes or opinions. For ex: prediction of the election results or popularity of a sports person.

QUESTIONS

1. What is naturalistic observation? Give examples.
2. What is objective observation?
3. What are the limitations of laboratory observation?
4. What is the meaning of Introspection?
5. What is retrospection?
6. What are the drawbacks of introspection method?
7. What are the merits and demerits of case study method?
8. When is field investigation method used?
9. Explain experimental method.
10. How many kinds of variables are there? Give examples.
11. What is experimental group?
12. What is 'Control group'?

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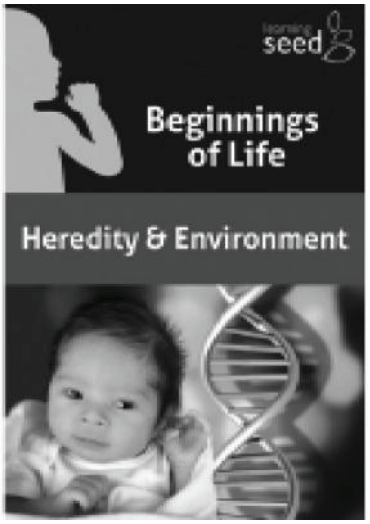
CHAPTER III

Biological bases of human behaviour

Part A : Heredity and Environment



Meaning and Definition:

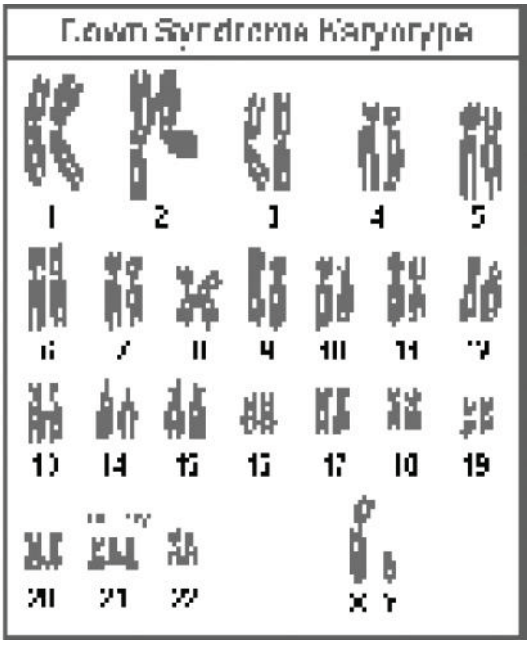
"Heredity refers to all the inborn characteristics of an individual". They are inherited at the moment of conception through the genes from both the parents. Hence, "Heredity can be understood as **"the genetic blue print that we inherit from our biological parents".**

Heredity provides the potentialities for development and behaviour typical of the species and also is an important source of individual differences. Heredity determines the ranges within which human behaviour can be modified by environmental influences. For example, a child born with an introverted disposition will grow up to be more or less introverted, depending on environmental influence, but it is unlikely that the child will ever be extroverted.

Cell – Chromosomes, Genes, and DNA

Human life begins as a single cell and grows into an individual made of trillions of cells, each containing a replica of the original code. That code

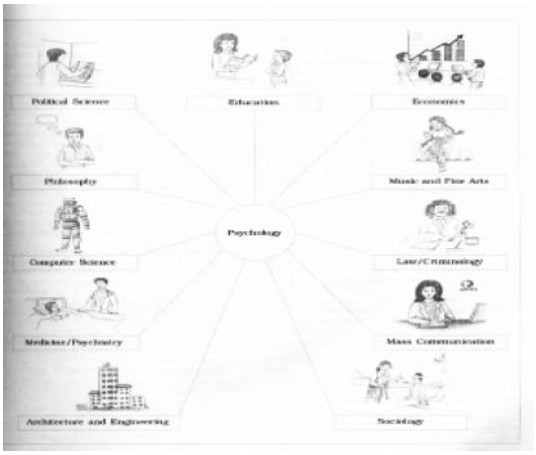
is carried in the 'Genes'. **The nucleus of each human cell contains 'Chromosomes', which are threadlike structures made up of deoxyribonucleic acid or DNA, DNA is a complex molecule that has helix shape, like a spiral staircase and contains genetic information. 'Genes' the units of hereditary information, are short segments of DNA.** Genes contain the instructions for building specific proteins. Proteins are the building blocks of cells as well as the regulators that direct body's processes.



Chromosomes

Each gene is located in a definite position on a particular chromosome and has a specific function. Some proteins give cells their characteristic physical properties. For example, bone cells get their hardness, skin cells their elasticity and nerve cells their capacity to conduct electrical impulses from different kinds of proteins they possess. Some other proteins trigger chemical reactions, carry chemical messages and fight foreign invaders. The activity of genes is affected by their environment. For example, hormones that circulate in the blood make their way into the cell. This can turn genes 'on' and 'off '. And the flow

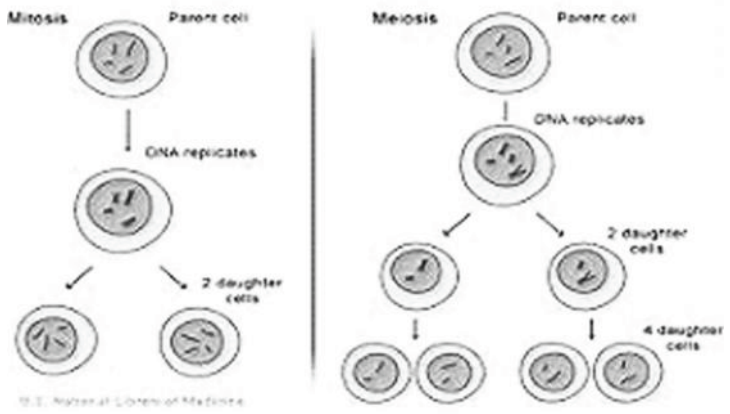
of hormones can be affected by environmental conditions, such as light, nutrition and behaviour.



Human cell, Chromosome and DNA structure

Mitosis and Meiosis

The figure below depicts the process of cell division called 'Mitosis' and 'Meiosis'



After conception, the single cell develops into a complex organism, with billions of cells specializing in different functions. All cells in our body (except the sperm and egg) have 46 chromosomes arranged in 23 pairs. This is because we inherited one chromosome from our mothers

and one from our fathers. These cells reproduce by a process called **'mitosis'.** During mitosis, the cell's nucleus, including the chromosomes, duplicates itself and the cell divides. Two new cells are formed, each containing the same DNA as the parent cell, arranged in the same 23 pairs of chromosomes. Thus each cell has the same genetic information except the reproductive cells.

The sperm and ovum, the human reproductive cells contain only 23 single chromosomes instead of usual 46. This is because **'meiosis'** a special form of cell division in which the number of chromosomes is reduced by half. During meiosis, a cell of the testes (in men) or ovaries (in women) duplicates its chromosomes, but then divides twice, thus forming four cells, each of which has only half of the genetic material of the parent cell. By the end of meiosis, each egg or sperm has 23 unpaired chromosomes.

Gametes:

New individuals are created when two special cells called gametes, or sex cells- the sperm and the ovum combine. A gamete contains only 23 chromosomes, half as many as regular body cell. Gametes are formed through cell division process called meiosis.

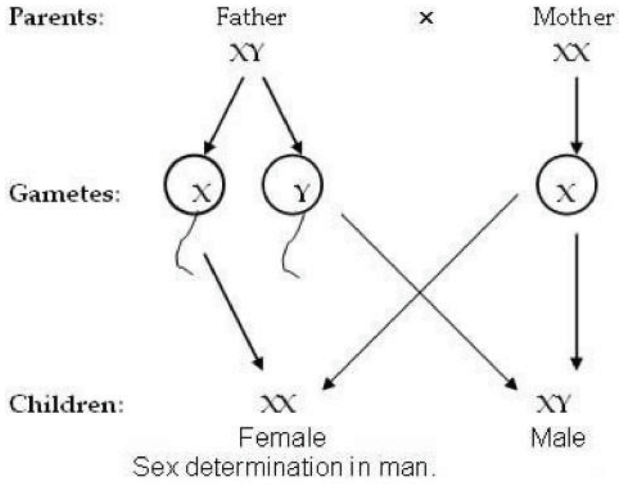
Fertilization

In the process of 'fertilization' an egg and a sperm fuse to create a single cell, called a Zygote. In the zygote, the unpaired chromosomes from the egg and the unpaired chromosomes from the sperm, combine to form one set of paired chromosomes. In this manner, each parent contributes half of the off spring's genetic material.

Sex determination :

The process of reproduction consists of fusion of the sperm, male sex cell or gamete with the ovum or the female gamete resulting in a 'zygote' or fertilized egg, a new single cell. At conception, the zygote receives 23 chromosomes from the sperm and 23 from ovum. They form themselves in pairs. The first 22 pairs are 'autosomes', or nonsex chromosomes, 23rd pair are the sex chromosomes. They determine if the resulting

new life is a male or a female.



Sex determination in man.

In a female, the sex chromosomes are 'X' Chromosomes. In a male an X Chromosome is paired with a smaller 'Y' chromosome. An ovum can carry only 'X' Chromosome. The sperm can carry either a 'X' or a 'Y'. When an ovum is fertilized by an X carrying sperm, the resulting zygote has a pair XX, which makes it female. When an ovum is fertilized by a 'Y' carrying sperm, the zygote has a pair XY and so is a male. Thus the sex chromosome carried by the sperm cell that fertilized the ovum was X or Y.

Prenatal stages

With conception, the story of prenatal development begins to unfold. The duration of pregnancy is 38 weeks / 266 days divided into three periods.

1. **Period of the Zygote / Germinal (first 2 weeks after conception)** During this period the cells multiply and forms into blastocyst. The blastocyst burrows into the uterine wall.
2. **Embryonic period :** This period starts from the end of **2 weeks to 8 weeks** after conception. A primitive brain and spinal cord appear. Many external body structures and internal organs form.

3. **Foetal period: 2 – 9 months**, Growth and development continue during this time. This is the longest prenatal period.

Dominant and Recessive Genes.

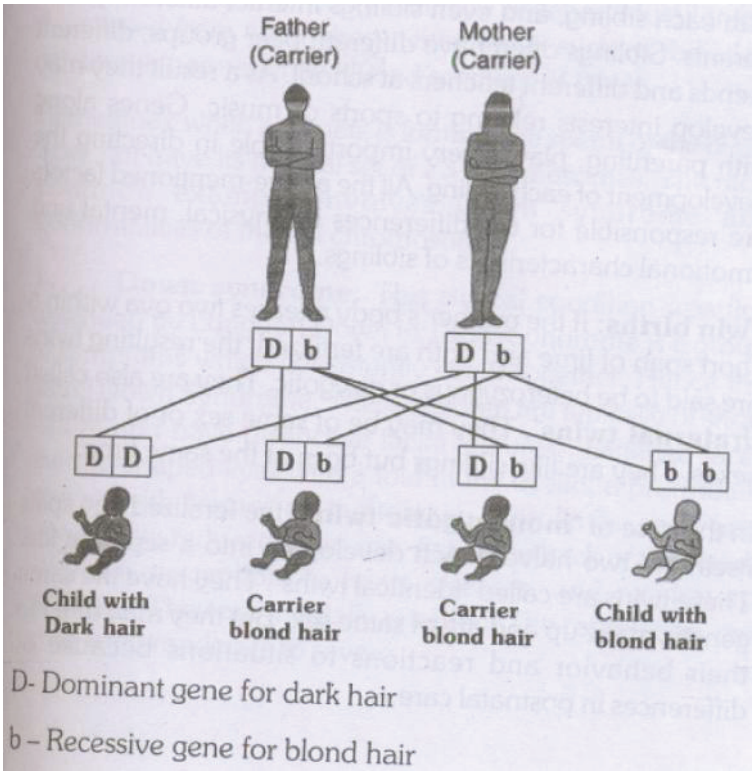
It is interesting to know that meiosis, a special type of division implies an unlimited variety of combinations of chromosomes and genes, in sperm and ovum, accounts for the differences in the genetic make up of siblings.

The 23 paired chromosomes of a male and a female are both similar and different. Each chromosome in the pair contains varying forms of the same genes, at same location on the chromosome. A gene for hair colour, for example, is located on both members of one pair of chromosomes. However, one of those chromosomes might carry the gene for blond hair; the other chromosome in the pair might carry the gene for dark hair.

If one gene of a pair exerts its effect it is called 'dominant gene' . The one gene which does not express its trait because of the potential influence of the other is called 'recessive gene'. This is the dominant - recessive gene principle. A recessive gene exerts its influence only if the two genes of a pair are both recessive. If we inherit a recessive gene for a trait from each of our parent, we will express the trait. If we inherit a recessive gene from only one parent, we may never know that we carry the gene for a particular trait.

A more powerful trait is said to be dominant over the weaker, recessive trait. For example, the 'dominant' trait for curly hair combined with the 'recessive' trait for straight hair, the resulting expression in the child is curly hair.

Dominant – Recessive Gene Transmission Principle

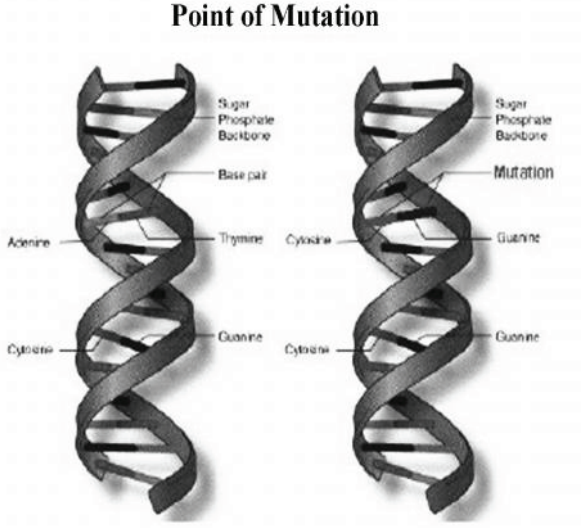


D- Dominant gene for dark hair
b – Recessive gene for blond hair

Although both parents have dark hair, each parent can have a recessive gene for blond hair. So their child may inherit either dark or blond hair genes as shown above. There is one in four possibilities of the child receiving recessive gene from each parent.

Mutation:

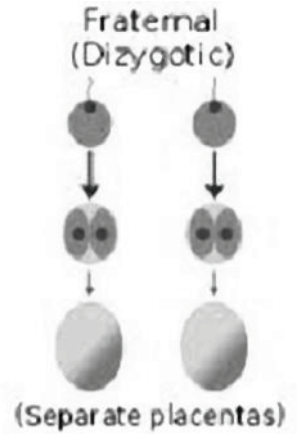
Mutation is a sudden but permanent change in a segment of DNA. A mutation may affect one or two genes or it may involve many genes. Some mutations occur spontaneously, simply by chance. Others are caused by hazardous environmental agents. For example, Ionizing radiation.



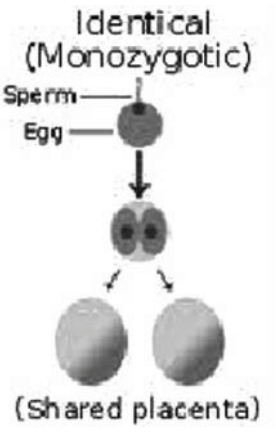
Siblings:

Siblings are the brothers and / or sisters born to the same parents with a gap of time. Siblings share common experiences, such as their parents' personalities or intellectual orientation, the family's socio-economic status and the neighbourhood in which they live. But it is important to note that each child is unique. There are many non-shared environmental experiences, both within the family and outside the family. It is possible that parents interact differently with each sibling, and even siblings interact differently with parents. Siblings often have different peer groups, different friends and different teachers at school. As a result they may develop interests relating to sports or music. Genes along with parenting play a very important role in directing the development of each sibling. All the above mentioned factors are responsible for the differences in physical, mental and emotional characteristics of siblings.

Twin births: If the mother's body releases two ova within a short span of time and both are fertilized, the resulting twins are said to be heterozygous or dizygotic. They are also called '**fraternal twins'** . They may be of same sex or of different sexes. They are like siblings but born at the same time.



In the case of '**monozygotic twins'** the fertilized egg splits itself into two halves, each developing into a separate life. These twins are called 'Identical twins'. They have the same genetic make up and are of same sex. But they may differ in their behaviour and reactions to situations because of differences in postnatal care.



Multiple births:

In rare cases triplets, quadruplets, or more number of births at a time are possible. This is called multiple births. The probable causes for multiple births are late motherhood, fertility drugs, and In Vitro Fertilization. (IVF)

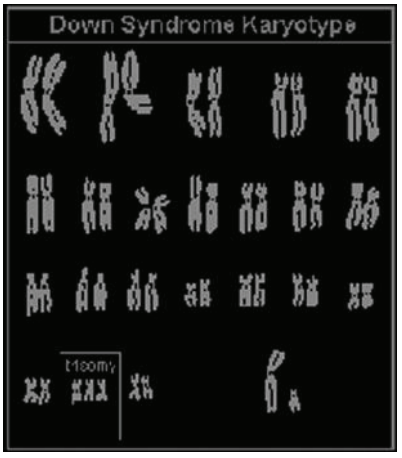
Siamese twins:

Are born because of incomplete splitting of the fertilized ovum. As a result they are joined at the hip or chest, or head. They are called Siamese as this kind of twins was recognized in Siam, Thailand. It is possible to separate these twins surgically if they are sharing some superficial tissues. If they are sharing some vital organs like heart or head or intestine, the survival after surgery is rare.

Chromosomal abnormalities:

Abnormalities of chromosomes are a major cause of serious developmental problems. Some of these abnormalities involve whole chromosomes that do not separate properly during meiosis. Other abnormalities are produced by inheriting harmful genes by mutation of genes. Mutation can be caused from an environmental agent such as radiation, which is a permanently altered segment of DNA. Sometimes, when a gamete is formed, the sperm or the ovum does not have its normal set of 23 chromosomes. The most common example involves Down Syndrome and abnormalities of the sex chromosomes.

1. Down Syndrome: This clinical condition was first described by Langdon Down in 1866. Syndrome is a group of symptoms which consistently occur together. Hence the name Down Syndrome. These children are typically of short stature and have distinctive facial features, flattened face, almond shaped eyes with a fold in the eyelid ; a protruding tongue, with fissures on the tongue ; short limbs ; short and broad neck ; reduced brain size, flat at the back of the head. They are susceptible to heart diseases, and respiratory infections. They are mentally retarded. The retardation can range from moderate to severe.



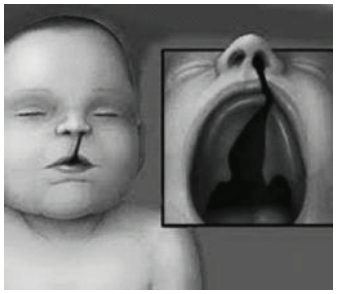
Down syndrome is caused by the presence of an extra copy of chromosome 21. It is also called 'Trisomy 21'. The extra chromosome most often comes from the mother's egg, when her homologous pair

21st chromosome fails to separate during meiosis. The health of the male sperm may also be involved. About 1 in 1,000 infants is born with this abnormality. The probable reason for Down syndrome is related to parental age at the time of conception. The incidence of children with Down syndrome is high in mothers above the age of 38, and young mothers, below 18 years of age, whose reproductive system have not fully developed. Proper care and training can help these children to read and write. They are generally cheerful. They can learn self-help skills and routine tasks.

2. Hemophilia: This is a serious sex-linked recessive disorder. The blood of people with hemophilia lacks the chemical components that cause blood clot. Thus, when a person with hemophilia bleeds, it does not stop soon. It takes a long time resulting in anemia. It can also lead to severe internal bleeding causing tissue damage. Approximately 1 in 5000 baby boys is born with this disorder. It is almost unknown in girls. Interestingly women are the carriers of this genetic defect.

3. Cleft palate: When a split in the roof of the mouth occurs, from birth it results in a condition called cleft palate. Studies indicate that babies born to mothers who smoke may be at the risk for 'cleft palate'. Certain drugs, including tranquilizers can produce malformations of face, even head and limbs. Cleft palate can also be accompanied by similar division in the upper lip called **'harelip'** (origin from a resemblance to the mouth of a hare). This division may vary in size. It may extend from mouth up into the nostril. Both cleft palate and harelip interfere with the natural sucking ability of the infant. It is possible to correct these defects through plastic surgery. If it is not corrected early, it can result in speech difficulty.

Cleft palate



Hare lip

4. Lobster's claw: (Lobster a large shelfish with inward curving jaws). This is a rare congenital deformity of the hand. Here the middle finger is missing resulting in a cleft/division in the hand. Hence it appears like a lobser's claw. It occurs in both the hands. It can also occur in feet where the middle toes are missing. It can be treated surgically to improve the function and appearance.

5. Polydactyly : (Meaning many fingers) This is a condition where one or more extra fingers and / or toes are found at birth. Generally these extra fingers do not contain any bone. Hence it is possible to remove them surgically to restore normal appearance.

Cloning : The term 'clone' is derived from 'klon' the greek word for 'twig'. This was first introduced by the department of horticulture worldwide when they began the technology of grafting.

Dolly

A clone in the biological sense is a single cell or multicellular organsim that has been directly copied from and is therefore genetically identical to another living organism. This term can also refer to 'natural' clones made either when an organism reproduces asexually or when two genetically identical individuals are produced by chance that is, identical twins. But literally, a clone is an identical copy created intentionally.

Additional information on cloning

There are different types of cloning . The cloning technologies can be used for other purposes besides producing the genetic twin of another organism. There are three types of cloning They are:

a) DNA Cloning

b) Reproductive cloning

c) Therapeutic cloning

a) DNA Cloning: This refers to the transfer of a DNA fragment of interest from one organism to a self replicating genetic element such as bacterial plasmid. The DNA of interest can then be

propagated in a foreign host cell. This technology has become popular in molecular biology laboratories today.

Scientists studying a particular gene often use bacterial plasmids to generate multiple copies of the same gene. Plasmids are the self replicating extra chromosomal circular DNA molecules, distinct from the normal bacterial genome.

To clone a gene, a DNA fragment containing the gene of interest is isolated from chromosomal DNA using restriction enzymes and then united with the same enzymes. When the fragment of chromosomal DNA is joined with its cloning vector in the lab, it is called recombinant DNA molecules. After introducing it into a suitable host cell, we can repeat the process.

b) **Reproductive cloning:** This is a technology used to generate an animal that has the same nuclear DNA as of another currently or previously existing animal. In a process called "Somatic cell nuclear transfer (SCNT) scientists transfer genetic material from the nucleus of a donor adult cell to an egg whose nucleus has been removed. The reconstructed egg containing the DNA from a donor cell must be treated with chemicals or electric current in order to stimulate cell division. Once the cloned embryo reaches a suitable stage, it is transferred to the uterus of a female host where it will continue to develop until birth.

c) **Therapeutic cloning:** This is also called 'embryo cloning' . This relates to the production of human embryos for use in research. The aim of this process is not to create an individual but to harvest stem cells that can be used to study human development and to treat disease. From stem cells it is possible to generate any type of specialized cells. These cells are extracted from the egg after it is divided for 5 days. Many researchers are anticipating that stem cells can be used to serve as replacement cells to treat heart disease, Alzheimer's disease, cancer and so on.

All the above mentioned cloning technologies are useful in curing many of the diseases and repopulate many of the endangered

species like tiger, giant Panda and so on. But it is important to note that all these processes are expensive and have low success rates. The cloned animals are prone to infection and growth disorders. They die prematurely.

People are becoming curious about human cloning. With limitations concerning reproductive cloning, it is potentially dangerous and ethically wrong to clone humans. However, cloning is one of the fascinating creations invented by genius scientists.

Environment

Meaning and Definition:

Environment is the broad range of experiences that an individual encounters over a life time. Heredity factors and the environmental factors contribute to the development of an individual, the two are so closely interwoven that it is difficult to separate their effects. So, psychologists speak of the 'interaction' between heredity and environment for complete human development.

The term 'environment' refers to factors in and around the individual helping or hindering his / her intelligence, temperament, height, weight and other abilities. To understand the role of environment better, let us examine the influence during the prenatal and the postnatal environment separately.

1. **Prenatal Environment:** The lifelong journey of human development begins with conception and requires 266 days or about 9 months for the baby to develop fully inside the womb of the mother. During this period mother's diet has a profound influence on the developing fetus. The quality of the life support system provided by the mother influences the fetus from conception until birth. For example, the diet, infection, radiation and drugs affect the developing fetus. During prenatal development, toxins, nutrition and even stress can influence some genes to stop functioning while others become stronger or weaker.
2. **Postnatal Environment:** The power of heredity is great. But so is the power of environment. According to behavioral geneticists,

environmental factors are as important as genetic factors. Many complex behaviours have some genetic loading. However the actual development requires a congenial environment for the finer expression of any behaviour. Environmental influences, which we group as 'nurture' include parenting, family dynamics, schooling and neighbourhood quality.

A person's 'individual environment' within the family as well as outside it, is important. Even within the same family, every child grows up in a different environment. There are differences in the way the parents react to each child. Other events in children's lives like illness, injuries, friends and other individual experiences also become environmental influences.

a) Family: Home and parents are important part of a child's life. Supportive and loving or conflicting family atmosphere affect the behaviour of the child outside the home. Mothers, fathers, grandparents and others in the family interact in a multitude of ways with infants, toddlers, young children and adolescents. Parents occupation, socioeconomic status, family size, divorce and remarriage influence the development of a child. Psychologists have found that happy and satisfying relationship within a family is associated with the ability to experience empathy, high self-esteem and interpersonal trust.

Sibling relationships are important as the positive or negative feeling associated with sibling is likely to be expressed while interacting with peers and others. Sibling conflicts can even lead to insight in understanding social relationships . Constructive conflict helps children recognize each other's needs, wishes, and point of view. It helps them learn how to fight, disagree and compromise within the context of a safe, stable relationship.

b) Peer group: This forms naturally among children who live near one another or go to school together. Groups are usually all girls or all boys to begin with. The peer groups influence increases as the child grows older. By adolescence, peers exert a heavy influence on dress, tastes, and activities. Teenagers are found to spend endless hours with their special friends. Peer group is a good setting for understanding concepts like fairness, reciprocity and co-operation. Peers learn to reinforce each other's values, beliefs, and behaviour standards.

c) Friendship: Early in childhood, children establish casual friendships with peers who share common interests. They tend

to have mutual liking based on positive feelings. As children grow, close friendships get established. They start interacting with more varied situations. They disclose their personal secrets and experience mutual emotional support. Close friendship is expressed through generosity, sensitivity and honesty. They learn to enjoy and relax in the company of each other.

d) School: Children enter elementary school at the age of six. They start with formal education and their lives change dramatically. The next 12 years, school going children will spend 6 hours a day, 5 days a week and 9 months a year in school. So, school exerts a great influence on lives of children. Apart from class-room learning, they learn team work and prosocial behaviour. School is a great instructor, in cultural norms and values; neatness, discipline, punctuality, competition, hard work and material success. They learn the importance of leadership, decision making and need for academic achievement. They develop high motivation to move up the ladder in their lives.

e) Community: This constitutes a number of people living together in a definite area. It is an organized system of communication network. People share common facilities and services. They participate in common spiritual life and have common social activities. People living in an Indian village and English Parish or a French commune are best examples of community living.

f) Neighbourhood: This consists of people living on either side of one's home. They tend to have a great influence on the social life of a growing child. The type and condition of housing, yards, streets, sidewalks, recreational facilities and businesses in a neighbourhood have a tremendous impact on children's activities

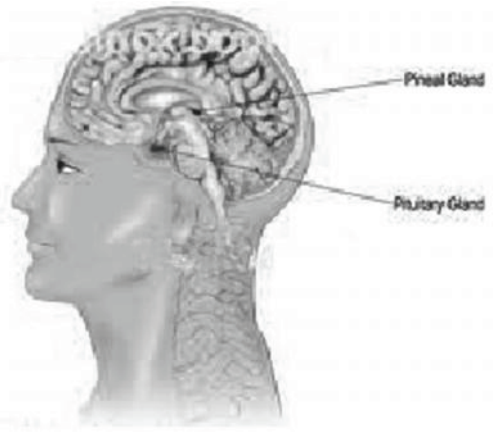
and developmental opportunities. Adults in the neighbourhood can be role models. They can also monitor the activities of the local children. The social networks that form in neighbourhoods can provide both support and access to resources such as jobs for adolescents.

g) Religious beliefs: Religiousness can be expressed in many ways. For example, community outreach, individuals who are committed to a life of faith, report a sense of well being, live long and happy lives. This is because religious beliefs lead them to adopt healthier life styles, provide them with social support and offer them a sense of meaning and purpose in life.

Relative importance of heredity and environment:-

Contemporary psychologists all over the world see neither nature nor nurture as wholly responsible for the development of human being. Instead they focus on how heredity and environment constantly vinteract to shape the developing individual. Not only do environments influence how genes are expressed, but genes can help to shape the environments to which people are exposed. Genetic and environmental influences blend and become indistinguishable in the development of an individual.

PART – B – Nervous system and Glands

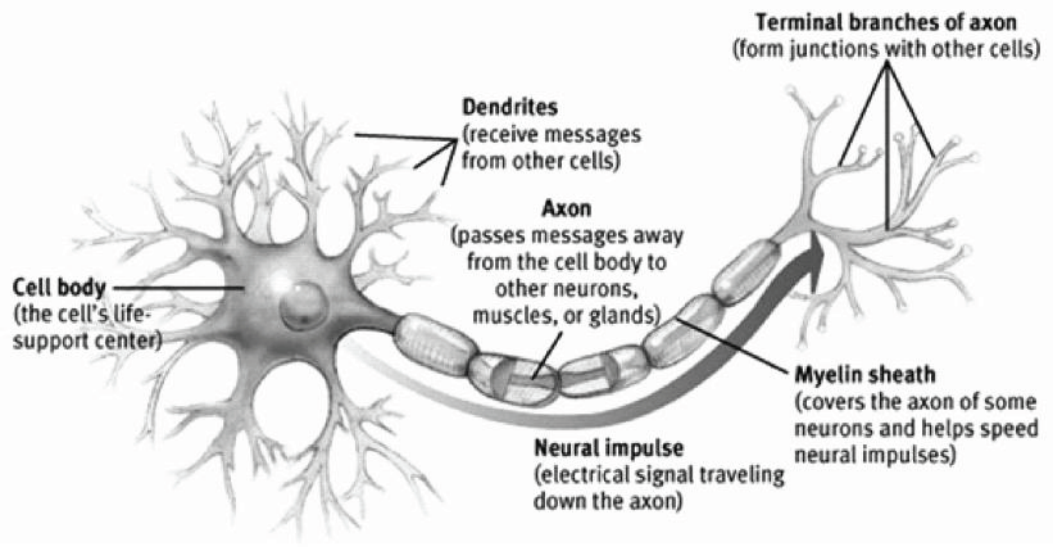


Any behaviour, be it riding a bicycle or painting a picture, is a sum total of various processes in the body. The **nervous system** enables the summation of these processes with the aid of endocrine glands. The knowledge of such biological processes gives us an insight into our behaviour and mental functions. The brain interprets the information coming from the senses and we perceive different events that happen. The advanced brain structure in humans facilitates the use of language, decision making processes and problem solving. Such actions and thoughts are made possible by several biological variations. This enlightens us about the close connection between the mind and the body. So if one has to study behaviour, studying the structures like sense organs, brain and nerves is as important as studying how these structures assist the flow of information into the system, its filtration, processing and interpretation.

It is very interesting to note that simple everyday tasks such as writing, talking and picking up a pencil require a sequence of events that is marvelous. The nervous system helps us to carry out these activities. The ability to play a musical instrument, drive a car, or kick a foot ball depends on muscular co-ordination. It becomes necessary for the body to provide messages to the muscles. The muscles produce these complicated activities that characterize successful physical activity.

Psychologists try to explain behaviour. Biological psychologists try to explain behaviour in biological terms. Our understanding of human behaviour cannot be complete without the knowledge of the fundamentals of the brain and the rest of the nervous system. Our behaviour, moves, motivations, goals and desires have a good deal to do with our biological make up. To understand the control over the body, we must start by studying **neurons,** which is the basic part of nervous system.

Structure and Functions of Neurons.



Neurons or nerve cells are the basic units of the nervous system. They are individual cells in the nervous system that receive, integrate and transmit information to other cells by conducting electrochemical impulses. There are numerous neurons in our body and these help in

the control of behaviour. They vary in shape, size and other characteristics according to their location and function in the nervous system. The brain contains the most concentrated mass of neurons . There are different types of neurons but all of them have a similar basic structure. The distinctive feature of neuron is the ability to communicate with other cells and pass on information. The neuron has the following structure.

a. **Cell body:** It is shaped like a pyramid and is the largest part of neuron. It contains the nucleus which hold the genetic information or the inherited material. A large number of cells that are closely inter-woven among the neurons are called **glial cells.** These provide nourishment to them. The cell body receives the impulses from other neurons through **'dendrites'.**

b. **Dendrites:** It is the collection of fibers that extend out from the cell body like the branches of a tree. These short fibers project from the cell body and receive the transmitted signals from adjacent cells. The messages that are received from other nerve cells are transmitted towards the cell body. The part of the neuron that carries messages to other neurons is called an **'axon'.**

c. **Axon:** It is a slender, extended, long fibre that takes a signal from the cell body and conducts it along its entire length towards other neurons. It is longer than the rest of the neurons. At its terminal point, an axon breaks into a number of hair-like branches and is close to the dendrite part of another neuron. Axons end in small bulges called **'terminal buttons'.**

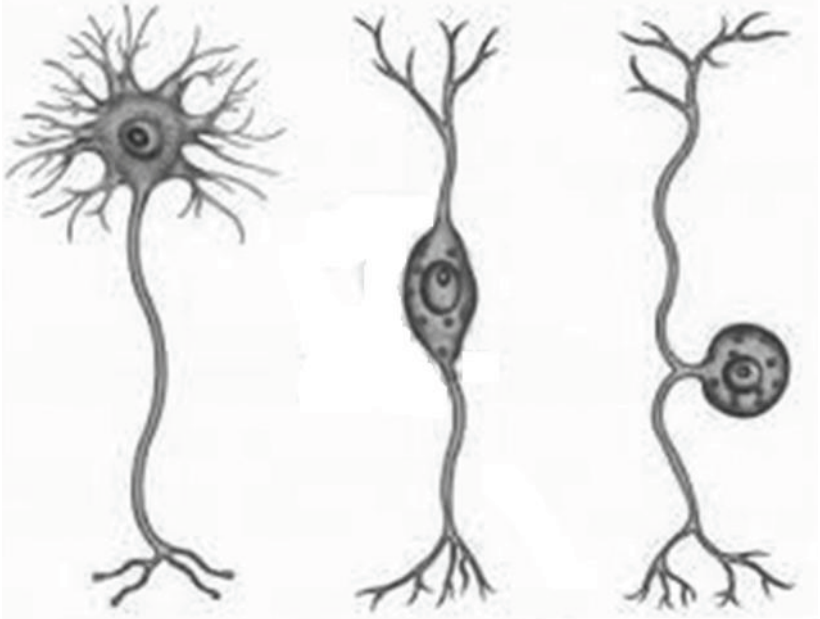
d. **Terminal buttons:** At the end of the axon, there are small branches that end in swollen bulb-like structures called the terminal buttons. These release chemical substances called **neurotransmitters.** These chemicals serve as messengers that activate neighboring neurons. The points at which neurons interconnect are called **'synapse'.**

e. **Synapse:** A synapse is a gap between two neurons where information is transmitted from one neuron to another.

f. **Myelin sheath:** Most neurons are protected with a layer of fat and protein cells called the myelin sheath. It helps neurons to send

messages to one another, more rapidly. The objective of this covering is to prevent signals from adjacent cells interfering with each other. The myelin sheath is divided into segments. When a neural impulse travels down the axon, it jumps from one break point in the string to another, thus making direct contact with the nerve cell. The impulse thus travels faster than it could, if it had to move along the entire axon. The speed of impulse depends upon the thickness of the myelin sheath. The thicker the myelin sheath, the faster is the impulse. Communication is faster (as rapid as 120 metres per second) in neurons with myelin, where as neurons without myelin may communicate as slowly as 5 metres per second. The loss of muscle control seen with the condition **'multiple sclerosis'** appears to be due to a degeneration of myelin sheaths.

Neurons can be classified into three types based on their functions.



Motor Neuron **Inter Neuron** **Sensory neuron**

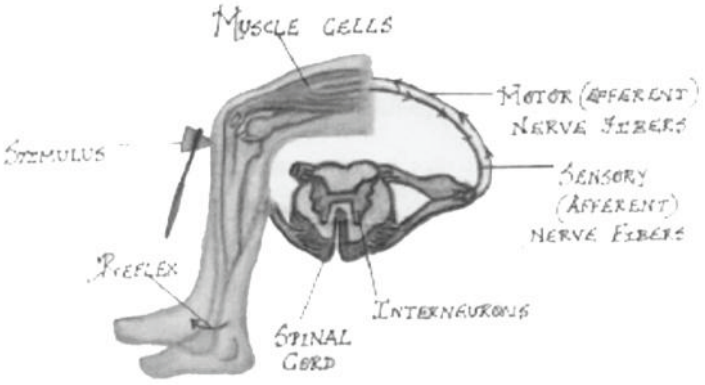
1. **Sensory neurons:** These carry impulses from the sense organs to the brain. When these impulses reach the brain, an individual is able to see, hear, smell and taste.
2. **Motor neurons:** These send impulses to the effectors such as muscles. As a result, one turns his head or moves his legs.

3. Association Neurons: These are also called **connector neurons.** These connect sensory and motor neurons and carry impulses between them. They are located in the brain and the spinal cord. They act as the mediator between incoming information from the receptors and the outgoing message carried by the effectors.

Reflexes:

A Reflex is a relatively simple, inborn, automatic response of some part of the body. For example, Knee jerk, the foot kicks forward if the appropriate tendon in the knee is struck. A simple circuit, the **reflex arc** occurs in the knee jerk. In this action only sensory and motor neurons are involved. Many reflex arcs are centered in spinal cord. Hence we call these actions as **spinal reflexes.**

They are automatic, requiring no conscious effort. For example, if a person accidentally touches a hot iron, he will immediately pull his hand away even before the brain registers as to what has happened. The nerve impulses bring the message (HOT) to the spinal cord, and the spinal cord commands through the other nerve impulses to pull the hand away from the iron. This is called **the reflex action** and the neural circuit underlying a reflex is called a **reflex arc**.

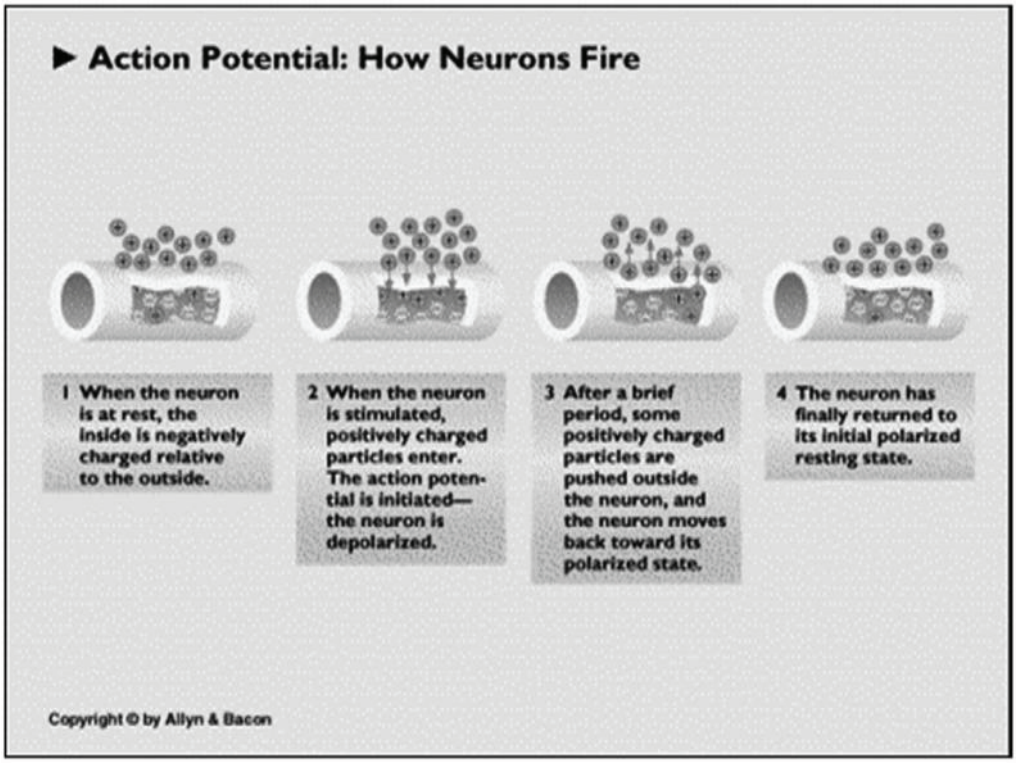


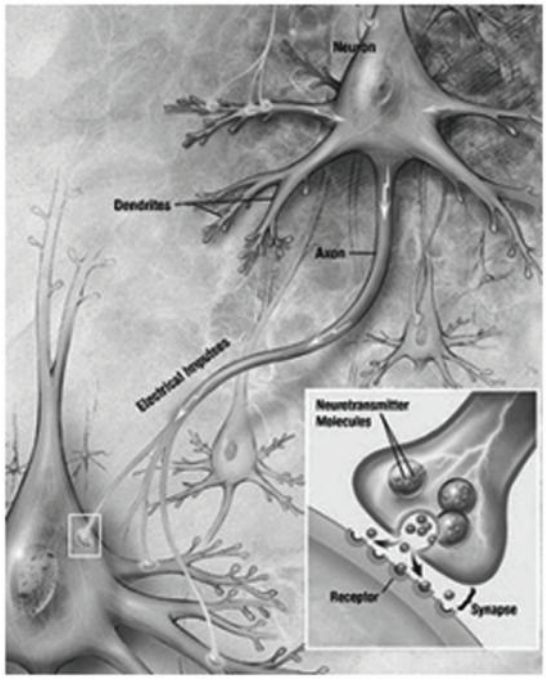
Reflex arc

Communication within neurons - An electrochemical process

The process by which neural impulses travel is electrochemical in nature. Chemical changes take place within neurons that cause an

electric charge to be transmitted along their lengths. There are fluids in the neuron that contain electrically charged atoms and molecules called **'ions'.** The organic and chloride ions are negatively charged. The potassium and sodium ions are positively charged. They flow back and forth across the cells membrane but do not cross at the same rate. There is a higher concentration of negatively charged ions inside the cell because of the difference in flow rates. It results in the neuron membranes being charged negatively on the inside and positively on the outside. This difference in voltage means that the neuron is at rest. It is a store of potential energy. The **resting potential** of a neuron is its stable, negative charge when the cell is inactive.





With the voltage of a neuron remaining constant, the cell is quiet and no messages are being sent. However, there is disruption in this stability, if there is stimulation of sufficient intensity. This alters the permeability of the cell membrane momentarily. When the neuron is stimulated, channels in the cell membrane open briefly allowing positively charged ions pumped out of the axon and nearon charge returns to negative. Action potential is a quick shift in the electrical charge across the cell membrane of neurons. The information is communicated within the neurons when there is disturbance along the membrane. The firing of the action potential in one segment of the axon triggers the firing of the action potential in the next segment and so on.

all or none response. It occurs either at full length or it does not occur at all. There is nothing in between. It is like firing a gun, one cannot half fire a gun. The same is true of neuron's firing of action potentials.

Communication between neurons

The neural impulse must be transmitted from the neuron to other cells. This transmission takes place at junctions called 'synapse'. The two

neurons do not touch each other. They are separated by the **'synaptic cleft',** a microscopic gap between the terminal button of one neuron and the cell membrane of another neuron. Signals have to jump this gap to permit neurons to communicate. The neuron that sends a signal across the gap is called **'pre-synaptic neuron'** and the neuron that receives the signal is called **'post synaptic neuron'.**

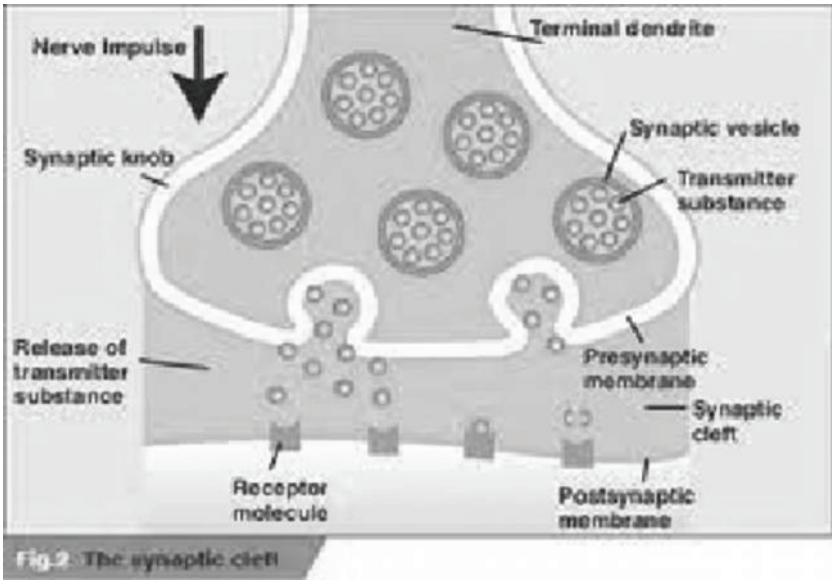


Fig.2 The synaptic cleft

There are two possible processes that occur, when one neuron influences -another. When one neuron induces a second neuron to fire, it is the **excitatory process.** Likewise, when one neuron induces another neuron not to fire, it is called the **inhibitory process.**

Neurotransmitters

Neurotransmitters are chemicals released at the synapse. The nervous system is dependent on these chemicals to communicate information between neurons. These neurotransmitters are fundamental to our behavior, playing a key role in everything from our muscle movements to our moods and health. There are several types of neuro transmitters.

1. **Acetylcholine (ACh):** This is found throughout the nervous system. It is involved in every move like typing, walking and talking. Breathing depends on ACh released to the muscles by motor neurons. Alzheimer's disease, characterized by the progressively degenerative disorder that ultimately produces loss of memory and confusion in its patients, is associated with a deficiency in the production of ACh.

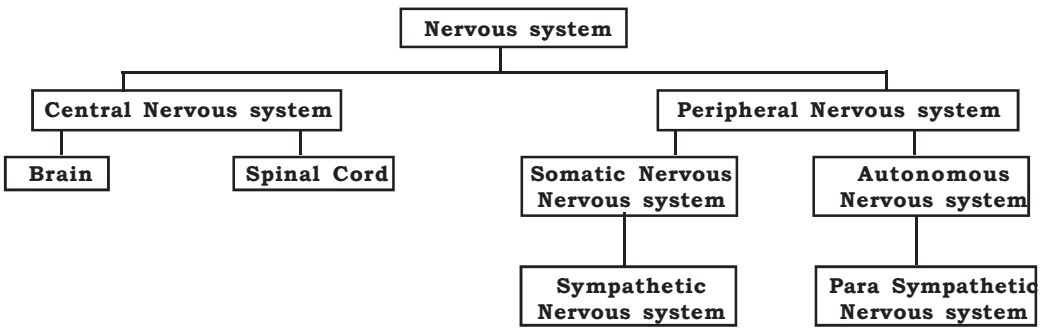
2. **Dopamine deficiency** in the brain, can result in **Parkinson's disease,** marked by varying degrees of muscular rigidity and shaking. Unusually **high levels of dopamine** result in **schizophrenia** and other severe mental disturbances.

3. **Norepinephrine** and **Serotonin** abnormalities have found to be linked with **depression** and other psychological disorders.

4. **Endorphins** are naturally secreted neurotransmitters similar to the opiates. They are found in the brain. They disrupt messages from our pain receptors. They are released by the body in response to pain and vigorous exercise.

The Nervous system

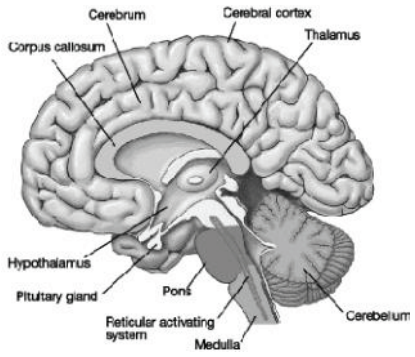
The nervous system is a highly complex one. The purpose of nervous system is to collect information, produce responses to stimuli and co-ordinate the working of different cells. The beginning of a nervous system are seen in the jelly fish and the worms. In simple organisms, which move, eat and eliminate wastes, the system may have one or two nerve cells. In human beings, the nervous system contains billions of cells, because of the complex tasks that they do.



To understand the nervous system, distinctions among its major parts have to be made. First is the **central nervous system** which consists of the **brain** and the spinal cord. Next is the **peripheral nervous system**. This contains neurons in all parts of the body like the legs, arms, face and so on. It carries impulses from the central nervous system to the muscles and glands. In the reverse direction, impulses are carried from the sense organs to the central nervous system. The peripheral nervous system is divided into **somatic nervous system** and the **autonomic nervous system**. The somatic nervous system controls the skeletal muscles and the sense organs. The autonomous nervous system controls the heart, lungs, and the digestive organs. Generally, the autonomous nervous system operates automatically, with little influence from the central nervous system. The autonomous nervous system is divided into the **sympathetic nervous system** and the **parasympathetic nervous system**. While the sympathetic nervous system arouses bodily reactions, the parasympathetic nervous system counteracts these bodily processes. These two systems strike a balance between excitement and calmness.

Central Nervous system:
The Brain

The greatest natural marvel is the brain. It is the most complicated and unique mechanism known to mankind. It is responsible for our behavior, noblest thoughts and simple urges. It is **soft, spongy and pinkish gray** in color. It weighs just about three pounds in an average adult and is made up of billions of nerve cells. It is bathed in a special nutritive fluid called the cerebrospinal fluid. The fluid nourishes the brain and provides a protective cushion. The interconnection among these cells is beyond anyone's comprehension. "Its ability to allow human intellect to flourish is most astonishing". In the words of Ornstein and Thomson,



The Human Brain

the structure of the brain is compared to a rickety house initially built for a small family, but then added to as late generations needed accommodation. In the end, we have a structure of layers, reflecting the evolution of the brain.

The brain is composed of three concentric layers that developed at different stages in evolution:

1. The primitive central core
2. the limbic system, which evolved upon this core at a later stage of evolution and
3. the **cerebral cortex** responsible for higher mental processes.

The Central Core:

When we move up the spinal cord from the base of the skull, we discover the structures of the central core of the brain. The first part consists of the **brain stem.** From the point of view of evolution, the brain stem is the oldest part of the brain. This contains the ascending and descending nerve fibers that connect the body with the higher brain structures. It has structures that regulate the complex reflexes like respiration, heart rate, temperature and appetite necessary for the maintenance of life.

Medulla:

The enlargement of the spinal cord, as it enters the skull is the medulla. Structurally the medulla is narrow and about an inch and a half long. It controls a number of critical body functions, the most important of which are respiration, heart beat and blood circulation. Other functions of the medulla include involuntary reflexes. If a mosquito flies towards the eye, we blink ,without thinking about it. The response is automatic and is controlled by the medulla. It also controls some reflexes that help individuals maintain an upright posture. Here, the major nerve tracts coming up from the spinal cord and those descending from the brain cross over, so that the right side of the brain receives sensory impulses from and controls the left side of the body and the left side of the brain receives sensory impulses from and controls the right side of the body.

Cerebellum:

The second and the most prominent structure of the central core is the 'cerebellum'. It is also called the **'little brain'.** It is found just above the medulla and behind the pons. It is a roundish structure about the size of a small fist, bulging out from the pons. It is concerned with a sense of balance and coordinates the muscles so that movement is smooth and precise. It regularly monitors feed back from muscles to coordinate their placement and movement. The specific movements made by the individual are initiated in the cortex, but their coordination and adjustment in context with the environment depend upon the cerebellum. For example, speaking in order to say what we want to say, our lips, mouth and tongue must coordinate with each other precisely. Most people can speak without mistakes, at the rate of several words per minute and the cerebellum is responsible for this action. It controls the intricate movements involved in the motor activities of various muscles. Once learnt, these complex movements are programmed into the cerebellum and occur subsequently in an automatic manner. In addition the cerebellum is involved in several intellectual functions ranging from analysis of sensory information to problems solving.

Damage to the cerebellum makes a person clumsy and un-co-ordinated. His movements are jerky. He staggers and trembles while moving. He has difficulty in performing simple movements such as walking automatically. He might have trouble in using a pen, threading a needle or riding a bicycle. Sometimes, the speech becomes slurred.

Pons:

'Pons' means **bridge.** It is a bulge in the stem. It plays the role of a relay station, in sorting out and relaying sensory messages from the spinal cord to the other parts of the brain and from these parts of the brain back to the spinal cord. In addition, it joins the two halves of the cerebellum. It acts as a transmitter of motor information coordinating muscles and integrating movement between the right and left halves of the body. It also plays a role in sleep and wakefulness.

Reticular Activating System:

A large structure occupying the core of the brain stem is the reticular activating system. It is essentially a dense network of neurons and has connections with many higher areas of the brain. Because it is centrally located, it plays a coordinating role linking parts of the brain. It is an ever vigilant guard that can quickly activate other parts of the brain to produce general bodily arousal. If you are startled by a loud noise, your reticular formation can put you into a heightened state of awareness, so you can decide what kind of response is necessary. It screens the incoming information. Irrelevant information is filtered out. Important information is passed onto higher centres. In addition, it serves another function. It can filter out background stimuli to allow a person to sleep undisturbed. The reticular activating system also appears to play a role in attention when several messages enter the nervous system at a time. The reticular activating system decides which is most urgent. Some messages may be toned down, while others may never reach higher centres. Damage to this area can cause coma.

Thalamus:

It is located just above the brain stem, but inside the cerebral hemispheres. It consists of two egg shaped groups of nerve cell nuclei. One region of the thalamus acts as a busy 'relay station', mostly for information concerning senses. Messages from eyes, ears and skin travel to the thalamus to be communicated upward to higher parts of the brain. It also integrates and organizes them, making sure that specific message from the eyes and ears are directed to the appropriate part of the brain. Another region of thalamus plays a significant role in control of sleep and wakefulness and is also considered a part of the limbic system.

Hypothalamus:

It is a tiny bean shaped structure right under the thalamus (hypo means 'under'). It is small in structure about the size of a finger tip, but involved in powerful drives that are associated with survival of the individual like hunger, thirst, emotion, sex and re-production. Centres in the hypothalamus govern eating, drinking and sexual behaviour. It also plays an important role in emotions. Another of its major function is to maintain 'homeostasis', a steady internal envi-

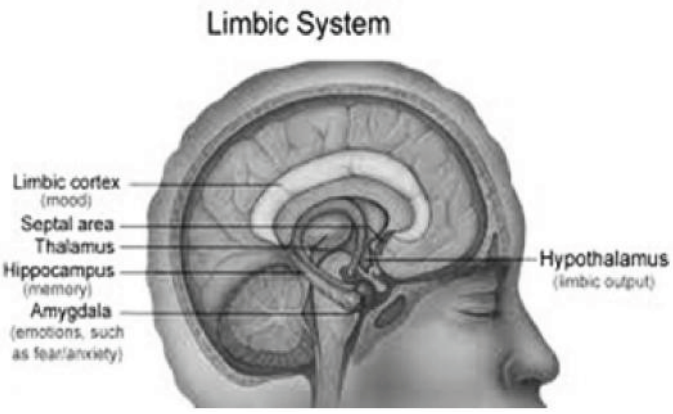
ronment for the body. It monitors the amount of nutrients stored in cells, in addition to regulating body temperature. It controls the complex operations of the autonomic nervous system. Hypothalamus controls hormonal reactions to fear and stress. Hanging down from the hypothalamus and connected to it by a short stalk is the **pituitary gland**. It is also called the **"master gland",** because it controls other endocrine glands of the body.

Basal ganglia:

They are a group of sub cortical structures to the left and right of the thalamus. They are damaged in Parkinson's disease that impairs the control of the movements. They do not control movement directly. They also contribute to other complex behaviours.

The Limbic System:

Encircling the central core of the brain, along the inner edge of the cerebral hemispheres are number of structures which together form the limbic system (**Latin word meaning border).** This system programmes the sequential activities necessary to satisfy some basic motivational and emotional needs controlled by the hypothalamus. In animals, activities like feeding, attacking, fleeing from danger appears to be governed by the limbic system. It is also closely involved in emotional behavior. Patients with damage to this system are unable to carry out a sequence of actions. Small distractions make them forget what they have set out to do.



One structure within the limbic system called the **amygdala** produces rage and aggression. Another structure is the **septum** which

lessens these responses. Another feature of the limbic system is the **hippocampus.** It has the shape of a sea horse. It is larger in human beings than in any other species. Its duty is to compare sensory messages with what the brain has learnt to expect about the world. It has been called the 'gateway to memory'. Along with other areas of the brain, it helps us to store new information for future use. When the hippocampus is damaged, people are unable to remember events. It also houses many pleasure centres, the areas when electrically stimulated seem to bring pleasure. Thus the limbic system is involved in several important functions including self preservation, learning and memory.

The Cerebral Cortex

So far, the focus has been on the areas of the brain that control functions similar to those found in less sophisticated organisms. Some unique features of the human brain are embodied in the ability to think, evaluate and make complex judgments. The location of these abilities along with others is the cerebral cortex. It is the recent addition in the evolution of the brain.

In Latin, cortex means **'bark'.** The cortical areas of the brain are gray because it consists largely of nerve cell body and unmyelinated fibers. It is therefore called the gray matter. The inside of the cerebrum is composed mostly of myelinated axons and appears white.

The cerebrum is highly developed in human beings than in any other organism. The cerebral cortex is layer of nerve cell bodies about three millimeters thick.

The cortex has many deep wrinkles. It looks like a crumpled piece of paper with many ridges and valleys. The ridges are called 'gyrus' and the valleys are called **'sulcus'** and the deep ones are called **'fissures'**. The folds in the brain's surface enable it to contain its billions of neurons. It consists of a mass of convoluted tissue deeply folded that accounts for 80% of the brain's total mass. It is one twelfth of an inch thick. When flattened out, it covers an area of about two feet square. This permits a high level of integration of neurons and allows the processing of

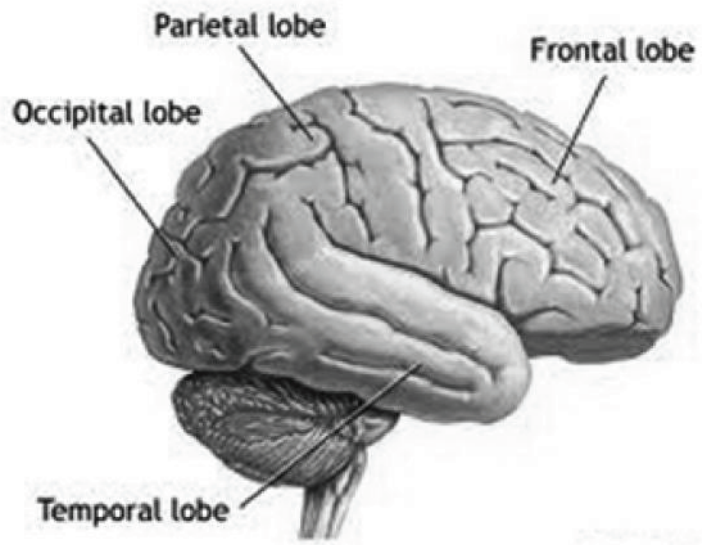
information also. It has the final say in both organizing information sent by other structures and initiating responses.

A view from the top reveals that the cerebral cortex is composed of two structures. They are more or less symmetrical. These are the cerebral hemispheres, one on the right and the other on the left with a deep division into right and left hemispheres. The functions of the right side of the body are controlled by the left hemisphere and the functions of the left side by the right hemisphere. They are connected by a bundle of nerve fibers called the **'corpus callosum'.**

In order to understand the brain, researchers have divided each cortical hemisphere into four separate regions called lobes. They are **the frontal, parietal, occipital and temporal lobes**. Two long shallow fissure within the surface of the cortex separate these four lobes.

1. The Frontal Lobe:

The frontal lobe is the largest of the four lobes in each hemisphere. It is located in front of the brain, just under the skull in the area of the forehead. It is an important centre for **motor and association cortex.** The motor cortex issues orders to about 600 muscles of the body that produce voluntary movement. A large area of the motor cortex is used exclusively by muscles involved in talking, thus reflecting the critical role of speech. Nerve fibers that descend from the motor cortex on one side of the brain activate muscles on the opposite side of the body. Thus the left hemisphere controls the right side of the body and the right hemisphere controls the left side of the body. **Paul Broca (1861)**, a French neuro surgeon in the nineteenth century reported that damage to a particular area of the left frontal lobe caused difficulty in speaking. Subsequent researchers have confirmed that this frontal region is the primary centre for controlling speech. Speech becomes haltingly laborious and often ungrammatical. The speaker is unable to find the right words. It is called the Broca's area after its discoverer. The association areas of the frontal lobe are responsible for problem solving, setting goals, adapting to new situations, planning and decision making. It also influences our emotional life.



Lobes of the brain

2. The Parietal Lobe:

The parietal lobe is located at the top of the brain. The area covered by these lobes is called the **somatosensory cortex,** which receives information about pressure, temperature, touch and pain from all over the body. Just like the motor cortex, the somatosensory areas in each hemisphere receive sensory input from the opposite side of the body. Sensory messages inform us what the movable parts of our body are doing at every moment. It is this ability that enables us to perform a simple task such as touching our nose with our eyes shut. Certain parts of the sensory cortex are associated with certain body parts. The areas pertaining to the hands and face are large, since these parts are particularly sensitive.

3. The Occipital Lobe:

The occipital lobe is located at the lower back part of the brain. It consists of the **visual cortex** which is a complete network of neurons devoted to seeing. The eyes receive the sensory information ; the

visual cortex integrates the information into electrical pattern, which the brain translates into vision. The visual cortex of each hemisphere receives sensory messages from both eyes. Damage to the occipital lobe results in varying degrees of impaired visual cognition ranging from partial to complete blindness.

4. The Temporal Lobe:

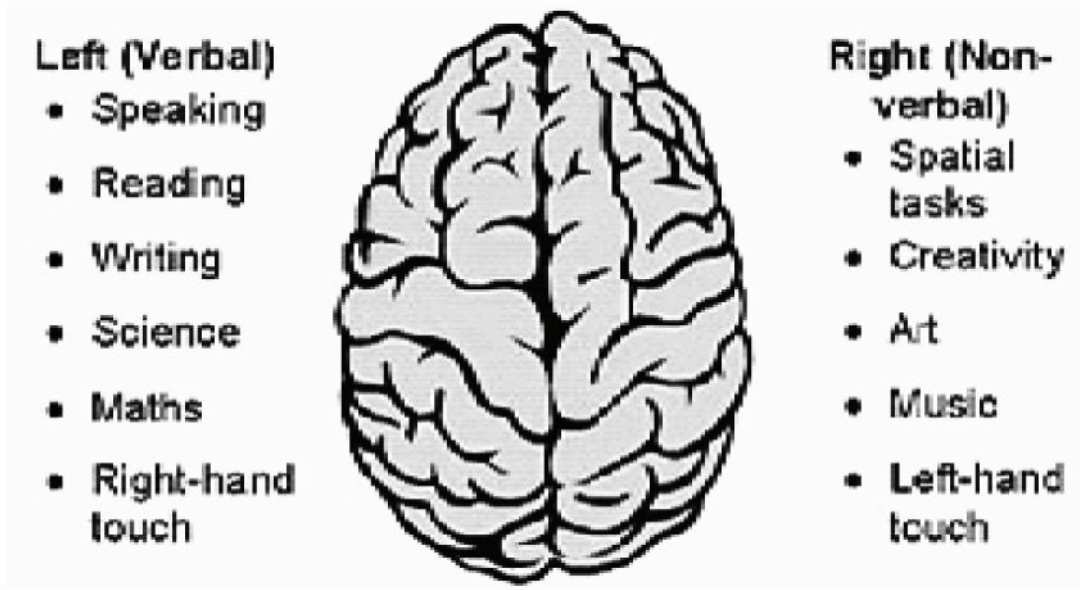
The temporal lobe is located at the sides of the brain just above the ears behind the temples. It is involved in emotion, perception, memory and language comprehension. It contains the **auditory** cortex which processes sound. The auditory cortex receives information directly from the auditory system. These auditory signals are transmitted to an adjacent structure known as **Wernicke's area (1874),** which interprets sounds of human species. Wernicke's aphasia occurs when there is difficulty in both, understanding others' speech and in producing language. This disorder is characterized by speech that sounds fluent but makes no sense.

The descriptions given are simplified ones. There is considerable overlap in what the various lobes do.

Each of these three concentric structures of the brain - a central core, the limbic system and the cerebral cortex has specialized functions, but they work together to produce the most effective results.

Significance of Right and Left Brain:

The cerebrum which is the seat of complex thought is divided into two separate halves called **hemispheres**. Hemispheres control the side of the body, opposite to their location. **The left hemisphere of the brain controls the right side of the body and the right hemisphere controls the left side of the body.** Thus damage to the right side of the brain is typically indicated by functional difficulties in the left side ,of the body. The degree to which the left or right hemisphere controls various cognitive and behavioral functions is known as **lateralization.**



Functions of the hemispheres

The left hemisphere controls our ability to express ourselves in language. It performs complex logical and analytical activities and is proficient in mathematical computations. It controls speech, reading, writing, reasoning and arithmetic. It operates in a logical analytical mode, focuses on details and perceives in terms of individual features rather than holistic pattern. The right hemisphere comprehends simple language. It has a highly developed spatial and pattern sense. It is superior to the left hemisphere in constructing geometric drawings. It can assemble colored blocks to match a complex design much more effectively than the left hemisphere. It plays a role in musical, artistic abilities, drawing, in perception of complex geometric patterns and understanding of spatial relations. It is effective on tasks that require the visualization of relationships. The right hemisphere also shows more emotional and impulsiveness than its companion.

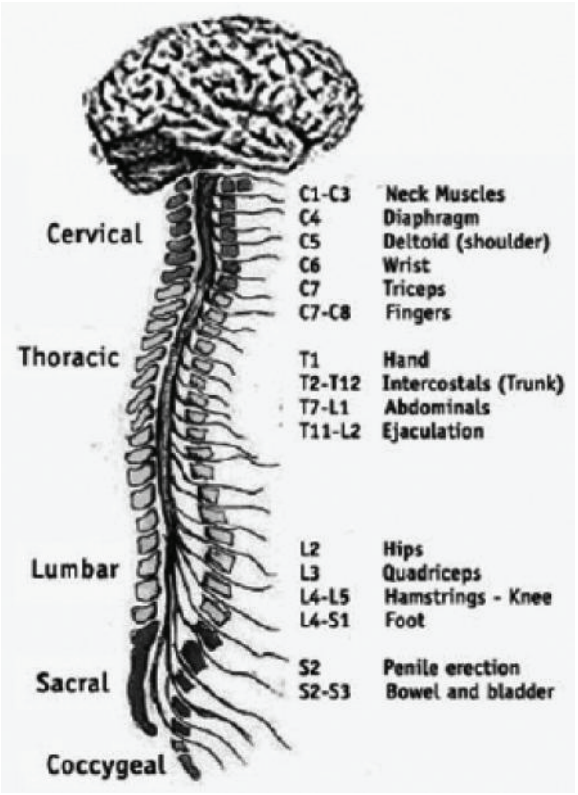
Some researchers have speculated that individual differences in cognitive style are related to individual differences in the relative efficiency of the two hemispheres. Thus individuals who are very logical, analytical

and verbal would have highly efficient left hemisphere functions, whereas those who are unusually holistic, musical, intuitive and impulsive would have a balance in favor of right hemisphere.

Spinal Cord

The spinal cord is as thick as a pencil. It is a large rope like, segment of nerve tissues that leaves the brain and runs down the length of the back. Sometimes it controls certain simple kinds of behavior on its own without involving the brain. These behaviors are called **spinal reflexes.**

At other times, the response is modulated by messages from the higher nerve centres. It is protected by the bony spinal vertebrate. It is compared to a large cable network, which exchanges innumerable messages with the central receiving and transmitting station. It is composed of thirty one divisions or segments. Each segment has a pair of spinal nerves. There are thirty one pairs, one serving the right and the other serving the left side of the body. The spinal nerves run in and out from the cord between vertebrae. Each nerve consists of two roots, a **dorsal root** towards the back which contains sensory fibers and a ventral root towards the front of the body which contains motor fibers. The dorsal root carries afferent impulses (sensory) and the **ventral root** carries efferent (motor impulses). In the event of any damage or injury to the dorsal fibers, one would lose sensitivity in the part of the body connected with them. Likewise, the parts of the body connected with the ventral fibers, would be paralyzed, if they were to be damaged. A butterfly shaped mass of **gray matter** is located at the centre of the spinal cord. This area contains connector neurons and other cells. The **white matter** surrounds the gray matter and is composed of the ascending and descending neural column. The grey matter is concerned with the first level of integration because it contains the connector neurons necessary for reflexes. The white matter which contains ascending and descending fibers serves the second purpose of the spinal cord by transmitting impulses to and from the higher centres of integration in the brain. The spinal cord has three major functions.



Spinal cord

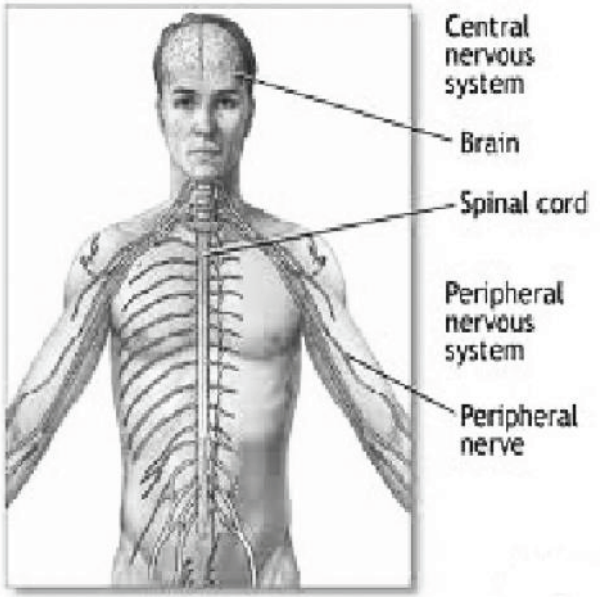
1) It carries sensory information through afferent nerve fibers from receptors throughout the body to the brain and conducts information through efferent nerve fibers from the brain to the muscles and glands.

2) It plays an important role in reflex actions. These are automatic actions evoked rapidly by particular stimuli. The simplest reflex may involve a sensory neuron, motor neuron; inter neuron and a part of the spinal cord. The path of the reflex action is called the reflex arc. Spinal reflexes permit us to react to potential dangers very quickly.

3) Another important function is bodily movement. If the spinal cord is damaged by injury or disease, it results in paralysis, as it plays a critical role in transmitting signals from the brain to the motor neurons that move the body's muscles.

The Peripheral Nervous system

Peripheral means out going. The peripheral nervous system includes nerve fibers and nerve cells lying outside the central nervous system. It includes neurons that connect the central nervous system to other parts of the body. It plays the function of sending impulses coming from the senses to the central nervous system and impulses from the central nervous system to muscles and glands. There are **forty three major pairs** in the human body divided into two groups. **Twelve pairs** of nerves connect directly with the brain. The portion of the skull that contains the brain is known as the **cranium.** These nerves are called **cranial nerves.** They extend from the head, neck and body, directly into the cranial cavity. These involve motor function, which helps us to move the eyes, tongue, jaw and parts of the neck. The remaining **thirty one pairs** called the spinal. nerves, project outward from spaces between the vertebrae in the spinal column to various parts of the body. These serve the chest, trunk and extremities. Impulses from sensory fibers give rise to sensations of the skin. Motor fibers carry impulses involved in moving legs, portions of the trunk and arms. The peripheral nervous system is not a coordinating system. It brings impulses to and from the coordinating centres in the central nervous system.

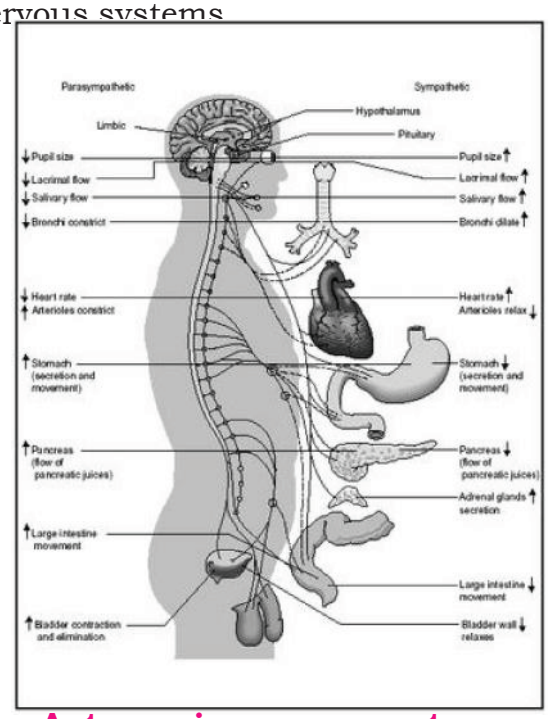


The central and Peripheral nervous system

The **Peripheral nervous system** is further divided into two parts, the **somatic** nervous system and the **autonomic** nervous system.

The somatic nervous system controls the skeletal muscles of the body and specializes in the control of voluntary actions. When you switch off a light or write something, your somatic system is active. The afferent nerve fibres (sensory) carry information about the external stimulation from the skin and the muscles to the central nervous system. The efferent (motor) fibres carry impulses from the central nervous system back to the body parts where action is initiated. The somatic nerves are **'two way streets**' with incoming and outgoing lanes.

The autonomic nervous system works automatically without a person's conscious control. It specializes in the control of involuntary functions. It also has nerves that connect to the heart, blood vessels, smooth muscles and glands. It controls automatic involuntary visceral functions that people do not normally think about; such as heart rate, digestion, perspiration, etc. It controls the physiological arousal when people experience emotions. It is sub divided into two parts viz., the sympathetic and the parasympathetic nervous systems.



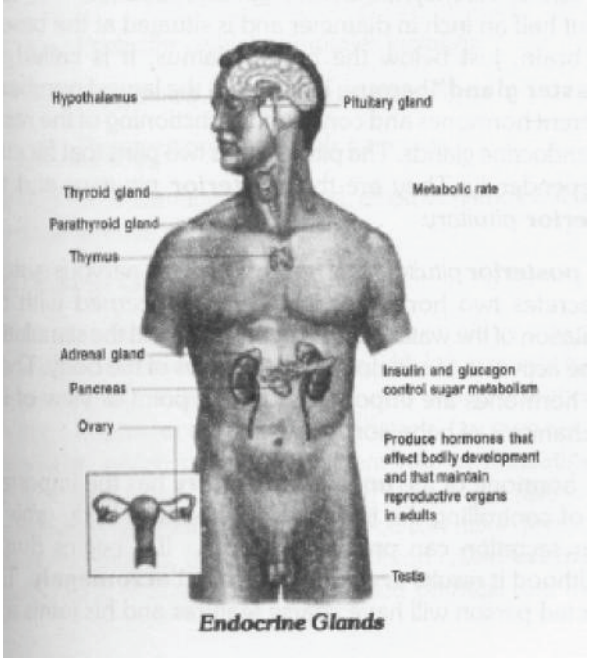
Autonomic nervous system

The sympathetic division prepares the body for action by mobilizing the body's resources for emergency. It slows down the digestive processes, pumps blood, supply to the periphery preparing the body for action or drains blood from the periphery lessening bleeding in case of an injury. It creates the 'fight or flight' response. The sympathetic nerves are responsible for sending signals to the adrenal glands for further action.

The parasympathetic division helps the body to conserve energy. When the parasympathetic nerves are activated, it slows the heart rate, reduces blood pressure and promotes digestion. If an individual suddenly comes across a speeding car on the road, the sympathetic nerves increase the heart rate. Afterwards the parasympathetic nerves slow it down again and keep the rhythm regular. Both systems are involved in emotion and stress and work in a coordinated manner.

The Endocrine system

The **endocrine** system is a chemical communicative network that sends messages throughout the nervous system through



Endocrine glands

the blood stream .The endocrine glands are also called **ductless glands.** They discharge their secretions called hormones directly into the blood stream. Endocrine means **'internally secreting'** and these secretions are important in the regulation of body processes and activity.

Hormones are chemical substances that play a role in the growth of living tissue, conservation of energy and utilization of food. Together these processes are known as metabolism. The glands are not a part of the nervous system but closely connected to the brain and work in association with it to affect behavior as well as processes like reproduction and growth. Following are the endocrine glands given in detail.

1) Pituitary Gland:

It is one of the major endocrine glands. It is oval in shape, about half an inch in diameter and is situated at the base of the brain, just below the hypothalamus. It is called **'master gland'** because it produces the largest number of different hormones and controls the functioning of the rest of the endocrine glands. The pituitary has two parts that function independently. They are the **'posterior pituitary'** and **'anterior pituitary'.**

The **posterior pituitary** is an extension of the nervous system. It secretes two hormones which are concerned with the regulation of the water balance of the body and the stimulation of the activities of certain smooth muscles of the body. These two hormones are important from the point of view of the mechanisms of behavior.

The hormone of the **anterior pituitary** has the important job of controlling the timing and amount of body growth. Over-secretion can produce a **giant.** If it begins during adulthood it results in a condition called acromegaly. The affected person will have coarse features and his joints and extremities will be enlarged. A severe deficit during childhood can result in **dwarfism,** also known as a midget. The person will be very short for his age and will have sharp features. The other hormones secreted by the pituitary gland can be grouped as follows:

a) Those that affect the skeletal growth, protein, fat and carbohydrate metabolism, and secretion of milk.

b) The hormones which control the functions of all other glands for example.

i) Thyrotropic – controls the thyroid gland

ii) Adrenocarticotropic (ACTH) – controls adrenal glands

iii) Gonadotropic – affect sex glands

iv) Prolactin – which stimulates lactation

v) Progestron – stimulates maternal urge

vi) Pancreatropic – controls pancreas

If this gland is damaged or injured, all other glands will under go degenerative changes.

2) Thyroid Gland:

They are located at the base of the neck on either side of the wind pipe. It is brownish red in colour, with left and right halves. They look like a butterfly's wings and weigh less than an ounce. It produces a very important hormone called **thyroxin,** which plays a significant role in regulating the body's metabolism. Under secretion of thyroxin, also known as **hypothyroidism** during childhood can have devastating effects on infants. It leads to a condition called **cretinism.** Cretinism is characterized by retarded physical and mental growth. They have poor body proportions, low metabolic rate, a broad nose, dry skin and poor mental activity. If in later life, hypothyroidism slows metabolism, the person feels depressed, is sluggish and might gain weight. There is slow growth, muscle weakness, irregular menstrual periods in girls , dry skin, hair loss, poor memory and difficulty in **concentration.** On the other hand, too much thyroxin leads to a condition called **hyperthyroidism.** It can cause nervousness, irritability, fatigue, a fast heart beat and increased perspiration. Other symptoms include weight loss, an elevated body temperature, thirst and general excitability. The eyes may feel irritated and the tissues around the eyes appear to bulge out.

Although these are two different conditions, in both hypo and hyper conditions, the thyroid can become larger than usual. An enlarged thyroid

gland is a lump characterized by swelling under the skin at the front of the neck. When it is, large enough to be seen, it is called a **goiter.** Enlarged thyroid can also develop when people do not get enough iodine in their diets.

3) Parathyroid Glands:

They are oval shaped glands embedded in the thyroid gland. They produce **parathormone** which plays a role in the regulation of calcium levels in the blood. Precise calcium levels are important for the human body. Small variation can cause muscles and nerve impairment, which in turn affect behaviour.

4) Thymus Gland:

It is a mass of glandular tissues located in the upper chest. It is soft, flat and pinkish grey in color. It weighs 1/3 to one half ounce at birth. It continues to grow throughout childhood and reaches its peak weight at puberty. Thereafter under the influence of many factors, it shrinks in size until it is gradually replaced by fat and connective tissue. Much of the thymus gland typically atrophies by the age 20 and the decline takes place throughout life there after. It plays an important role in the development of the child's **immune system.**

5) Pancreas

It is located near the stomach. It produces **insulin** which plays an important role in the body's use of glucose. It affects appetite also. Variations in the production of insulin in the body cause a change in human behavior. High blood sugar causes irritability and depression. Low blood sugar sometimes causes seizures that last for a few minutes.

6) Adrenal Glands:

They are located just above the kidneys. They are orange colored, triangular in shape and measure about one ½inch in height and 3 inches in length. Each adrenal gland has **two** parts, the **inner core** is the **adrenal medulla** and the outer region is **the adrenal cortex.**

a) Adrenal medulla: it helps a person in coping with physical and

emotional stress and prepares the organism in a number of ways for an emergency. It secretes **epinephrine** (also called adrenalin) and **norepinephrine** (noradrenalin). **Epinephrine** helps in increasing the heart rate, facilitates the blood flow to the muscles and the brain. It causes relaxation of the smooth muscles and helps in the conversion of glycogen to glucose in the liver. It helps in the constriction of the blood vessels in the stomach and intestines. All these changes help us to deal with the emergency situations.

Norepinephrine - helps the organism for emergency action. In its travel through the blood stream, when it reaches the pituitary, it stimulates it to release a hormone that acts on the outer part of the adrenal gland. It thus stimulates the release of adrenocortical hormones. They help in the release of sugar stored in the liver, so that the body has energy for quick action. This hormone has little effect on smooth muscles and metabolic processes.

b) Adrenal Cortex: This is the outer portion of the adrenal gland. It secretes hormones that have an effect on the body's metabolism and on chemicals in the blood. It produces other hormones necessary for fluid and electrolyte (salt) balance in the body. When the secretions are less, the individual undergoes a marked change in behaviour. He becomes weak and lethargic, loses appetite and suffers from break down of physiological functions.

7) Sex Glands:

These are also called **gonads.** They are **testes in the male** and **ovaries in the female**. The testes produce **androgens** and the ovaries produce **estrogen.** Estrogen is responsible for the development of secondary sex characteristics of females. They also regulate several aspects of pregnancy. Androgen is responsible for secondary sex characteristics of males. They also affect sperm production and male sex drive. Cessation of these harmones results in menopause in women and climacteric in men. Consequently, reproduction comes to an end. These glands are controlled and regulated by **gonadotropic** hormone of the pituitary gland. Variation in the hormonal output may result

impotency in men and frigidity in women. Under secretion leads to the individual being sexually immature and the secondary sex characteristics do not emerge.

Exocrine Glands

The exocrine glands are the glands of **external secretion.** Most glands of the body are exocrine. They have **ducts** connecting to anatomical surface. The Tear, sweat and mammary. The **sweat glands** deposit their product on the body surface.

ACTIVITIES

Activity - 3.1:

Have a diagram of the brain and ask interested classmates to name different parts of the brain and their functions.

Activity - 3.2:

Discuss the importance of each gland in relation to behavior with your friends.

Activity - 3.3:

Observe the behavior of your classmates having working and non-working mothers, ask them to report the advantages and disadvantages.

PART - A

Points to remember

1. **Heredity**: determines the potentiality for development and behaviour and also gives us the cause for the individual differences.
2. **Cell:** Human life begins as a single cell and grows into an individual made of trillions of cells. Each containing a replica of the original code.
3. **Genes:** Genes are the carriers of Hereditary information.

4. **Chromosomes:** Chromosomes are thread like structure made up of DNA
5. **Mitosis:** is a process of cell division after conception.
6. **Meiosis:** Meiosis is a special form of cell division in which the number of chromosome is reduced by half.
7. **Gametes:** are also called sex cells-fusion of the sperm and the ovum. Gametes are formed through cell division called Meiosis.
8. **Fertilization:** The fusion of the mature sperm with the mature ovum results in the process of fertilization leading to a new life called Zygote.
9. **Sex determinants:** When a ovum is fertilized by a 'X' carrying sperm the resulting life will be female, whereas when the ovum is fertilized by 'Y' carrying sperm will be a male.
10. **Dominant gene:** If one gene of a pair has greater influence it is called a dominant gene.
11. **Recessive gene:** The one gene which does not express its trait because of the potential influence of the other, becomes, the recessive gene.
12. **Mutation:** a sudden but permanent change in a segment of DNA results in mutation.
13. **Chromosomal abnormalities** are caused when the chromosomes do not separate properly during meiosis. Or when mutant genes are inherited abnormalities can occur. Or when the sperm or the ovum does not ave normal set of 23 chromosomes, abnormalities like Down's Syndrome Occur.
14. **Cloning:** A clone is an identical copy created intentionally with the help of cloning technologies.
15. **Environment:** Environmental influences include parenting, family patterns, schooling and neighbourhood qualities. Genetic and environmental influences blend and become indistinguishable in the development of an individual.

PART – B

Points to remember

Neurons	Are the basic units of the nervous system. It consists of a cell body, dendrites, an axon, terminal buttons and the myelin sheath. These neurons communicate with each other, by secreting neurotransmitters. These trigger chemical and electrical processes known as the action potential. Neurotransmitters play a significant role in mood, memory, and psychological well being.
A reflex action	Is automatic and requires no conscious effort. For example, if a person accidentally touches a hot iron, he will immediately pull his hand.
The nervous system	Is the main integrating system of the body. It is divided into the central nervous system consisting of the brain and the spinal cord. It is responsible for processing, interpreting and storing information and also issues orders to the muscles, glands and organs.
Central nervous system	Consists of Brain and Spinal cord.
The peripheral nervous system	It divided into somatic nervous system, which controls the voluntary actions and the autonomic nervous system which controls the heart, lungs and digestive organs.
The autonomic nervous system	Is divided into sympathetic nervous system and the parasympathetic nervous system. The sympathetic nervous system mobilizes the body for action and the parasympathetic nervous system conserves energy.

The spinal cord	Consists of nerve tissues. It leaves the brain and runs down the length of the back. Each spinal nerve consists of two roots. The dorsal and the ventral root. It is compared to a large cable network, which exchanges numerous messages with the central, receiving and transmitting them.
A brain	Is composed of three concentric layers that developed at different stages in evolution. i) The primitive central core ii) The limbic system iii) The cerebral cortex
	The medulla Controls respiration, heart beat and blood circulation.
The cerebellum	Is concerned with a sense of balance and coordinates the muscles so that the movement is smooth and precise.
The pons	Play the role of relay station in sorting out and relaying sensory messages from the spinal cord to the other parts of the brain back to the spinal cord.
The reticular activating system	Screens the incoming information. Irrelevant information is filtered out.
Thalamus	One region acts as a busy relay station, while another region plays an important role in controlling sleep and wakefulness.
Hypothalamus	Under the thalamus is the hypothalamus, which is associated with the survival of the individual like hunger, thirst, emotion and sex. Hanging down from the hypothalamus

	is the pituitary glands, which controls other endocrine glands of the body.
The Limbic system	This consists of a number of structures. It helps in carrying out sequential activities. Another feature of the limbic system is the hippocampus. Its duty is to compare sensory messages with what the brain has learnt to expect about the world. It is also called the 'gateway to memory'.
Cerebral Cortex	It contains billions of neurons and has many deep wrinkles. It has the final say in both organizing information sent by other structures and initiating responses. There is also the presence of the cerebral hemispheres, one on the right and the other on the left. The functions of the right side of the body are controlled by the left hemisphere and the functions of the left side, by the right hemisphere. The corpus callosum connects the two hemispheres.
The cerebral cortex	Is divided into four regions called lobes. i) Frontal lobe: It is located in front of the brain. It is an important centre for motor and association cortex. ii) Parietal lobe: It is located at the top of the brain. The area is covered by somatosensory cortex which receives information about pressure, temperature, touch and pain from all parts of the body.

iii) Occipital lobe: It is located at the lower back part consists of the visual cortex which helps in seeing.

iv) Temporal lobe: It is located at the sides of the brain. It is involved in emotion, perception, memory and language comprehension.

Endocrine glands — They secret hormones that are directly released into the blood stream which takes it throughout the body. Hormones are chemical substances that play a role in the growth of living tissues.

The endocrine glands are

a) Pituitary Gland (master gland) — Situated at the base of the brain. It controls the functioning of the rest of the endocrine glands. Over secretion produces a giant and deficit during childhood produces a dwarf.

b) Thyroid Glands — Are located at the base of the neck on either side of the windpipe. It produces thyroxin which regulates the body's metabolism.

Hypothyroidism (under secretion) produces a cretin.

Hyperthyroidism (over secretion) causes nervousness, irritability, fatigue, and increased perspiration.

Goiter: an enlarged thyroid gland.

c) Parathyroid Glands — They are embedded in the thyroid gland. It produces parathormones

	which plays a role in the regulation of calcium levels in the blood.
d) Thymus Gland	It is located in the upper chest. It plays an important role in the child's immune system.
e) Pancreas	It is situated near the stomach. It produces insulin which plays a role in the use of glucose.
f) Adrenal Glands	Are situated above the kidneys. It is divided into two parts. Adrenal medulla and adrenal cortex. Adrenal medulla produces epinephrine which causes relaxation and norepinephrine that helps during emergency.
g) Sex Glands	They are testes in the male and ovaries in the female. The testes produces androgen which is responsible for the secondary sexual characteristics in male. The ovaries produce estrogen that is responsible for the development of secondary sexual characteristics in females.

QUESTIONS

PART –A

1. What is Heredity?
2. What are genes, chromosomes and DNA?
3. Mention the 2 types of cell division.
4. What is fertilization?
5. Mention the three prenatal stages.
6. What is gene mutation?

7. What is the difference between identical and fraternal twins?
8. Explain chromosomal abnormality.
9. What are dominant and recessive genes?
10. What is cloning?
11. Write about relative importance of heredity and environment.
12. Write a note on external environment.

PART – B

1. Mention the parts of Neuron with the simple diagram.
2. What is the function of reflex arc?
3. Mention the parts of the brain.
4. What are the functions of sympathetic and parasympathetic nervous system?
5. Name the endocrine glands.
6. What are exocrine glands? Give example.

CHAPTER – IV

Human Development

Meaning of Development

Development is the pattern of progressive, orderly, and predictable changes that begin at conception and continue throughout life. Development involves changes during growth, and decline during old age.

Development, is connected to physical changes. These are commonly observed at home with siblings, with parents and grandparents, in school with peers, and all the others around us. From conception until the moment of death, we not only change physically, but we also change in the way we think, use language, and develop social relationships. Changes are not confined to any one area of a person's life; they occur in the person in an integrated manner.

Development is influenced by an interplay of biological, cognitive, and socio-emotional processes. Biological Development is predominantly related to genes inherited from our parents. For example physique and physical features. The role of **cognitive processes** in development relate to mental activities associated with thinking, reasoning, problem solving and decision making. **Socio – emotional processes** that influence development refer to changes in an individual's interactions with other people, and the spirit of competition and the sense of co-operation.

These processes influence changes in development of the individual as a whole throughout the human lifespan.

Life – Span Perspective on Development

The study of development according to the Life Span Perspective (LSP) includes the following assumption:

1. Development is lifelong, i.e., it takes place across all age groups starting from conception to old age. It includes both achievement and failures, which influence in dynamic (change in one aspect goes with changes in others) ways throughout the life – span.
2. The various processes of human development i.e., biological, cognitive and socio-emotional are interwoven in the development of a person throughout the life span.
3. Development is multi-directional. Some dimensions or compoents of a given dimension of development may increase, while others show decrement. For example, the experiences of adults may make them wiser and guide their decisions. However with an increase in age, one's performance is likely to decrease on tasks requiring speed, and accuracy.
4. Development is highly plastic i.e., within person, modifiability is found in psychological development, though plasticity varies between individuals. This means skills and abilities can be tuned throughout one's life.
5. Development is influenced by historical conditions. For example the experiences of 20 year olds who lived through the freedom struggle in India would be very different from the experiences of 20 year olds of today living in liberated India.
6. Development is the concern of a number of disciplines. Different disciplines like psychology, anthropology, sociology, and neuro-sciences study human development, each trying to provide answers to development throughout the life span.
7. Each individual responds and acts depending on contexts, which include inherited traits, the physical environment, social, historial and cultural context.

Factors Influencing Development

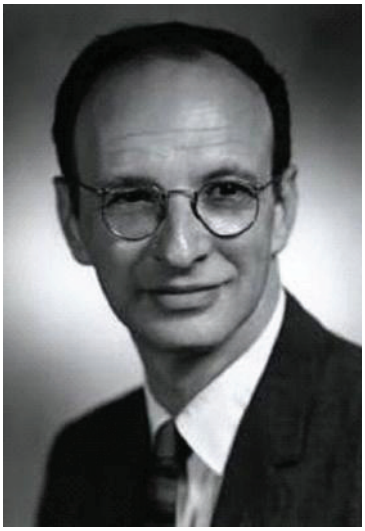
The entire collection of genes within the individual is known as **genotype.** However, not all of this genetic material is apparent or distinctly identifiable in our observable characteristics. **Phenotype** is the way an individuals' genotype is expressed in observable and measurable characteristics. Phenotypes include physical traits, such as height, weight, eye colour, skin colour and texture, and many of the psychological characteristics such as intelligence, creativity and personality. These observable characteristics of an individual are the result of the interaction between the person's inherited traits and the environment. It is the genetic code which predisposes a child to develop in a particular manner. Genes provide a distinct blueprint and timetable for the development of an individual. But genes do not exist in isolation and development occurs within the context of an individual's environment. This makes each individual unique.

A child's genotype (what s/he has inherited) such as being co-operative, and attentive is likely to result in teachers and parents giving more pleasant response as compared to children who are not co-operative or not attentive. Besides these, children themselves, choose certain environments based on their genotype. For example, because of their genotype, children may perform well in music or sports and they will seek and spend more time in environments, which will enable them to perform their musical skills, similarly an athlete would seek sports related environment. These interactions with environment keep changing from infancy through adolescence. Environmental influences are as complex as the genes we inherit.

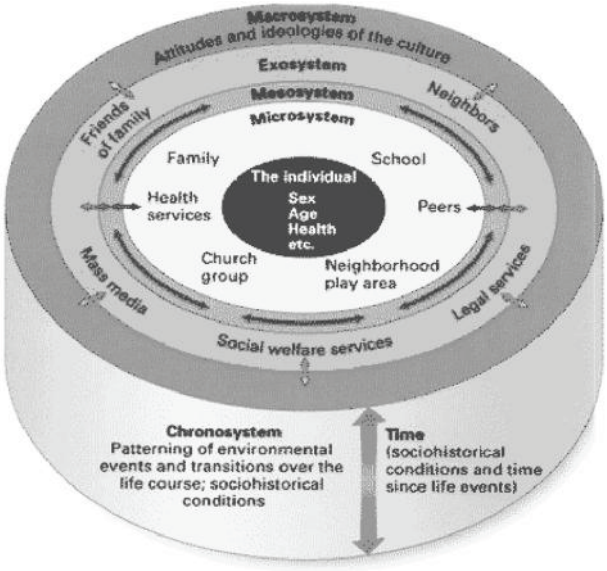
Context of Development

Development does not take place in a vaccum. It is always embedded in a particular socio cultural context. Transition during one's life time such as entering school, becoming an adolescent, finding jobs, marrying, having children, retirement, etc., all are joint functions of the biological changes and changes in one's environment. The environment can change or alter during any time of the individual's life span.

Urie Bronfenbrenner's contextual view of development emphasizes the role of environmental factors in the development of an individual. This has been depicted in Figure below.



Urie Bronfenbrenner



Contextual view of development

The **microsystem** is the immediate environment / setting in which the individual lives. It is in these settings where the child directly interacts with social agents – the family, peers, teachers, and neighbourhood. The **mesosystem** consists of relations between these contexts. For instance, how a child's parents relate to the teachers, or how the parents view the adolescent's friends, are experiences likely to influence an individuals relationships with others. The **exosystems** includes events in social settings where the child does not participate directly, but they influence the childs experiences in the immediate context. For example, the transfer to a different place, of working mother or father may cause tension among the parents which might affect their interactions with the child or the general amenities available to the child like quality of schooling, libraries, medical care, means of entertainment, etc., **Macrosystem** includes the culture in which the individual lives. **Chronosystem** involves events in the individual's life course, and socio

– historical circumstances of the time such as divorce of parents, or change of economic status of parents affect the growing child.

Bronfenbrenner's view is that a child's development is significantly affected by the complex world that envelops her / him.

Overview of developmental stages

Human life proceeds through different **stages.** It may be noted that certain patterns of behaviour and certain skills are learned more easily and successfully during certain stages. These accomplishments of a person become the social expectations of that stage of development. They are known as **developmental tasks.**

Prenatal stage:

Prenatal development is affected by maternal characteristics, which include mother's age, nutrition and emotional state. Disease or infection carried by the mother can adversely affect prenatal development. For example, rubella (German measles), genital herpes and Human Immunodeficiency Virus (HIV) are believed to cause genetic problems in the newborn. Another source of threat to prenatal development is **teratogens -** environmental agents that cause deviations in normal development that can lead to serious abnormalities or death. Common teratogens include drugs, infections, radiations, and pollution. Intake of drugs (marijuana , heroin, cocoaine, etc.) alcohol, tobacco, etc., by women during pregnancy may have harmful effects on the foetus and increase the frequency of congenital abnormalities. Radiations (such as X- rays), and certain chemicals near industrial areas can cause permanent change in the genes. Environmental pollutants and toxic wastes like carbon monoxide, mercury and lead are also sources of danger to the unborn child.

Infancy:

The activities needed to sustain life functions are present in the newborn - it breathes, sucks, swallows, and discharges the bodily wastes. The newborns in their first week of life are able to locate what direction

a sound is coming from, can distinguish their mother's voice from the voices of other women and can imitate simple gestures like tongue protrusion and mouth opening.

Motor Development: The newborn's movements are governed by **reflexes** – which are automatic, built-in responses to stimuli. They are genetically carried survival mechanisms, and are the building blocks for subsequent motor development. Before the newborns have had the opportunity to learn, reflexes act as adaptive mechanisms. Some reflexes present in the newborn – coughing, blinking and yawning persist throughout their lives. Other gestures and postures disappear as the brain functions mature and voluntary control over behaviour, starts developing.

Some major reflexes in the newborn

Reflex	**Description**	**Developmental course**
Rooting	Turning the head and opening the mouth when touched on the cheek.	Disappears between 3 and 6 months.
Moro	If there is a loud noise, the baby will throw her / arms outward while arching her / his back, and then bring the arms together as if grasping something.	Disappears in 6 to 7 months (although reaction to loud noises is permanent)
Grasp	When a finger or some ther object is pressed against the baby's palm, the baby's finger close around it.	Disappears in 3 to 4 months; replace by voluntary grasping.
Babinski	When the bottom of the baby's foot is stroked, the toes fan out and then curl.	Disappears in 8 to 12 months.

As the brain develops, physical development also progresses. As the infant grows, the muscles and nervous systems mature which lead to the development of finer skills. Basic physical (motor) skills include grasping and reaching for objects, sitting, crawling, walking and running. The sequence of physical (motor) development is universal with minor exceptions.

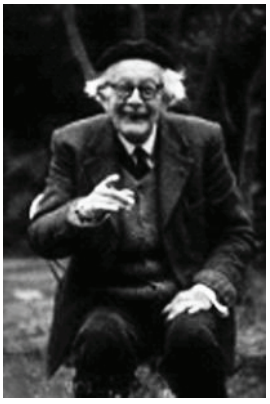
Sensory Abilities

Newborns can recognize their mother's voice just a few hours after birth and have other sensory capabilities. It is interesting to note that Newborns prefer to look at some stimuli rather than faces, these preferences change over the first few months of life. The newborn's vision is estimated to be lower than the adult vision. By 6 months of age it improves and by about the first year, vision is almost the same as that of an adult. With regard to colour vision, they might be able to distinguish between red and white colours but in general they are colour deficient and full colour vision develops by 3 months of age. When it comes to hearing, infants can hear immediately after birth. As the infant develops, proficiency at localizing sound improves.

Newborns respond to touch and they can even feel the pain, sense of smell and taste are also present in the newborn.

Cognitive Development:

Piaget believed that a child's mind passes through a series of stages of thought from infancy to adolescence.



Piaget

Piaget's Stages of Cognitive Development

Stage	Approximate Age	Characteristics
Sensorimotor	0 – 2 years	Infant explores the world by co-ordinating sensory experiences with physical actions.
Preoperational	2 – 7 years	Symbolic thought develops, object permanence is established, the child cannot co-ordinate different physical attributes of an object.
Concrete operation	7 – 11 years	The child can reason allogically about concrete events and classify objects into different sets. Is able to perform reversible mental operations on representations of objects.
Formal operational	11 – 15 years	The adolescent can apply logic more abstractly;hypothetical thinking develops.

Each stage is characterized by a distinct way of thinking and is age related. It is important to remember that it is the different way of thinking which makes one stage more advanced than the other and not the amount of information. This also shows why a 16 year old thinks differently from an 8 year old. The child during infancy, i.e., the first two years of life, experiences the world through senses and interactions with objects – through looking, hearing, touching, mouthing and grasping. The newborn lives in the present. What is out of sight is out of mind. For example, if you hide the toy in front of the child with which the child has been

playing the young infant would react as if nothing has happened i.e., s/he will not search for the toy. The child assumes the toy does not exist. According to piaget children at this stage do not go beyond their immediate sensory experience i.e, lack **object permanence -** the awareness that the objects continue to exist when not perceived. Gradually by 8 months of age the child starts pursuing the object partially covered in her/his presence.

The basis of verbal communication seems to be present in infants. Vocalisation begins with the infant's babbling, sometime between 3 to 6 months of age.

Socio – emotional Development: Babies from birth are social creatures. An infant starts preferring familiar faces and responds to parent's presence by cooing and gurgling. They become more mobile by 6 to 8 months of age and start showing a preference for their mother's company. When frightened by a new face or when separated from their mother they cry or show distress. On being reunited with the parent or caregiver they reciprocate with smiles or hugs. Close emotional bond of affection that develop between infants and their parents (caregivers) is called **attachment.** In a classic study by Harlow and Harlow (1962), baby monkeys were separated from their mothers approximately 8 hours after birth. The baby monkeys were placed in experimental chambers and reared for 6 months by surrogate (substitute) "mothers", one made of wire and the other of cloth. Half the baby monkeys were fed by the wire mother half by the cloth mother. Regardless of whether they were fed by the wire or the cloth mother the baby monkeys showed a preference

for the cloth mother and spent a lot more time with her. This study clearly demonstrates that providing nourishment or feeding was not crucial for attachment and contact comfort is important. You too may have seen young children having a strong attachment to a favourite toy or blanket. There is nothing unusual in this, as the children know that the blanket or toy is not their mother. Yet it provides them comfort. As children grow and become more sure of themselves, they abandon these objects.

Human babies also form an attachment with their parents or caregivers who consistently and appropriately reciprocate to their signals of love and affection. According to Erik Erikson (1968), the first year of life is the key time for the development of attachment. It represents the stage of developing trust or mistrust. A sense of trust is built on a feeling of physical comfort which builds an expectation of the world as a secure and good place. An infant's sense of trust is developed by responsive and sensitive parenting. If the parents are sensitive, affectionate and accepting it provides the infant a strong base to explore the environment. Such infants are likely to develop a secure attachment. On the other hand, if parents are insensitive and show dissatisfaction and find fault with the child, it can lead to creating feelings of self-doubt in the child. Securely attached infants respond positively when picked up, move freely, and play, whereas insecurely attached infants feel anxious when separated and cry due to fear and get upset. A close interactive relationship with warm and affectionate adults is a child's first step towards healthy development.

Childhood

The child's growth slows down during early childhood as compared to infancy. The child develops physically, gains height and weight, learns to walk, runs, jumps and plays with a ball. Socially, the child's world expands from the parents to the family and adults near home and at school. The child also begins to acquire the concepts of good and bad, i.e., develops a sense of morality. During childhood, children have increased physical capacities can perform tasks independently, can set goals, and meet adult expectations. The increasing maturation of the

brain along with opportunities to experience the world, contribute to development of children's cognitive abilities.

Physical Development: Early development follows two principles (1) development proceeds **cephalocaudally,** i.e, from the cephalic or head region to the caudal or tail region. Children gain control over the upper part of the body before the lower part. This is why we would notice that the infant's head is proportionately larger than her/his body during early infancy or if we see in infant crawling, s /he will use the arms first and then shift to using the legs. (2) growth proceeds from the centre of body and moves towards the extremities or more distal regions – the **proximodistal** trend i.e., children gain control over their torso before their extremities. Initially infants reach for objects by turning their entire body, gradually they extend their arms to reach for things. These changes are the result of a maturing nervous system and not because of any limitation, because we notice that even visually impaired children show the same sequence.

As children grow older, they look slimmer as the trunk part of their bodies lengthens and body fat decreases. The brain and the head grow more rapidly than any other part of the body. The growth and development of the brain are important as they help in the maturation of children's abilities, such as eye-hand coordination, holding a pencil and attempts made at writing. During middle and late childhood years, children increase significantly in size and strength. Increase in weight is mainly due to increase in the size of the skeletal and muscular systems, as well as size of some body organs.

Motor Development: Gross motor skills during the early childhood years involve the use of arms and legs, and moving around with confidence and more purposefully in the environment. Fine motor skills – finger dexterity and eye-hand co-ordination improve substantially during early childhood. During these years the child's preference for left or right hand also develops. The major accomplishments in gross and fine motor skills during early childhood years are given in Table below.

Major Accomplishments in Gross and Fine Motor Skills.

Age in years	Gross Motor skills	Fine Motor skills
3 years	Hopping, jumping, running	Build blocks, pick objects with forefinger and thumb
4 years	Climb up and downstairs with one foot on each step	Fit jigsaw puzzle precisely
5 years	Run hard, enjoy races	Hand, arm, and body all co- ordinate with eye movement.

Cognitive Development: The child's ability to acquire the concept of object permanence enables her/him to use mental symbols to represent objects. However, the child at this stage lacks the ability that allows her/him to do mentally what was done physically before. Cognitive development in early childhood focuses on Piaget's stage of **preoperational thought.** The child gains the ability to mentally represent an object that is not physically present. You may have observed children draw designs/figures to represent people, trees, dog, house, etc., This ability of the child to engage in symbolic thought helps to expand her/his mental world. The progress in symbolic thought continues. A salient feature of preoperational thought is **egocentrism** (self – focus) i.e., children see the world only in terms of their own selves and are not able to appreciate others' point of view. Children because of egocentrism, engage in **animism** thinking that all things are living like oneself. They attribute life-like qualities to inanimate objects. For example, if a child while running slips on the road, s/he might show animism by saying "road hurt me". As children grow and are approximately between 4 and 7 years of age they want answers to all their questions like : Why is the sky blue? How do trees grow? and so on. Such questions help the child to know why things are as they are. Piaget called this the stage as **intuitive thought**. Another feature of thought during preoperational stage is characterized by children having a tendency for **centration.**

i.e, focusing on a single characteristic or feature for understanding an event. For example, a child may insist on drinking a "big glass" of juice, preferring a tall narrow glass to a short broad one, even though both might be holding the same amount of juice.

As the child grows and is approximately between 7 and 11 years of age (the period of middle and late childhood) intuitive thought is replaced by **logical thought**. This is the stage of **concrete operational thought,** which is made up of operations - mental actions that allow the child to do mentally what was done physically before. Concrete operations are also mental actions that are reversible. In a well known test, the child is presented with two identical balls of clay. One ball is rolled by the experimenter into a long thin strip and the other ball remains in its original shape. On being asked which has more clay, the child of 7 or 8 years, would answer that, both have the same amount of clay. This is because the child imagines the ball rolled into thin strip and then into a ball, that means s/he is able to imagine reversible mental action on 'concrete/real' objects.

Socio – emotional Development:

The important dimensions of children's socio-emotional development are the **self, gender** and **moral** development. During the early years of childhood, some important developments in the self take place. The child due to socialization has developed a sense of who s/he is and whom s/he wants to be identified with. The developing sense of independence makes children do things in their own way. According to Erikson, the way parents respond to their self initiated activities heads to developing a sense of initiative or sense of guilt. For example, giving freedom and opportunities for play like cycling, running, skating, etc., and answering children's questions will create a sense of support for the initiative taken. In contrast, if they are made to feel that their questions are useless and games played by them are stupid, the children are likely to develop feelings of guilt over self initiated activities, which may persist through the children's later life also. Self understanding in early childhood is limited to defining oneself through physical characteristics. I am tall, she has black hair. I am a girl, etc., During middle and late

childhood, the child is likely to define oneself through internal characteristics such as 'I am smart and I am popular' or 'I feel proud when teachers assign me responsibility in school'. In additional to defining oneself through psychological characteristics, children's self descriptions also include social aspects of self such as reference to social groups like being a member of school's music club, environment club, or any religious group. Children's self understanding also includes social comparison. Children are likely to think about what they can do or cannot do in comparison with others. For example," I got more marks than Atul" or "I can run faster than others in the class". This developmental shift leads to establishing one's differences from others as an individual.

Once the children enter school, their social world expands beyond their families. They also spend greater amount of time with their agemates or peers. Thus the increased time that children spend with their peers shapes their development.

Moral development

Another important aspect of the child's development is learning to differentiate between the rightness or wrongness of human acts. The way children come to distinguish right from wrong, to feel guilty, to put themselves in other people's position, and to help others when they are in trouble, are all components of moral development. Just as children pass through the various stages of cognitive development, according to Lawrence Kohlberg, they pass through the various stages of moral development, which are age related. Kohlberg interviewed children in which they were presented with stories in which the characters face moral dilemmas. Children were asked what the characters in the dilemma should do, and why. According to him, children approach thinking about right and wrong differently at different ages. The young child, i.e., before 9 years of age, thinks in terms of external authority. According to her / him actions are wrong because s/he is punished and right because s/ he is rewarded. As the child grows, i.e., early adolescence, s / he develops moral reasoning through set of rules of others, such as parents or laws of the society. These rules are accepted by the children as their own. These are "Internalised" in order to be virtuous and to win

approval from others (not to avoid punishment) Children view rules as absolute guidelines, which should be followed. Moral thinking at this stage is relatively inflexible. As they grow they gradually develop a personal moral code.

Challenges of Adolescence

The term adolescence is derived from the Latin word **adolescere,** meaning **"to grow into maturity",** It is the transitional period in a person's life between childhood and adulthood. **Adolescence** is commonly defined as **'the stage of life that begins at the onset of puberty, when sexual maturity or the ability to reproduce is attained.'** It has been regarded as a period of rapid change, both biologically and psychologically. Though the physical changes that take place during this stage are universal, the social and psychological dimensions of the adolescent's experiences depend on the cultural context. For example, in cultures where the adolescent years are viewed as problematic or confusing, the adolescent will have very different experiences from someone who is in a culture, where adolescent years are viewed as beginning of adult behaviour and therefore, undertaking responsible tasks. Although most societies have at least a brief period of adolescence, it is not universal across cultures.

Physical Development:

Puberty or sexual maturity marks the end of childhood and signifies the beginning of adolescence, which is characterized by dramatic physical changes in both, growth rate, and sexual characteristics. However, puberty is not a sudden event, but is part of a gradual process. The hormones released during puberty result in the development of **primary** and **secondary sexual characteristics.** The primary sex characteristics include those directly related to reproduction and the secondary sex characteristics include features or signs of achieving sexual maturity. Pubertal changes in boys are marked by acceleration in growth, facial hair, and changes in voice. In girls, rapid growth in height usually begins about two years before **menarche,** the onset of menstruation. The growth spurt generally begins at the age of 12 or 13 for boys and at the age of 10 or 11 for girls. It is normal

to have variations in the pubertal sequence. For example, among two boys (or two girls) of same chronological age, one may complete pubertal sequence before the other has begun it. Both genetics and environment play a part in this. For example, identical twins reach menarche closer in time than do fraternal twins; on an average, girls from affluent families go through menarche earlier than girls from poor families; and historical trends show that, the age of menarche is declining in industrialized nations reflecting better nutrition and advances in medical care.

Physical development during adolescence is also accompanied by a number of psychological changes. Around puberty adolescents show an increase in interest in members of the opposite sex and in sexual matters and a new awareness of sexual feelings develops. This increased attention to sexuality is caused by factors such as individual's awareness of the biological changes taking place and the emphasis placed on sexuality by peers, parents and society. Even then, many adolescents lack adequate knowledge or have misconceptions about sex and sexuality. Sex is a topic parents find difficult to discuss with children, so adolescents tend to become secretive about sexual concerns which make exchange of information and communication difficult. The concern over adolescent sexuality has become intense in recent times because of the risk of AIDS and other sexually transmitted diseases.

The development of a sexual identity defines the sexual orientation and guides sexual behaviour. As such it becomes an important developmental task for adolescents. Adolescents are preoccupied with what they are like and develop individual images of what they look like. Another important developmental task during adolescence is accepting one's physical self maturity. Adolescents need to develop a realistic image of their physical appearance, which is acceptable to them. It is important to keep in mind that puberty also involves cognitive and social changes along with physical changes.

Cognitive Developmental changes: Adolescents thought becomes more abstract, logical, and idealistic ; they become more capable of examining their own thoughts, others thoughts, and what others are thinking about them. Adolescents' developing ability to reasons gives them a new level of cognitive and social awareness. Piaget believed that formal operational thought appears between the age of 11 and 15. During this stage adolescent thinking expands beyond actual concrete experiences and they begin to think more in abstract terms and reason about them. In addition to being abstract, adolescent thought is also idealistic. Adolescents begin to think about ideal characteristics for themselves and others and compare themselves and others with these ideal standards. For example, they may think what an ideal parent is like and compare their parents with these ideal standards. This may at times make adolescents wonder which of the new – found ideal standards they should adopt. In contrast to trial and error approach used by children in earlier stages of development, adolescent thinking becomes more systematic in solving problems – they think of possible courses of action, why something is happening the way it is and systematically seek solutions. Piaget called this type of logical thinking – **hypothetical deductive reasoning.**

Logical thought also influences the development of moral reasoning. Social rules are not considered as absolute standards and moral thinking shows some flexibility. The adolescent recognizes alternative moral courses, explores options, and then decides on a personal moral code. For example, should I smoke as everyone I know does? Is it ethical to copy answers in the examinations? This also lends the possibility of adolescents not following society's norms if they conflict with personal code of ethics. For example, individuals at this age might participate in a protest march for a cause rather than adhere/confirm to college norm.

Adolescents also develop a special kind of egocentrism. According to David Elkind, **imaginary audience** and **personal fable** are two components of adolescents' egocentrism. Imaginary audience is adolescent's belief that others are as pre-occupied with them as they are about themselves. They imagine that people are always noticing them and are observing each and every behaviour of theirs. Imagine a

boy who thinks that all notice the ink spot on his shirt, or a girl with a pimple feels, all people would think how bad her skin is. It is this imaginary audience, which makes them extremely self – conscious. The personal fable is part of the adolescents' egocentrism that involves their sense of uniqueness. Adolescents' sense of uniqueness makes them think that no one understands them or their feelings. For example, an adolescent girl thinks that none can sense the hurt that she feels because of being betrayed by a friend. It is quite common to hear the adolescent say to the parents 'you do not understand me'. To retain their sense of personal uniqueness they may weave stories filled with fantasy around them to create a world that is away from reality. Personal fables are often part of adolescent diaries.

Identity formation

Identity is who you are and what values, commitments and beliefs are. The primary task of adolescence is to establish an identity separate from the parents. During adolescence a detachment process enables the individual to develop a personalized set of beliefs that are uniquely her or his own. In the process of achieving an identity the adolescent could experience conflict with parents and within herself or himself. Those adolescents who can cope with the conflicting identities develop a new sense of self. Adolescents who are not able to cope with this identity crisis are confused. This 'identity confusion' according to Erikson, can lead to individuals isolating themselves from peers and family ; or they may lose their identity in the crowd. Adolescents on one hand, may desire independence but may also be afraid of it and show a great deal of dependence on their parents. Rapid fluctuations between self-confidence and insecurity are typical of this stage. Adolescents may of one time complain of being "treated like a baby" whereas on other occasions they may seek comfort by depending on their parents. Seeking an identity involves searching for continuity and sameness in oneself, greater responsibility and trying to get a clear sense of who one is i.e., an identity.

The formation of identity during adolescence is influenced by several

factors. The cultural background, family and societal values, ethnic background, and socio economic status all prevail upon the adolescents' search for a place in society. Family relationships become less important as the adolescent spends more time outside the home and develops a strong need for peer support and acceptance. Increased interactions with peers provide them with opportunities for refining their social skills and trying out different social behaviours. Peers and parents are dual forces having major influences on adolescents. At times conflicting situations with parents lead to increased identification with peers. But generally parents and peers serve complementary functions and fulfill different needs of the adolescents. Vocational commitment is another factor influencing adolescent identity formation. The question "What are you going to be when you grow up?" , requires the ability to think about the future and to be able to set realistic and achievable goals. In some cultures freedom is given to the young people to choose an occupation, whereas in certain other cultures the option of making this choice is not given to the children.

Here parents' decision is likely to be accepted by the children. Career counseling in schools offers information regarding appraisal of the students for various courses and jobs and provides guidance in making a decision about career choices.

Some Major concerns: when adults reflect on their adolescent years and recall the conflicts, uncertainties, occasional loneliness, group pressures, they feel it was definitely a vulnerable period. During adolescence peer influence, new gained freedom, unresolved problems may create difficulties for many. Confirming to peer pressure can be both positive and negative. Adolescents are often confronted with decisions regarding smoking, drugs, alcohol and breaking parental rules, etc., These decisions are taken without much regard to the effect they can have. Adolescents may face periods of uncertainty, loneliness, self-doubt, anxiety and concern about themselves and their future. They are also likely to experience excitement, joy and feelings of competence as they overcome the developmental challenges.

Delinquency: Delinquency refers to a variety of behaviours, ranging from socially unacceptable behaviour, legal offences to criminal acts. Examples include truancy, running away from home, stealing or burglary or acts of vandalism. Adolescents with delinquency and behavioural problems tend to have a negative self identity, decreased trust and low level of achievement. Delinquency is often associated with low parental support, inappropriate discipline, and family discord. Often adolescents from communities characterized by poverty, unemployment and having feelings of alienation from the middle class perform antisocial acts to gain attention and to be popular with their peers. However, most delinquent children do not remain delinquent forever. Change in their peer group, becoming more aware of their social responsibilities and developing feelings of self worth, imitating positive behaviour of the role models, breaking negative attitudes, and overcoming poor self-concept help in reduction of delinquent behaviour.

Substance Abuse : Adolescent years are especially vulnerable to smoking , alcohol, and drug abuse. Some adolescents take recourse to smoking and drugs as a way of coping with stress. This can interfere with the development of coping skills and responsible decision making. The reasons for smoking and drug use could be peer pressure and the adolescents need to be accepted by the group, or desire to act more like adults, or feel a need to escape the pressure of school work or social activities. The addictive powers of nicotine make it difficult to stop smoking. It has been found that adolescents who are more vulnerable to drugs, alcohol and nicotine use, are impulsive, aggressive, anxious, depressive and unpredictable, have low self-esteem, and low expectation for achievement. Peer pressure and the need to be with their peer group make the adolescent either go along with their demands to experiment with drugs, alcohol and smoking or be ridiculed. Drug use if continued long enough can lead to physiological dependency, i.e., addiction to drugs, alcohol or nicotine may seriously jeopardize the rest of the adolescents' lives. Positive relationships with parents, peers, siblings, and adults play an important role in preventing drug abuse. In India, a successful anti-drug programme is the society for Theatre in Education Programme in New Delhi. It uses street performances to entertain people

between 13 to 25 years of age while teaching them how to say no to drugs. The United Nation International Drug Control Programme (UNDCP) has chosen the programme as an example to be adopted by other non-governmental organizations in the region.

Eating Disorders: Adolescents obsession with self, living in fantasy world and peer comparisons lead to certain conditions where they become obsessed with their own bodies. **Anorexia** nervosa is an eating disorder that involves relentless pursuit of thinness through starvation. It is quite common to see adolescents eliminate certain foods from their diets or to eat slimming foods only. The media also projects thinness, as the most desirable image and copying such fashionable image of thinness leads to anorexia nervosa. **Bulimia** is another form of eating disorder in which the individual follows a binge and purge eating pattern. The bulimic goes on an eating binge then purges by self – induced vomiting or using a laxative at times alternating it with fasting. Anorexia nervosa and bulimia are primarily female disorders more common in urban families.

Adulthood:

An adult is generally defined as someone who is responsible, mature, self-supporting and well integrated into society. There is a variation in development of these attributes, which suggests that there is a shift in timing when an individual becomes an adult or assumes adult roles. Some people take up jobs along with their college studies or may get married and not pursue their studies. Others may continue to live with their parents even after getting married and being financially independent . The assumption of adult roles is directed by an individual's social context. The best time for some of the most important life events (i.e., marriage, job, having children) might be quite different in different cultures but within a culture there is similarity in the course of adult development.

In early adulthood, two major tasks are exploring the possibilities for adult living and developing a stable life structure. The twenties represent the novice phase of adult development. Gradually, a transition from

dependence to independence should occur. This could be marked by an image of the kind of life the young person wants, especially in terms of marriage and a career.

Career and work : Earning a living, choosing an occupation, and developing a career are important themes for people in their twenties and thirties. Entering work life is a challenging event in anyone's life. There are apprehensions regarding different adjustments, proving one's competence, performance, dealing with competition and coping with expectations both of the employers and oneself. It is also the beginning of new roles and responsibilities. Developing and evaluating career becomes an important task of adulthood.

Marriage, Parenthood and Family : The adjustments that young adults have to make when entering a marriage relate to knowing the other person if not known earlier, coping with each other's likes, dislikes, tastes and choices. If both the partners are working, adjustments are required regarding sharing and performing roles and responsibilities at home.

In addition to getting married, becoming a parent can be a difficult and stressful transition in young adults, even though it is usually accompanied by the feeling of love for the baby. How adults experience parenting is affected by different situations such as the number of children in the family, the availability of social support, and the happiness or unhappiness of the married couple.

Death of a spouse or divorce creates a family structure in which a single parent either the mother or the father has to take up the responsibility of the children. In recent times, women are increasingly seeking employment outside the home thus creating another type of family in which both parents work. The stressors when both parents are working are quite the same as a single working parent, namely, taking care of children, their school work, illness and coping with workload at home and in the office, etc. Despite the stresses associated with parenting, it provides a unique opportunity for growth and satisfaction and is perceived as a way of establishing concern and guiding the next generation.

Middle age:

Physical changes during middle ages are caused by maturational changes in the body. Though individuals may vary in the rate at which these changes occur, almost all middle aged people notice gradual deterioration in some aspects of their physical functioning such as decline in vision, sensitivity to glare, hearing loss, changes in physical appearance (e.g., wrinkles, grey hair or thinning of hair, weight gain). It is also believed that some cognitive abilities decline with age while others do not. Decline in memory is more in tasks involving long-term memory than short-term memory. For example, a middle – aged person can remember the telephone number immediately after s/ he has heard it but may not remember it so efficiently after a few days. Memory tends to show greater decline, while wisdom may improve with age. Remember that individual differences exist in intelligence at every age and as not all children are exceptional, neither do all adults show wisdom.

Old Age

It is difficult to determine when "old age" begins. Traditionally, the age of retirement was linked to old age. Now that people are living longer, age of retiring from work is changing, and the cut-off point for the definition of "old age" is moving upward. Some of the challenges, which the aged have to cope with include retirement, widowhood, illness or death in the family. The image of old age is changing in certain ways. Now there are people who have crossed seventy years of age or so and are quite active, energetic and creative. They are competent and are therefore, valued by society in many walks of life. In particular we have aged people in politics, literature, business, art and science. The myth of old age as an incapacitating and therefore, frightening phase of life is changing.

Of course, the experience of old age also depends on the socio-economic conditions, availability of health care, attitude of people, expectations of society and the available support system. Work is most important during early adult years, then family becomes most important and beyond that health becomes the most important issue in the persons life. Clearly,

successful ageing for much of our adult life focuses on how effective we are at work, how loving our relationships are in our family, how good our friendships are, how healthy we are and how cognitively fit we are.

Retirement from active vocational life is quite significant. Some people perceive retirement as a negative change. They consider it as a separation from an important source of satisfaction and self-esteem. Others view it as a shift in life with more time to pursue their own interests. It is seen that older adults who show openness to new experiences, more striving and achievement oriented behaviour prefer to keep busy and better adjusted.

Older adults also need to adjust to changes in the family structure and new roles (grand parenting) that have to be learnt. Children usually are busy in their careers and families and may set up independent homes. Older adults may depend on their children for financial support and to overcome their loneliness (after children have moved out). This might trigger-off feelings of hopelessness and depression in some people.

In old age feeling of loss of energy, and dwindling of health and financial assets, lead to insecurity and dependency. The elderly tend to look towards others to lean on and to care for them. Indian culture favours dependence of elderly on their children for old age needs caring. In fact, parents in most oriental cultures rear their children with the fond hope that they will care for them during old age. It is important to give the elderly a sense of security and belonging, a feeling that people care for them during old age (especially in the time of crisis) and to remember that we all have to grow old one day.

Although death is more likely to occur in late adulthood, death can come at any point in development. The deaths, especially of children and younger adults, are often perceived to be more tragic than those of others. In children and younger adults, death is more likely to occur because of accidents but in older adults it is more likely to occur because of chronic disease. The death of a spouse is usually seen as the most difficult loss. Those left behind after the death of their partner suffer deep grief, cope with loneliness, depression, financial loss and are also at risk of many health related problems. Windows by far out number widowers, because studies show that women live longer than men and tend to marry men

older than themselves. During such times, support from children, grand children, and friends can help the individual cope with the loss of spouse.

Activities

What has been your experience while making a choice in the selection of subjects?

POINTS TO REMEMBER

1. **Development:** Development is the pattern of progressive, orderly and predictable changes that begin at conception and continue throughout life.
2. **Growth:** It refers to the increase in the size of the body parts of the organism which is generally measured in height and weight.
3. **Maturation:** refers to the changes that follow an orderly sequence and are largely determined by genetic factors. For example: Talking and walking during childhood.
4. **Evolution:** Natural selection is an evolutionary process that helps species that are best adopted to changes to survive and reproduce.
5. **Genotype:** refers to a person genetic inheritance.
6. **Phenotype:** includes physical and physiological traits expressed in observable and measurable characteristics
7. **Context:** To understand differences in functioning. It is important to see the individual in the context of complex world that envelops her/him.
8. **Prenatal stage:** From conception to birth. Prenatal development may be affected by maternal malnutrition, maternal drug use, and some maternal diseases.
9. **Motor development:** Relates to development of body parts, follows cephalocaudal and proxinodistal trends. Early motor development depends on both maturation and learning.
10. **Attachment:** Cultural variations in child rearing can affect the patterns of attachment between the child and the care giver.
11. **Cognitive development:** refers to the understanding of the world oneself. In early childhood focuses on piaget's stages of development.

12. **Moral development:** The child's moral development deals with learning to differentiate between right and wrong.
13. **Puberty** marks the end of childhood and signifies the beginning of adolescence.
14. **Cognitive development in adolescence:** The thoughts become more abstract, logical and idealistic.
15. During **adolescent years** a number of conflicts, uncertainties, the feeling of loneliness and identity confusion are bound to occur.
16. **Adulthood** is a stage where a person becomes responsible, mature, self supporting, and well integrated, into society.
17. **Old age** is linked with retirement from active vocational life.

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QUESTIONS

1. What is the difference between maturation and development?
2. What is the difference between Genotype and Phenotype?
3. Explain Bronfenbrener's contextual view of development.
4. What are teratogens?
5. Name the reflexes found in the Newborn.
6. What are the stages of childhood according to piaget?
7. What is the meaning of 'cephalocaudal' development?
8. What is the meaning of 'proximodistal' trend?
9. Explain motor development during childhood.
10. Discuss the challenges of adolescence.
11. What are the changes during adulthood?
12. Mention the common diseases suffered during old age.
13. What are the risks involved during old age?
14. Explain the life-span perspective on development.
15. Mention some reflexes in the newborn.
16. Mention the stages of cognitive development according to piaget.
17. What are eating disorders?

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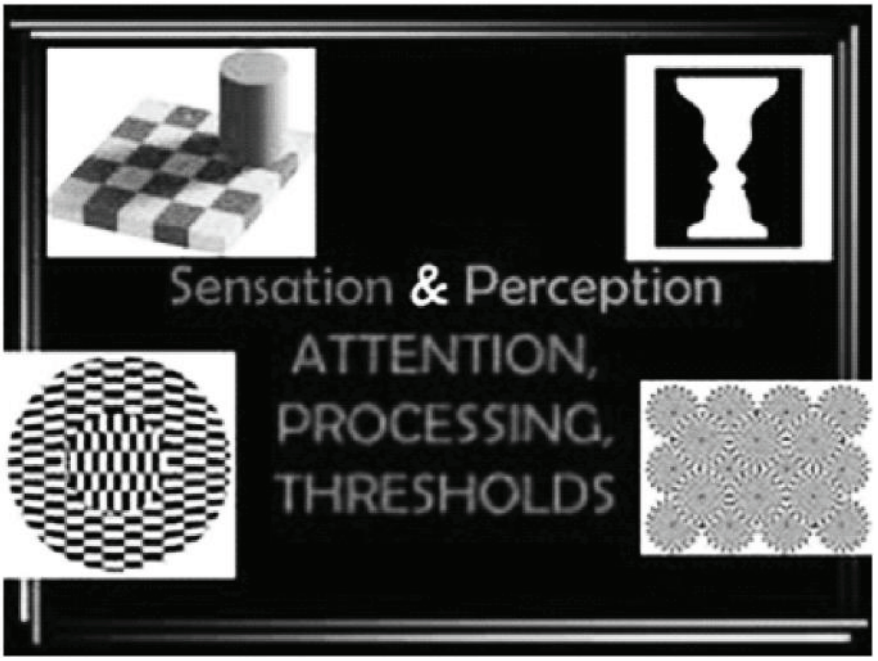
CHAPTER V

SENSATION

Introduction and Definition

To understand behavior, we must know how the sensory mechanisms are constructed and how they mediate the sense of light, sound, touch



and taste. As we are aware, objects do not photograph themselves on the brain. They have to go through a lot of processes before we become aware of them. All information about the world comes to us by way of our sense organs. Sense organs are therefore called the "gateways of knowledge".

Sensation can be defined as an awareness of conditions inside and outside the body. Each sensory system gathers information about a different aspect of physical environment. Our senses – hearing, vision, smell, taste, touch, balance and motion – are the products of the different sensory system. Each organ has its own receptors in specialized nerve cells that translates information from the environment and the body into nerve impulses. The brain translates these impulses into sensations.

'When we initially encounter a stimulus, our sense organs are stimulated, resulting in sensation'. Stimuli vary in type and intensity. Different types of stimuli activate different sense organs. Sensations detect the awareness of changes in physical energy caused by environmental or internal events. The cells that determine these changes are known as sense receptors. They are located in the sense organs the eyes, ears, tongue, nose, skin and internal body tissues. The sensory receptors give rise to sensory processes and thus produce an immediate awareness of sound, colour and form. They tell us what is happening inside our bodies and in the world around us.

All our sense organs serve one purpose. They help us to survive. They warn us of danger, provide information we need to interpret events and deal with the future. Pain which causes human misery is also essential as it alerts us to illness and injury. Sensory experiences contribute to the quality of our life; they inspire us, amuse and entertain us.

Earlier, it was believed that there were only just five senses - sight, sound, taste, smell and touch. Now there are studies which prove that human sensory capabilities go beyond these five basic senses such as kinesthetic, vestibular and organic. We are sensitive not only to touch but to a wider set of stimuli - pain, pressure, temperature to name a few.

Psychophysics

The sensitivity of each of our sense organs is obtained in the field of psychophysics. It is concerned with the relationship between physical properties of stimuli and our psychological experiences of them. The first psychophysicist was Gustav Fechner (1801-1889). He was a professor of physics at the university of Leipzig, with a strong interest in the workings of the mind. He made an attempt to bridge the material world and the mental world. Principles were drawn from both Physics and Psychology, to determine how the strength or intensity of a stimulus affects the strength of sensation in an observer.

Further Psychophysics has several objectives. First, to detect a stimulus in the environment. Second, to discriminate between two stimuli. Next, to ascertain how much of something is present, and examines each of these objectives.

Characteristics of Sensations

Every sensation has some fundamental characteristics that are common to all. They are thresholds, intensity, latency, duration and extensity.

1. Threshold: A ray of light must reach a certain level of brightness for it to be distinguished from darkness. Likewise a sound made in a room should reach a level of intensity for it to be heard. A certain minimum level of stimulation of sense organ is required, before any sensory experience is actually evoked. The minimal amount of physical energy that is required to create a sensation is called the absolute threshold. It is also the smallest amount of energy that a person can detect reliably. It is considered reliable when a person can detect a stimulus 50% of the time. By studying absolute thresholds, our researchers have found that our senses are very sharp.

A. Examples of Absolute threshold:

Vision	A candle flame can be seen from 30 miles away on a dark, clear night.
Hearing	The ticking of a watch can be heard 20 feet away under quiet conditions.
Taste	Sugar can be tasted when one teaspoon is dissolved in 2 gallons of water.(one gallon = 4.5 ltrs)
Smell	Perfume can be detected when one drop is diffused into a 3 room apartment.
Touch	A wing of fly falling on your cheek from a distance of one cm can be felt on the cheek.

Sensory sensitivity is also studied by having individuals compare two stimuli and judge whether they are the same or different. A person may be asked to compare the weight of two blocks or the brightness

of two light bulbs. The minimal difference between the two stimuli that can be discriminated reliably half of the time by a person is called differential threshold or just noticeable difference. (JND)

B. Examples of differential threshold:

Senses	Sensation measured	Weber Fraction
Vision	Brightness, white light	1/60
Kinesthesia	Lifted weights	1/30
Pain	Thermally around on the skin	1/30
Hearing	Tone of moderate loudness	1/70
Pressure	Cutaneous pressure spot	1/7
Smell	Odor of Indian rubber	1/4

2. Intensity: For sensations to be effective, they must possess some amount of intensity. A faint light or a mild odor may make no impression on us at all. They should, however be not over intense. We know from experience that when a sensation becomes too powerful, instead of stimulating us in the normal way, it becomes more painful. For example a very bright light or a shrill sound can irritate us.

3. Latency: Though the appearance of stimulus and the experience of sensation appear to take place simultaneously, there is always a time lapse between the two. The stimulus arouses the nerve fibers that lead to the brain. The brain, on its part, takes time to respond through the motor nerves and the muscles. Latency period is the passage of time that occurs between the presentation of stimulus and the action executed by the individual. For Example, when we are suffering from some pain, medicine is administered. For the pain to subside, it takes sometime or when the teacher asks a question, the students who knows the answer takes a few seconds to respond.

4. Duration: In some instances, the stimulus does not evoke, a response immediately. It has to be repeatedly presented for a certain length of time. Duration determines as to how long a stimulus has to be present in the environment for stimulating the sense organ.

5. Extensity: Most sensations, in general and cutaneous sensations in particular occupy a certain amount of space. It is evident that a large stimulus occupies larger space and smaller stimuli occupy lesser area.

ATTENTION :

Meaning:

Of the many cognitive processes associated with the human mind, attention is one of the most intensely studied topic within psychology and cognitive neuroscience. In our daily life, we are attacked with a number of stimuli, but we are able to perceive only a few of them at a given time. It is not possible to respond simultaneously to all the sights, sounds and smells. Hence attention is the cognitive process of selectively concentrating on one thing, while ignoring other things. Attention is the readiness to perceive based on one's interests and motivations as well as on the nature of the stimulus. Examples include listening carefully to what someone is saying while ignoring other conversations in the room. It is amazing to know that human beings respond selectively and find stability in a conforming world. Attention is a gateway to the rest of the cognitive processes.

Definition:

Wilhelm Wundt was perhaps the first psychologist to study attention, distinguishing between broad and restricted fields of awareness. He was followed by William James who emphasized active selection of stimuli. In his own words William James said "Everyone knows what attention is, it is taking possession by the mind clear vivid form, of one out of what seem several simultaneously possible objects or trains of thought." "It implies withdrawal from some things in order to deal effectively with others. (Principles of Psychology – 1890). Ivan Pavlov noted the role of attention played in activating conditioned reflexes. John B Watson sought to define attention not as an inner process but rather as a behavioral response to specific stimuli.

Ross: Defined attention "as the process of getting an object or thought clearly before the mind". (1951)

Determinants / Factors influencing attention - objective and subjective:

At any given time in a man's life, the stimuli around him compete for his attention. It is very interesting to find out what makes him select a particular stimulus and ignore the others. Most researches have revealed that there are several factors that determine the attention of an individual. The results of these studies are important in the field of advertising. Before an advertiser induces a person to buy his product, he must attract the attention of the individual. There are many interesting things, in the pages of a magazine, in news papers, to what an advertiser has to say about his products. So it becomes essential for an advertiser to discover ways and means of attracting people and also sustain their attention for a longer time. To achieve this, the characteristics of the stimulus are important. Equally important are our own internal needs, expectations, past experiences and motives.

The factors can be classified into two categories:

1) Objective factors: These are aspects in the environment that attract our attention.

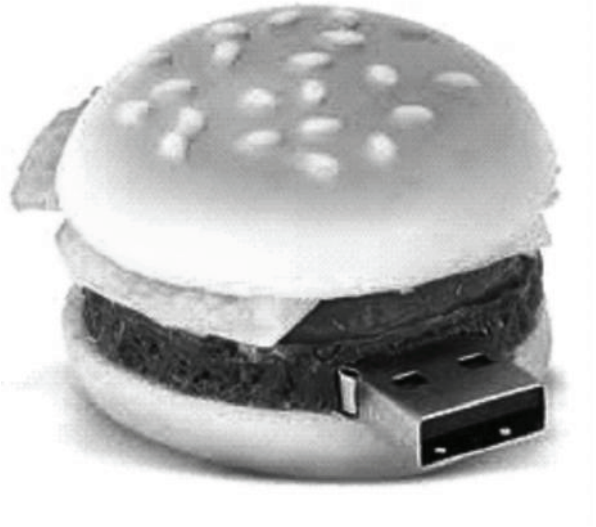
2) Subjective factors: These are factors that are found within us.

Objective Factors

1 Nature of the stimulus: 'The nature of the stimulus can be visual or auditory. It can involve words or pictures, people or animals. Pictures attract attention more rapidly than words and a picture with human beings attract more attention than a picture of an inanimate object. A rhyming auditory passage is more attention demanding than the same passage presented in prose form.

2) Location : Studies indicate that the best location for a visual stimulus for attracting attention is in front of the eyes in the center of a page. A position in the upper portion of a page is more favorable than one in the lower position. The left hand side is said to receive more attention than the right hand side.

3) Novelty: We tend to attend to anything that is novel. Smells, tastes and sounds, to which we are accustomed, go unnoticed, but anything strange draws our attention immediately. A stimulus appears novel among a group of familiar objects and a familiar item among novel objects is attention demanding.



Novelty

4) **Intensity**: We generally respond to a strong stimulus more easily than a feeble one. A bright lighted sign or the blaring of a loud speaker is attention demanding.

5) Size: The size of a stimulus is a determining factor. The bigger the stimulus, the better are the chances of attracting attention. Here an elephant has an advantage over an ant.

6) Repetition: A television advertisement that is repeated several times catches the attention of people. When a speaker wants to drive home a point in his audience, he repeats his speech more than once. However, repetition is attention catching only within certain limits, above which it leads to boredom and monotony.

7) **Change**: When repetition leads to inattentiveness, the advertisers change the advertisements completely and thus draw the attention of people. Any change in the existing advertisement is attention demanding.

8) **Definite form:** Experimental studies have revealed that anything that has a definite form is easily attended to than anything that is vague.

9) **Movement:** A moving object or an apparently moving object is more attention catching than a stationary one.

10) **Contrast:** Contrasting colors are used in designing fabrics to attract the attention of customers.

Subjective Factors

1) **Interest:** Interest plays a major role in attracting our attention. In a simple example, people who scan through newspapers, look into columns of their interest like crime beat, interviews, political developments, economic policies etc.,

2) **Organic State:** A hungry person is likely to notice the smell of appetizing food.

3) **Motives:** Motives play a significant role in attracting attention. A student is attentive to a statement such as "this question will probably appear in the examination". A mother is likely to notice the cry of her child, in spite of all the loud noises around her.

Intention, wish, hope, purpose, expectation, desire, aim, knowledge, belief, goal and needs serve to determine attention.

Kinds / Types – Voluntary, Involuntary, Habitual

Attention can be classified into 1) Involuntary attention 2) Voluntary attention and 3) Habitual attention.

1. Involuntary Attention

Involuntary attention is very common. The person does not use any effort on his part to attend to a stimulus. The attention is induced by something in the environment. There is no intention or desire to attend to it. Yet we cannot help turning our attention to it. It can be a lamp that suddenly lights or an unusual noise in an adjacent room. We look at the light, or strain our hearing in the direction of the source of the noise, in order to establish what it is. Children possess this power of involuntary attention to a great degree.

2. Voluntary Attention

Here attention is intentional, deliberate and purposeful. Most of our attending in our daily life is voluntary because there is always a motive and a purpose for attending to an object. Here distractions are sidelined and attention is sustained for a longer time. For example, watching a movie, listening to an interesting lecture, music, etc.,

3. Habitual Attention

We attend to certain stimuli because we are habituated to attend to it. For example, the naturalists will hear sounds in the woods that the ordinary picnicker would miss. A mother who is fast asleep is able to hear the faint cry of her baby.

Features / Phenomenon of Attention :

1. Division of Attention:

Divided attention is a very familiar phenomenon. It is our ability to attend to different stimuli at the same time. Divided attention involves, concentrating on more than one activity at the same time. If an individual is watching television or listening to music, while he is reading a book,

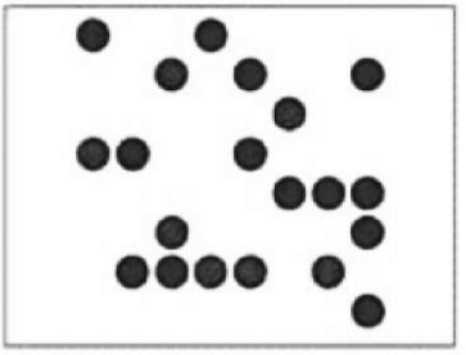
he is engaged in divided attention. In certain occupations, like in the case of a telephone operator, it is necessary to do two or more tasks at once, or to switch rapidly back and forth between two or more performances. When we become accustomed to perform a particular task, we need to attend to its details less and less. Our performance becomes automatic and our attention can be utilized elsewhere. For example: while learning to drive a car, too many things compete for our attention, like steering wheel, accelerator, turn signal, brakes, speedometer, other cars, pedestrians etc. With experience we are able to manage a lot of other things while driving, like carrying on a conversation, attending to a baby in the back seat and so on. There are other studies which reveal that only one task can be performed at a time. Since division of attention means a simultaneous focusing upon two separate activities, usually one or both of two simultaneous performances will show some impairment.

Division of Attention

2. Span of Attention

Span of attention is the number of objects that a person can take in a single glance. The ability to focus one's concentration on an object is considered to be of prime importance to the achievement of goals. A number of objects of the same category, say, small pebbles are on a table and covered with a paper. Then the paper is removed and the pebbles are shown to the subject for a few seconds. He is then asked to say, how many pebbles were there on the table. The number

of pebbles he has grasped will be his span. In other words, the number of pebbles and other uniform objects that can be grasped in one glance-one momentary act of perception and reported correctly would be the span of an individual. Span of attention is dependent on a number of factors like size of the stimulus, practice, duration of exposure time, distractions in the environment and so on.



Span of attention

For a reliable experiment, better control of the stimulus variables is required. The requirement has been met by the tachistoscope. Tachistoscope is a device which gives "quick looks" by limiting the duration of the exposure. It has a weighted plate that drops like a window sash in its frame. It has an opening that exposes a collection of letters, numbers, dots or any other stimuli material. An additional facility in the form of a screen in front can be included, with a fixation point. This helps the eyes to focus properly in advance, so that the eyes do not have the tendency to follow the falling plate.

In a typical experiment on the span of attention, a number of letters, numbers or dots are exposed to the subject's view. He responds by saying a number. The response can be recorded and the percent of correct responses is used for computations of the span.

3. Distraction of Attention

An individual is engaged in some work that calls for attention, but external stimuli disturb him and tend to distract him. These stimuli attract attention to themselves and away from the individual's task.

He may stop his work and notice the stimuli, or he may continue to keep working. What happens now? Does his work suffer? And if so, how much? A general presumption would be that the work suffers, if the extraneous stimulus is intense or has a characteristic of a determiner of attention. There are experimental evidences that reveal a disruption in work when distraction is introduced. However distraction can be overcome by various means.

Distraction of attention

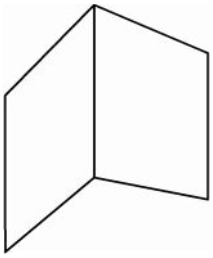
A group of college students are divided into two matched groups on the basis of their scores on an intelligence test. A few weeks later the control group took another form of intelligence test under normal conditions, while the experimental group took it under condition of visual and auditory distraction. The distractions were severe, ranging from loud noises of varied types to people, entering the room unannounced and disturbing the individuals. The conditions were very fatiguing for the experimental group. The experimental group did not fare as well as their counterparts in the control group.

It helps to overcome distraction by putting more energy into the work that one is doing. If the work continues day after day, under similar distraction, a different kind of adjustment takes place with the output maintained, without extra effort. It was found that the individuals became adapted to the noise. This is termed as "negative adaptation"

4. Fluctuation of Attention

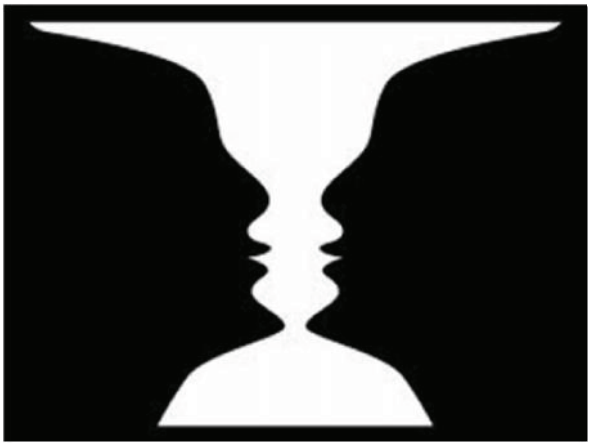
If you closely watch, you will note that you observe different objects at different times. This perception of now, one object and next another, when the physical conditions are constant is known as fluctuation of attention. Sometimes, when there are more than one aspect in a picture, attention tends to shift from one aspect to another. This shifting is also known as fluctuation of attention. Undoubtedly, fluctuations occur, but to measure these fluctuations is a matter of difficulty.

This phenomenon can be demonstrated in the laboratory by a simple experiment. A double perspective book figure is used here. This book figure appears half opened and half closed alternately. The shifting from one aspect of the book to the other is fluctuation.



Double perspective book figure

Another common example, is the use of ambiguous figures concerning figure and ground. Pointing to the figure, is it a white vase on a black background or two dark shadow profiles on a white background? The shift from one to the other is very common, resulting in fluctuation of attention.



The attention fluctuates between vase / two faces

Fluctuations occur involuntarily, but the "will", that a person possesses has some control over it. (For details refer to the experiment on fluctuation of attention).

PERCEPTION

Meaning and Definition

Our senses are exposed to a variety of stimuli in the environment . They provide the sensory information to us. 'The process by which these sensory information are sorted out, interpreted, analyzed and integrated is called perception.' It makes an attempt to assemble the building blocks of sensory experience into meaningful patterns. Psychologists interested in sensation asked to pay attention to the size of the object. Those interested in perception ask a different question, pay attention to the name of the object. For example, the psychologists are interested in the size of the elephant, others are interested in the animal elephant to signify the hugeness.

"Perception is the organizing process by which we interpret our sensory input".

Determinants of perception

Our interpretation of the sensory stimulus depend on clues, assumptions and principles of inference leading to perception.

i) Expectation and Awareness: Our perception is based on expectations, which in turn are based on perceptual set and schema. Perceptual set is a frame of mind that predisposes a person to perceive things in a certain way. It establishes expectations that guide our perceptions. Perceptual sets may arise from our own experiences and desire, from what other people might tell us and from context.

Schemas are forms of general knowledge of the world. They shape our expectations and so our perceptions. Schemas help us to perceive objects, at the same time they also make people overlook objects that do not belong in a schema.

It is assumed that all perceptions are conscious, and so we are aware of what we perceive. But sometimes we perceive stimuli at some

subconscious level. This is known as subliminal perception. This is the ability to perceive a stimulus that is below the threshold of conscious experience. Subliminal perception is very controversial. A number of studies have been conducted but the following are the common conclusions - under carefully controlled laboratory conditions people may perceive things without conscious awareness. But this is not possible in a natural setting. To give a simple example, children develop interest in buying and eating chocolates not because they like the taste of the chocolate, but more because of the advertisements they see and the colour of the foil and the sound it produces while unwrapping the chocolate, and even the shape, size and colour of the chocolate itself than the taste.

ii) Motives and needs: Individual differences in motives and needs affect perception. We may attend to and organize our sensory inputs to match our needs. Projective tests, like the Rorschach, are based on this idea. For example, the feeble cry of the baby can wake a sleeping mother and the ringing of a telephone, a sleeping doctor.

iii) **Learning**: Perceptual learning is "an increase in the ability - to extract information from the environment as a result of experience or practice with the stimulation coming from it". Perceptual learning may be considered as a kind of cognitive learning. Many examples can be given to show how learning shapes, perception - people trained in various occupations make perceptional distinctions that untrained people cannot make. Perceptional learning has practical and adaptive value. For example, an architect can design a building and civil contractor can only supervise building construction.

iv) **Attention**: The perceptual processes that select certain inputs for inclusion in our conscious experience or awareness at any given time are called 'Attention'. Attention divides our field of experience into a 'focus' and a 'margin'. Events that are clearly perceived are at the focus of attention, while those that are daily perceived are in the margin to the focus. These sensory inputs at the focus of our attention acquire, form and meaning, and so lead to perception.

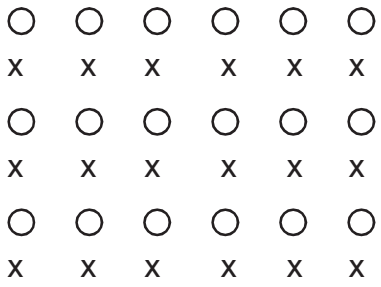
Principles of grouping and organization:

In a complex visual world, the mind develops strategies for coping with confusion. It tries to find the simplest solution to a problem. One method that it adopts is, to form groups of items that have certain characteristics in common. The way these groups are formed and the effect they have on perception depends on a variety of factors. It is this grouping that contributes to the unity in design.

The operation of most of the basic perceptual processes depends on a series of principles. These describe how we organize bits and pieces of information into meaningful wholes. These are known as Gestalt laws of organization. A group of German psychologists in the early 1900's, who studied patterns, also discovered a number of important principles that are logically sound for visual stimuli.

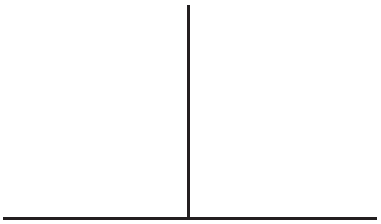
1) Proximity: It is the degree of distance between objects. Those elements that are close together have a tendency to be grouped together. In the figure, given below, we tend to see the dots as pairs rather than as a row of single dots. Objects are favoured according to the nearness of their position. The closer ones form groups by visually uniting.

2) **Similarity**: It is the degree of sameness to one another. Objects and figures that are similar in terms of color, shape and form tend to group together to form a pattern. Thus anything we perceive is grouped and ordered in the mind based upon their likeness towards one another.



(circles are perceived as one group and crosses as another)

3) **Continuity:** This refers to a grouping that results in a continuation of direction.



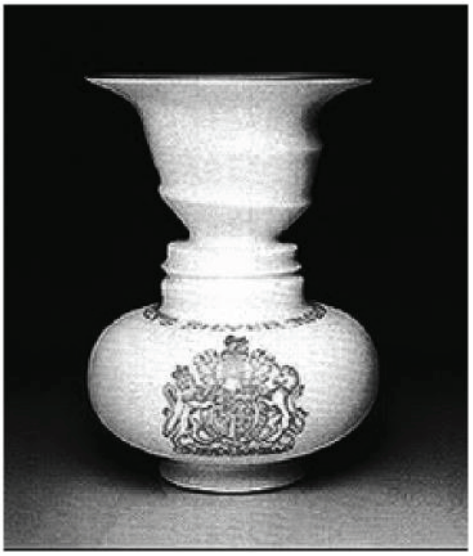
The figure on the left is seen as a vertical horizontal line and not as an extension of the alphabet L.

4) **Closure:** This refers to objects being grouped into recognizable form of shapes. We generally have a tendency to ignore the breaks in the figure and concentrate on the overall form.

These figures are easily perceived as triangle and the letter 'e' and 'T' even though none of the figures are complete

5) **Figure and ground:** This is, a fundamental principle of perception, which allows for reading imagery. There is a tendency to group stimuli together into a unified form called a figure and distinguish the figure from other stimuli present, generally referred to as the ground. All perception of forms involve as a necessary part the organization of figure against grounds, a fact illustrated by ambiguous figure devised by the Danish psychologist Edgar Rubin.

Images such as these are ambiguous concerning figure and ground. Is the figure a white vase on a black background or two dark shadow profiles on a white, background? Perceptual sets function in such cases and we tend to favor one interpretation over the other.



Errors in Perception

a) Illusion

We make sense of the world around us through perception. Perception is not a passive process. When we actively perceive, we bring to bear on our senses, various styles, habits and tendencies that create a coherent experience.

Generally our perceptions help us to navigate the real world with no difficulty.

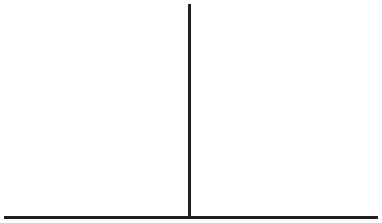
Sometimes we may be fooled and tend to misperceive the world. The resulting experience is called an illusion. Illusions are systematic errors and are valuable for psychologists because they provide clues about the perceptual strategies of the mind. This illusion occurs when our perception of an object is unusual, compared to its actual characteristics. It is a normal and universal phenomenon. For example, a person who is walking all alone in twilight may perceive a piece of rope lying near a bush as snake.

Although various explanations have been suggested for visual illusions, most of them concentrate either on the physical operation of the eye or on our misinterpretation of a given figure. The misinter-

pretation caused is due to errors in the visual processing, as well as in the way the brain interprets the information. Illusion shows that there is a connection between our prior knowledge, expectations and our perceptions.

b) Horizontal – Vertical Illusion:

In the horizontal - vertical illusion, the vertical line is drawn from the mid point of the horizontal line in the right angle position. The vertical line appears to be longer than the horizontal line, though both the lines are of equal length. One explanation is that the movement of the eyes along vertical line is more strenuous than the movement on the horizontal line. Another reason for the horizontal line to appear shor



Other factors like the thickness of the lines and the color of the lines may also contribute to the experience of illusion.

c) Muller Lyer Illusion

Sometimes visual perceptions occur when strategies that lead to accurate perceptions are extended to situations where they do not apply. Now compare the two lines. Most of us will perceive the line on the figure 1, as longer than the one on the figure 2. When the lines are measured they are found to be exactly of the same length. This is Muller Lyer illusion named after the man who devised it in 1889. We tend to view the figure 1 as longer than the one on figure 2. The illusion could be due to the perception of the lines enclosed by feather or arrow heads. Commonly, the length of figure 2 line is underestimated.

Other factors, like the thickness of the lines and the color of the lines, may also contribute to the experience of illusion.

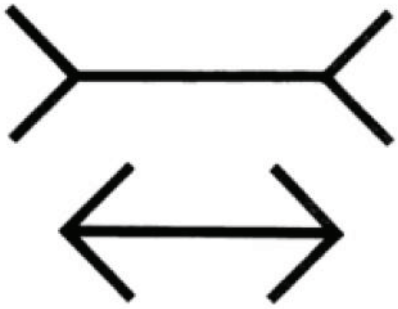


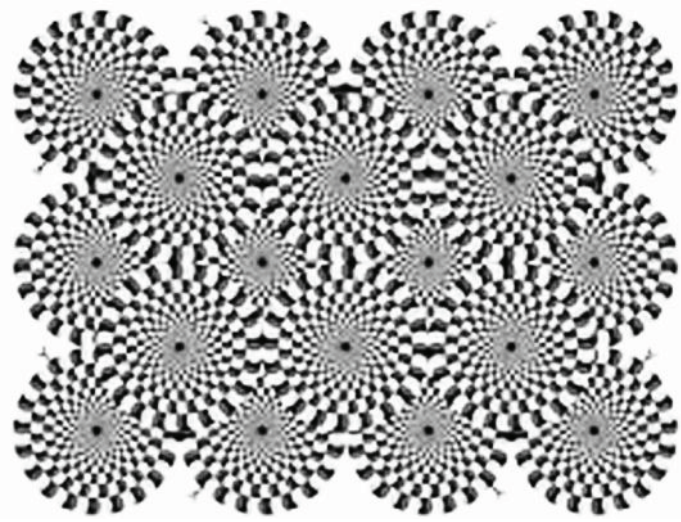
Figure 1: line enclosed by feather heads
Figure 2 : line enclosed by arrow heads

d) Phi-Phenomenon

On a brightly lit board indicating fluctuation of say for example, of prices of goods, the numbers appear to move across the board. Actually, simply the lights flash on and off in a particular pattern. This causes the feeling of real movement. This results in apparent motion and the phenomenon is called phi-phenomenon. It was originally demonstrated by Max Wertheimer (1912). It refers to the fact that stationary objects situated in different locations are seen to move if they flash at quick intervals.

Another type of apparent movement is what is called as the autokinetic effect. It is the tendency of a single point of light, which appears to move even when it is stationary in a dark room. This effect is caused by slight movements of our eyes, while we fix our vision on the point of light. Since there is no context in which we can locate the light, we are not aware that our eyes are moving. We attribute the movement to the light itself.

In another experiment, conducted in a dark room, if one of these four lights blink on and off, there is an illusion of a single light that moves from the first position to the second. When all four lights flash on and off in quick succession, it appears that a single light is travelling in a circle. The perceived size of the circle is smaller than would be the case if the lights were actually rotating.



The principle behind this phenomenon also lies behind the moving pictures we see at the cinema. We may not realize that at the movies we are looking at a rapid sequence of distinct images.

Hallucinations

The English word hallucination comes from the Latin verb 'hallucinari', which means 'to wander in the mind'. It is the experience of perceiving objects or events that do not have an external source. It is the perception of visual, gustatory, tactile, auditory or olfactory experiences without an external stimulus. It gives the individual a compelling sense of reality. It usually results from a mental disorder or as a response to a drug. Some common hallucinations are hearing voices when no one has spoken, seeing lights and objects that are not there or feeling a crawling sensation on the skin. Auditory hallucinations are the most common while hallucination related to smell and taste are rare. Many recreational drugs, including psychedelic drugs like LSD and other potent types of marijuana can cause hallucination. Hallucination can be frightening for the person experiencing them and also for those who are near them.

Differences between Illusions and Hallucinations

It is important to distinguish between illusions and hallucinations as the terms are often confused in conversations.

An illusion is a false interpretation of a real sensory experience. For example, a traveller in a desert sees a pool of water, but which is a mirage, caused by the refraction of light as it passes through layers of air of different densities. The bluish colored light is a real sensory stimulus, but mistaking it for water is an illusion. Hallucination by contrast is a perception of something real even though it is not caused by an external stimulus. For example; a person may hear his name called by a voice that no one else seems to hear. In illusion, there is always a clearly apparent external stimulus, whereas hallucinations occur when there is no stimulus.

Although, most of us experience illusion, fewer people have hallucination. Usually they are confined to the mentally ill and to those people under the influence of drugs.

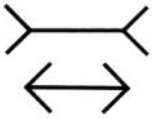
Illusion is a normal and universal phenomena, where as hallucination is not.

Illusion has an objective basis, while hallucination is purely subjective.

POINTS TO REMEMBER

Sense organs	Are the gate ways of knowledge.
Psychophysics	Is concerned with the relationship between physical properties of stimuli and our psychological experiences of them.
Sensations	Occur whenever our sense organs are stimulated by a stimulus in the environment.
Absolute threshold	Is the minimal amount of physical energy that is required to create a sensation.
Differential threshold	Is the minimal difference in stimulation that can reliably be detected by an observer when two stimuli are compared. It is also called as "just noticeable difference" (j.n.d.)
Intensity	For sensations to be effective they must possess a certain amount of intensity.

Latency period	Is the passage of time that occurs between the presentation of stimulus and the action exerted by the individual.
Duration	Determines as how long a stimulus has to be present in the environment for stimulating the sense organ.
Extensity	Is the amount of space that a sensation occupies.
Attention	Is the cognitive process of selectively concentrating on one thing, while ignoring the others.
The determinants of attention	Are divided into subjective and objective fac tors. The objective factors can be listed as the nature of the stimulus, location, novelty, intensity, size, repetition, change, definite form, contrast and movement. The subjective factors are organic state and motives.
Involuntary attention	When attention is induced by something in the environment.
Voluntary purattention	When attention is intentional, deliberate and poseful.
Habitual attention	When we are habituated to attend to a stimuli.
Divided attention	Is our ability to attend to different stimuli at the same time.
Span of attention	Is the number of objects that a person can grasp in a single glance. The instrument used to determine the span of attention in a laboratory setting is called the tachistoscope
Distraction of attention	Occurs when external stimuli disturb a person and tend to distract him from the task he is doing.
Fluctuation of attention	Refers to shifting of attention from one aspect to another aspect of the same stimulus.
Perception	Is the process by which sensory information is interpreted by the brain.

Illusion	Misinterpretation of a stimulus results in illusion
In a horizontal vertical illusion	The vertical line appears longer than the horizontal line, though both the lines are of equal length. 
In Muller Lyer illusion	The line 'a' is seen to be shorter than line 'b' though both the lines are of the same length. 
Phi-Phenomenon	Stationary objects situated in different locations appear to move if they flash at quick intervals.
Hallucination	Is when there is a perception of visual, gustatory, tactile, auditory or olfactory experiences without any external stimulus.

QUESTIONS

1. What is sensation?
2. Name the sense organs.
3. What are the characteristics of sensation?
4. What is attention?
5. Explain the factors influencing attention.
6. Name different kinds of attention and give examples.
7. What is the difference between distraction and fluctuation of attention?
8. What is division of attention?
9. What is the meaning of perception?
10. Explain the principles of grouping and organization.
11. What is illusion? Give an example.
12. Mention the errors in perception.
13. What is Phi-Phenomenon?
14. What is the difference between illusion and hallucination?

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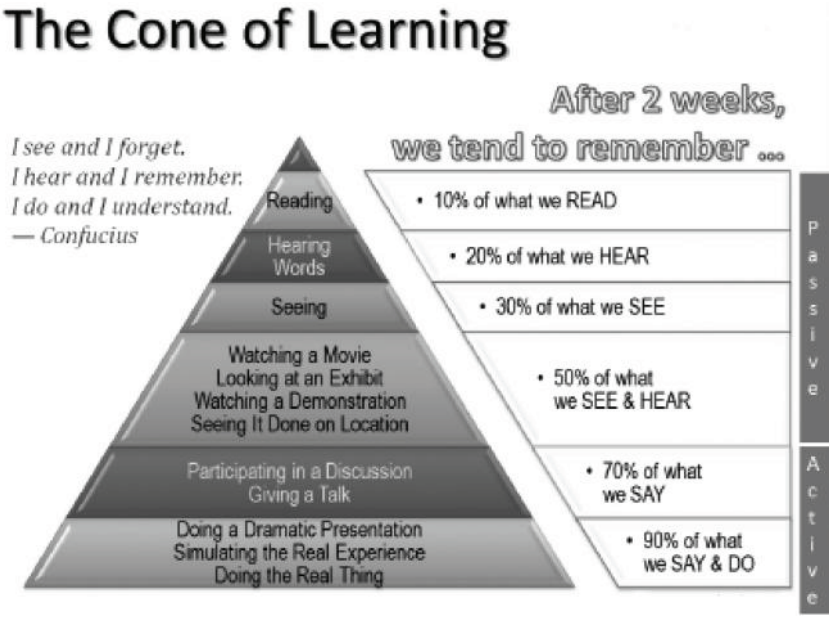
CHAPTER – VI

LEARNING



Meaning and Definition

Learning plays an important role in the life of every organism including human beings. From the beginning of childhood we learn motor, mental, perceptual and cognitive skills. These skills help us to adopt to the changing conditions in the world around us. In fact learning one skill helps us in learning the other with greater ease. Learning also refers to acquisition of knowledge, formation of habits and attitudes.

Psychologists define learning as 'a relatively permanent change in behavior brought about by experience'.

Let us understand the definition given above:-

1. Here the term 'learning' does not apply to temporary changes in behavior which may occur due to injury, illness, fatigue or drugs.

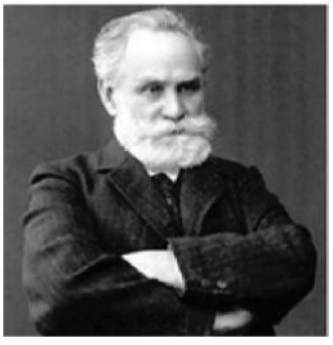
2. 'Learning' does not refer to changes resulting from maturation, we change in many ways as we grow.
3. Much of what we learn comes from observing the actions of others, we participate in many of the events we are observing.
4. The changes produced by learning are not always positive in nature, we may acquire many good habits as well as the bad ones.
5. Experience is the best teacher, providing the essential link between the past, the future and enabling us to adjust to the situation in which we are placed.

Learning is continuous and an ongoing process throughout our lives. Learning shapes our thinking, beliefs, attitudes, language development and life style. The quality of our learning depends on the exposure to the physical, social and cultural environments. We shape our lives through learning. We learn through different means and ways.

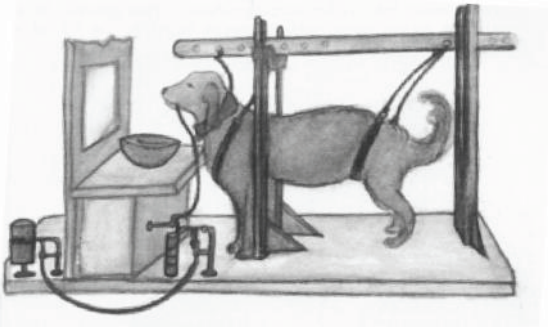
Methods of Learning

Classical conditioning: The school of 'behaviorism', focused on the basic kind of learning called 'conditioning'. This involves association between environmental stimuli and responses. Conditioning is the basis for many learned fears. It also helps explain how we acquire aversions to certain foods and drinks.

To understand classical conditioning phenomena, we need to know the origin of this concept. Ivan Pavlov (1849-1936) a Russian physiologist won a Nobel Prize in 1904, for his work on digestive process. It is interesting to note that it is the discovery of classical conditioning that made a physiologist turn into a psychologist



Ivan. P. Pavlov



Classical conditioning in Dogs

Pavlov was busy studying the secretion of stomach acids and salivation in dogs in response to the spraying of meat powder into the mouth. But he noticed that the dog being experimented upon, salivated even before the meat powder was in its mouth. The mere sight of food made its mouth water. Even the sound of the footsteps of the attender who fed the dog was enough to produce a physiological response in the dog.' Pavlov, who was a genius, recognized the implication of this observation and shifted the direction of his later experiments. Pavlov planned to ring a bell just before the food was brought into the experimental room. During the first few trials, the dog did not salivate at the sound of the bell. It salivated only when the food was in sight. Soon it began to salivate for the sound of the bell. In fact, even when Pavlov stopped presenting the meat powder, the dog salivated after hearing the bell sound. The dog had been classically conditioned to salivate to the bell sound.

Conditioning Process:

Pavlov chose a neutral stimulus that did not cause any salivation. Meat powder was a natural stimulus that triggered salivation, a natural response. He presented the bell sound, which was immediately followed by meat powder.

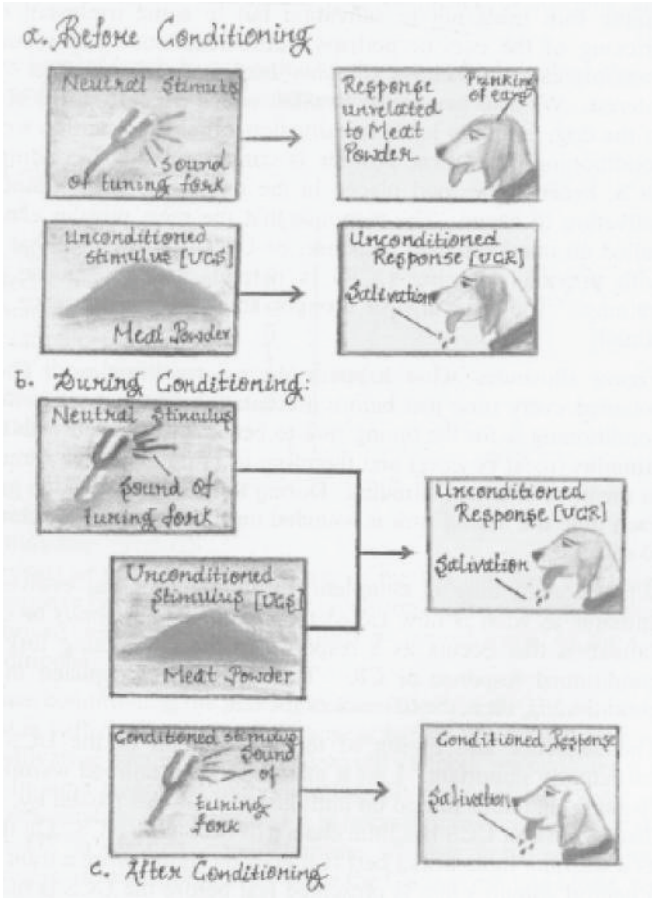
Pavlov termed the meat powder, a natural stimulus as unconditioned stimulus (UCS). The natural response to meat powder is salivation. It did not depend on any learning. This was termed unconditioned response (UCR). The neutral stimulus, bell was termed conditioned stimulus (CS). This was because the dog had to learn to associate food with bell and salivate at the sound of the bell. He paired the bell sound several times with meat powder. So salivation in response to the sound of the bell was termed as conditioned response (CR).

Conditioning:

Neutral stimulus		Natural stimulus		Natural response
Bell (CS)	+	Food (UCS)	⟶	Salivation (UCR)

After conditioning

Bell	⟶	Salivation
CS		CR



It is important to note that the sequence and timing of the presentation of the CS and UCS are particularly important. The optimal interval between the presentation of neutral stimulus and the presentation of the UCS in the laboratory was less than a second. The time interval can differ depending on the response being conditioned. The process by which the neutral stimulus becomes a CS became known as 'classical conditioning' and is also called 'Pavlovian or respondent conditioning' .

Principles of Classical conditioning

a) Extinction: This phenomenon occurs when a previously conditioned response decreases in frequency and finally disappears. In Pavlov's

experiment if the bell (CS) is presented repeatedly with no meat powder (UCS), the dog may salivate as usual for 2-3 trials. Then the salivation stops. This phenomenon is called 'Extinction'. The speed with which extinction takes place depends on the animal, the response, and the nature of the stimulus, the number and spacing of conditioning trials.

b) Spontaneous recovery: After the extinction of CR had occurred, the dog was brought back to the experimental table the next day and the bell was rung again. The dog responded with a little salivation. This process Pavlov called 'spontaneous recovery'. This happens because of old perception of relation between bell and food.

c) Higher-order conditioning: Here a neutral stimulus can become a second conditioned stimulus by pairing it with an already established CS. For example: A dog that has learned to salivate for the ringing of the bell can be further conditioned to salivate for a flash of light. This can be done by pairing the light, the bell and the food repeatedly.

Conditioning:

Light	+	Bell	+	Food	⟶	Salivation
CS_2		CS_1		UCS		UCR

After conditioning

Light		Salivation
CS_2	⟶	CR

d) Stimulus generalization: Once the dog is conditioned to salivate for the sound of the bell, a buzzer sound, a tuning fork, or any sound, of similar intensity can make the dog respond with salivation.

e) Stimulus discrimination: Here the animal is initially conditioned to respond to a tone of say 1000 hertz. If a tone of say 500 hertz is presented but not followed by food (UCS) after a few trials, the dog salivates only to 1000 hertz tone and not to 500 hertz tone, so the dog is said to have learned 'stimulus discrimination'.

Classical conditioning in human situation

In one of the experiments on learning of emotional responses, Watson took 11-months-old infant by name Albert as the subject. Albert was not afraid of white rabbits. Watson introduced a loud and irritating noise when Albert was about to touch the rabbit. When the loud noise and rabbit were paired repeatedly, Albert began to show fear when he saw the rabbit, even in the absence of noise.

Conditioning

Noise	+	Rabbit	⟶	Fear
UCS				UCR

After conditioning

Rabbit	⟶	Fear
CS		CR

Further tests showed that Albert's fear had generalized to other hairy and furry objects such as cotton wool, Santa Claus mask and even to Watson's white beard.

Classical conditioning has been used to study learning in newborn babies as young as 5-7 day old. When a puff of air is blown in the eyes, the natural response is blinking. If a mild tone is presented just before the air puff, the babies soon learn to associate the tone with the air puff and blink on hearing the tone alone.

Adults may not remember to keep up the appointment with the dentists because of prior associations of dentists and pain. We can also see that many biological responses, food preferences, fears, addictions may have their origins in classical conditioning. In human beings, it is easier to establish a conditioned fear of spiders, snakes or heights than of flowers or butterflies because during human evolution these insects, reptiles and high place, presented a danger.

Insight Learning

Insight is learning that appears to occur in a flash. One suddenly sees how to solve an equation, finish a puzzle, and assemble parts of a machine. Having obtained the solution, it is synonymous with what in human beings is known as having 'got the point' or the 'aha experience'.

Insightful learning is characterized by:

a) Trying out different response strategies.

b) Perceptual re-organization of elements in the environment.

c) Sudden occurrence of the solution.

Wolfgang Kohler (1925) placed chimpanzees in situations where a bunch of bananas was shown and kept out of reach of the animal., He then watched to see what the apes would do. Most did nothing, but a few turned out to be clever.

Wolfgang Kohler

Kohler kept a chimpanzee in a cage and placed a bunch of bananas and a long stick outside the cage. Inside the cage there was a stick which was too short to reach the banana but long enough to reach the long stick kept out side the cage. It was observed that for sometime the chimpanzee tried various strategies to reach the banana with little progress

towards the solution. Then it started surveying (perceptual recognization) the sticks and the banana and then all of a sudden without fumbling, the chimpanzee took the short stick from the cage and used it to bring the long stick in. Using the long stick he was able to draw the bunch of bananas inside. Kohler termed this sudden flash of idea or solution as' insight'

In another interesting situation, the chimpanzee was left in a cage with many boxes. A bunch of banana was hung at the top. The chimpanzee tried to climb the boxes one by one to reach the banana but could not succeed. After a while it piled up the boxes one over the other and reached for the bananas!!

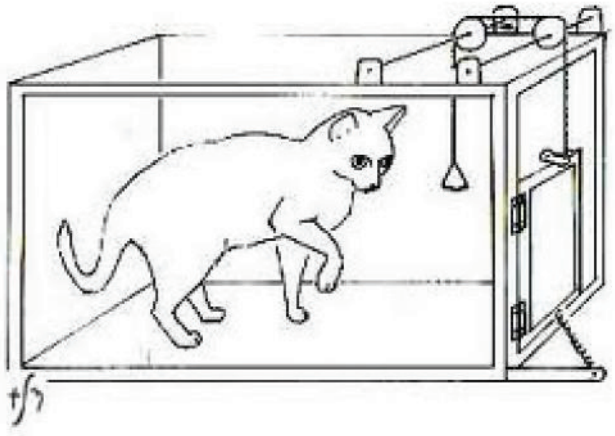
In a third kind of experiment the chimpanzee was sent inside a cage where the bunch of banana was hanging from the ceiling. But there were no boxes inside the cage. When the keeper entered the cage, the chimpanzee dragged him to the center of the cage, climbed on to the keeper's shoulders to reach for the bananas. Thus the chimpanzee applied the solution gained in the earlier learning, to this situation.

Kohler called the cognitive process underlying the chimpanzee's 'behavior' 'insight', a sudden awareness of the relationship among various elements that had previously appeared to be independent of one another. Kohler emphasized the 'suddenness' with which solutions were revealed. But later researches revealed that prior experience and initial trial-and-error practice in problem solving are required for insight. One study even demonstrated that only chimpanzees who had experience in playing with sticks could successfully solve the problem ; inexperienced chimpanzees could not make the connection between standing on the box and reaching

for the bananas. So it is clear that insight depends on previous experience with the elements involved in a problem.

Trial and error learning:

A common strategy for learning a solution to a problem is trial and error. This involves trying one possible solution after another until one works. Spiders, for example pursue prey by using trial and error. In a human situation, a person with a bunch of keys trying to open a door-lock is bound to apply trial and error method to unlock the door. Thomas Edison was able to invent the light bulb only by trying thousands of different kinds of materials for a filament before he found one that worked. (Carbon).



Puzzle box

Edward Thorndike (1898), then a young doctoral candidate was investigating one form of associative learning. In one classic experiment, he placed a hungry cat in a 'puzzle box' . It had to reach a piece of fish that was kept just outside the box. At first, the cat engaged in trial and error behaviour scratching, biting, or swatting at parts of the cage in an unorganized way. Then after a few minutes, the cat by chance succeeded in loosening a bolt which resulted in opening the door of the cage and

rushed out to get the reward, the piece of fish. When the cat was placed in box again, it took lesser time to escape. As the trials progressed, the animal learned to make lesser errors. Eventually it learned the correct response. Thorndike termed this as **'law of effect'.** This states that responses that lead to satisfying consequences get strengthened, he calls this as **'stamping in'.** Those responses, which are not rewarded, get weakened. Thorndike calls this as **'stamping out'.** According to Thorndike, 'behaviour' is controlled by its consequences.

Laws of learning :

Thorndike has given the following laws of learning:

1. **The law of readiness:** This law indicates the learner's state of mind to participate in the learning process. Readiness refers to preparation for action. This is very essential for learning. If the child is ready to learn, s/he learns more quickly, effectively and with greater satisfaction than if s/he is unwilling to learn.
2. **The law of effect:** Learning takes place properly when it results in satisfaction and the learner derives pleasure out of it. All pleasant experiences have a lasting influence and remembered for a long time. This law emphasizes the role of rewards and punishment in the process of learning. Reward motivates and encourages the child to learn more whereas, the punishment discourages the child and creates distastes and disguised towards that learning.
3. **The law of exercise:** Here two sub parts mainly law of use and disuse are stressed. Law of use refers to the strengthening of connection with practice and the law of disuse to the weakening of connection when the practice is discontinued. The law of use emphasizes the need of repetition and hence the learner feels that he recently learned the material. There is another aspect of 'frequency', when a learned material is put to use often, the chances of forgetting is less.

These findings of Thorndike provided the foundation for later studies concerning the effects of rewards and punishments on learning.

Operant conditioning:

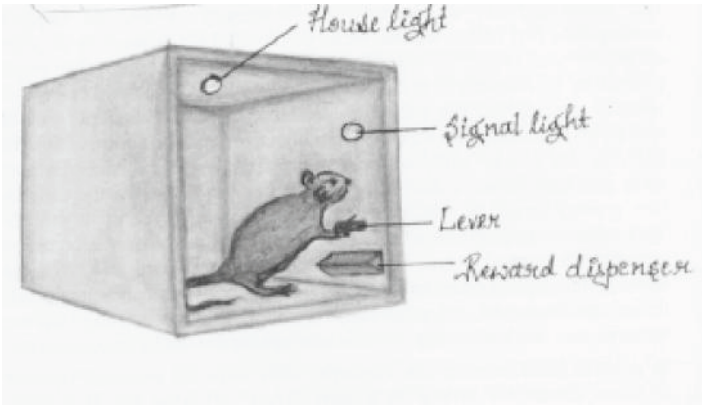
Operant conditioning is another approach to the study of associative learning which was introduced by B.F. Skinner.

To understand operant conditioning we need to distinguish between two kinds of behaviour which Skinner called 'respondent' and 'operant behaviour'. Respondent behaviour is directly under the control of a stimulus, as the unconditioned responses of classical condition. The relation of operant behaviour to stimulation is somewhat different. The behaviour often appears simply to happen to be emitted, that is, it appears to be spontaneous rather than a response to a specific stimulus. A stimulus that may influence operant behaviour is called a discriminative stimulus.

The word 'operant' derives from the fact that the operant behaviour 'operates' on the environment to produce some effect. Thus, when the telephone rings, going to where it is and receiving, are operant acts that lead to a telephonic conversation.

To demonstrate operant conditioning in the laboratory a rat is placed in a box called a "Skinner box". The rat is deprived of food for some specified period and so is assumed to be motivated by hunger drive. The inside of the Skinner box is bare, except for a protruding bar with a food dish beneath it. A small light bulb above the bar can be lighted at the experimenter's discretion.

B.F. Skinner



Skinner's Box

Left alone in the box, the rat moves about restlessly and by chance occasionally presses the bar. The rate at which it first pushes the bar defines its preconditioned operant level of bar pressing. After establishing the operant level, the experimenter attaches the food dispenser, so that every time the rat presses the bar a pellet of food falls into the dish. The rat eats and soon presses the bar again. The food reinforces bar pressing, and the rate of pressing increases dramatically. If the food dispenser is disconnected and pressing the bar no longer delivers food, the rate of bar pressing will diminish.

The experimenter can set up a discrimination by presenting food if the bar is pressed while the light is on, and not giving reinforcement if the response is made in the dark. This selective reinforcement leads to the rat's pressing the bar only in the presence of the light. Here, the light serves as a discriminative stimulus that controls the occurrence of the bar pressing response.

The above illustration gives us the meaning of conditioned operant behaviour. The behaviour 'operates' on the environment - the rat's bar pressing produces or gains access to the food. In classical conditioning, the animal is passive, it merely waits until the conditioned stimulus is presented and is followed by the unconditioned stimulus. In operant conditioning, the animal is active, its behaviour cannot be reinforced unless it first does something. There is no unconditioned stimulus that links the to-be-conditioned stimulus to the response.

Operant conditioning refers to increasing the probability of a response in a particular stimulus environment by following the response with reinforcement. Usually, the reinforcement is something that can satisfy a basic drive like food to satisfy hunger, but it need not necessarily be so.

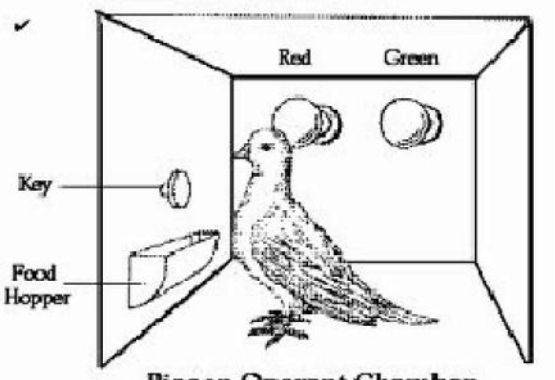
Measures of operant strength

Because the bar is always present in the Skinner box, the rat can respond to it as frequently or infrequently as it chooses. Hence rate of response is a useful measure of operant strength. The more frequently the response occurs during a given interval of time, the stronger it is.

The rate of response in operant conditioning is usually portrayed by a cumulative curve. The bar of the Skinner box is attached to a recording pen that rests on a slowly moving sheet of paper. Each time the animal presses the bar the pen moves upward and then continues on its horizontal path. Because the paper moves at a fixed rate, the slope of the cumulative curve is a measure of response rate. A horizontal line indicates that the animal is not responding while a steep curve indicates a fast response rate.

Partial reinforcement

Operant conditioning shows a high degree of orderliness or lawfulness. *One* illustration of orderliness is behaviour controlled by partial reinforcement - that is behaviour taking place when the response is reinforced only a fraction of the time it occurs.



Pigeon Operant Chamber

In the typical experiment, a pigeon learns to peck at a lighted disc mounted on the wall and gains access to a small quantity of grain as its reinforcement. Once this conditioned operant behaviour is established, the pigeon will continue to peck at a high and relatively uniform rate, even if it receives only occasional reinforcement. One pigeon was reinforced on the average of every 5 minutes (12 times an hour) yet pecking occurred some 6000 times per hour.

The practical significance of partial reinforcement is great. A mother is not always present to reward her child for looking both ways before crossing the street. But the influences of 'reinforcements are such that they persist against many non - reinforcements.'

Secondary reinforcement

Pavlov noted that once a dog had learned to respond to a conditioned stimulus in a highly dependable way, the conditioned stimulus could be used to reinforce, conditioned response to a new stimulus. Suppose the animal has learned to salivate to tone as a conditioned stimulus. This is a first-order conditioned response. If a flashing light is then presented along with only a tone, the flashing light when presented alone will come to elicit the conditioned response. Pavlov called this process second order conditioning. The conditioned stimulus of the first order conditioned (tone) has become a secondary reinforcer. Although second-order conditioning can be established with classical conditioning, it is more easily demonstrated with operant conditioning.

When a rat in a Skinner box presses a lever, a tone comes on momentarily followed shortly by a food pellet. After the animal has been conditioned in this way extinction is begun so that when the rat presses the lever, neither the tone nor the food appears. In time the animal ceases to press the lever.

Now the tone is connected again but without food. When the animal discovers that pressing of the lever turns on the tone, the rate of pressing markedly increases, overcoming the extinction, even though no food follows. The tone has acquired secondary reinforcing qualities. The strength of the tone as a secondary reinforcer can strengthen responses other than the response used during its original establishment and can do so with drives other than the one prevailing during the original training.

Secondary reinforcement greatly increases the range of possible conditioning. If everything we learned had to be followed by a primary reinforcer the occasions for learning would be very much restricted. As it is, any habit once learned can have other habits built upon it. A verbal promise of food can reinforce behaviour that would otherwise require food, mere praise itself becomes reinforcing.

Shaping behaviour

In classical conditioning, the conditional stimulus substitutes for the unconditioned stimulus in evoking the response appropriate to the

unconditioned stimulus. This substitution fails to account for learning of totally new responses. In contrast, operant conditioning plays an important role in the development of novel behaviour.

The experimenter can produce novel behaviour by taking advantage of random variations in the operant response and reinforcing only those responses that are in the desired direction. This technique is called 'shaping' behaviour, reinforcing only responses that meet the experimenter's specifications and extinguishing all the others.

Psychologists developed a large scale business, teaching animals elaborate tricks and behaviour routines by means of this shaping method.

In all training techniques the behaviour is shaped by means of reinforcement that is contingent upon the proper response. The importance of reinforcement in strengthening behaviour is demonstrated by what happens when we introduce noncontingent reinforcement i.e. reinforcement not contingent upon a specific response. In one experiment, Skinner placed hungry pigeons in separate Skinner boxes and at random intervals turned on a light that was immediately followed by food reinforcement: The effect on the behaviour of the pigeons was amazing. Each bird tended to select and repeat whatever it was doing when the reinforcement occurred. Thus for each bird some particular act or mannerism gained dominance because it occurred at the time of reinforcement, regardless of the fact that the act was in no way instrumental in producing the reinforcement.

Observation / Imitational Learning

Observational learning occurs when an organsim's responding is influenced by the observation of others, who are called models. Albert Bandura (1977, 1986) has demonstrated that both classical and operant conditioning can take place largely through observational learning

Bandura's theory of observational learning can help explain why physical punishment tends to increase aggressive behaviour in children, even when it is intended to do the opposite. Parents who depend on physical punishment often punish a child for hitting other children by hitting the child. The parents may sincerely intend to reduce the child's behaviour but they are serving as models for such behaiour. Although they may tell the child that hitting people will not accomplish anything, they have hit the child in order to accomplish something. In this situation actions speak louder than words, this is observational learning.

Transfer of Learning

Learning one skill often influences the acquisition of one type of performance, in turn it facilitates learning of another. The influence of earlier learning or later learning may on the other hand, be such that acquisition of one skill interferes with acquisition of another. In the first instance, we have positive transfer effects, frequently referred to as 'transfer of training' or 'transfer of learning'. In the second instance, we have a negative transfer effect, which is otherwise called 'negative transfer' or 'habit intereference'.

Higher organisms, including monkeys and human beings are adept at getting the knack of certain situations so that, when they encounter somewhat comparable situations, they know what to do.

Transfer in verbal learning

Transfer of verbal skills often, occurs. When comparable lists of nonsense syllables are learned one after another there is gradual reduction in the trials required to learn successive lists. It is as if the subjects are learning to learn this type of material.

Bases of transfer

Where transfer occurs, either in motor or verbal learning it comes from (1) similarity of contents (2) similarity of techniques (3) similarity of principles or (4) a combination of these.

Similarity of contents

Parts of old habits may be run off as a response to new situations, perhaps with minor modifications. After one has learned to drive a car, he soon masters the control of another. There is transfer from mathematical skills to mechanical engineering skills, because both involve the same symbols and symbolic relations. Transfer from one language to another occurs if the symbols and grammatical construction are alike.

Similarity of techniques

There are courses on how to study which aim to teach the student how to organize his learning so as to make him maximally efficient. Any transfer that comes from such courses is a transfer of study techniques.

Transfer in terms of technique, also occur, if having learnt the scientific approach to problems in one subject, the student applies scientific procedures to problems in other fields.

Similarity of principles

Transfer of principles is not always clearly different from transfer of techniques, because the use of a technique may involve the application of principle

A study of puzzle solving in human adults showed that when subjects

were taught the principles involved in solution of one problem, they solved without any error new puzzles which involved the same principle. Those who did not learn the principles involved failed to show much transfer.

Studies of transfer have failed to support the contention, once quite prevalent, that training in certain subjects serve to strengthen particular psychological functions. This doctrine known as the "formal discipline" has often been used to justify inclusion in the curriculum of studies which, although having no apparent practical value for certain students are said to be useful in "improving memory" or in giving "elasticity to mental functions". The evidence from experimental investigation show that transfer when it occurs is due to similarity of contents, techniques or of principles, not due to development of particular psychological facilities or functions.

Habit interference

Many errors in the early stages of learning are responses of transfer although inappropriately, from previous habits. Sometimes we experience great difficulty in eliminating these inappropriate responses. Since "carry over" from earlier training is usually a mixture of useful and useless, or interfering responses, we can see that whether transfer is positive or negative depends upon whether one's learning as a whole is aided or hindered by previous training.

We see habit interference in everyday life. The person who has learned to drive a car with a left-hand drive has unusual difficulty in learning to drive one with a right- hand drive. Habit interference with verbal activities also occurs at times. Students are sometimes "tripped up" by the construction of sounds of new words so that negative transfer occurs.

Negative transfer, like positive, occurs on the basis of similarity of content, techniques or principles, but it involves interference rather than facilitation. The contents, techniques or principles which make for negative transfer are opposed to those required by the new situation.

Factors influencing learning:

Operant or instrumental conditioning is a form of learning in which behaviour is learned, maintained or changed through its consequences. Such consequences are called **reinforcers,** is defined as any stimulus or event, which increases the probability of the occurrence of a (desired) response. A reinforcer has numerous features, which affect the course and strength of a response. They include its types – positive or negative, number or frequency, quality -superior or inferior and schedule continuous or intermittent (partial). All these features influence the course of operant conditioning. Another factor that influences this type of learning is the nature of the response or behaviour that is to be conditioned. The interval or length of time that lapses between occurrence of response and reinforcement also influences operant learning. Let us examine some of these factors in detail.

Types of Reinforcement

Reinforcement may be positive or negative. **Positive reinforcement** involves stimuli that have pleasant consequences. They strengthen and maintain the responses that have caused them to occur. Positive reinforcers satisfy needs which include food, water, medals, praise, money, status, information, etc. **Negative reinforcers** involve unpleasant and painful stimuli. Responses that lead organisms to get rid of painful stimuli or avoid and escape from them provide negative reinforcement. Thus, negative reinforcement leads to learning of avoidance and escape responses. For instance, one learns to put on woolen clothes, burn firewood or use electric heaters to avoid the unpleasant cold weather. One learns to move away from dangerous stimuli because they provide negative reinforcement. It may be noted that negative reinforcement is not punishment. Use of **punishment** reduces or suppresses the response while a negative reinforcer increases the probability of avoidance or escape response. For instance, drivers and co-drivers wear their seat belts to avoid getting injured in case of an accident or to avoid being fined by the traffic police.

It should be understood that no punishment suppresses a response permanently. Mild and delayed punishment has no effect. The stronger

the punishment the more lasting is the suppression effect but it is not permanent.

Sometimes punishment has no effect irrespective of its intensity. On the contrary, the punished person may develop dislike and hatred for the punishing agent or the person who administers the punishment.

Motivation energises an organism to act vigorously for attaining some goal. Such acts persist until the goal is attained and the need is satisfied. Motivation is a prerequisite for learning. Why does a child forage in the kitchen when the mother is not in the house? s/he does so because s/he needs sweets to eat for which s/he is trying to locate the jar in which sweets are kept. During the course of foraging the child learns location of the jar. Similarly when a hungry rat is placed in the box, the animal forages in the box for food. Incidentally it presses a lever and food drops in the box. With repeated experience of such activity, the animal learns to press the lever immediately after the animal is placed there.

Learning disabilities:

The inadequate development in learning that can occur in children and can persist throughout life is called Learning disability. This can manifest in language, speech, mathematical, or motor skills. The most common problems are a variety of reading / writing difficulties called dyslexia. The children with this problem find it difficult in word recognition and reading comprehension. They show deficiency in spelling, they omit, add, and distort words. And their reading is slow and halting. The other kinds of learning disabilities are:

Dysphonia – relates to the problem with pronounciation of words.

Dysgraphia – related to the problem with the style of writing.

Dyscalculia – relates to the problem with the comprehension of numbers and signs.

Writing habit

Students are required to form the habit of writing, specially what they have learnt newly. They also need to practice, writing short answers and long answers based on the marks allotted. When they start practicing, writing answers to questions they understand whether they have written meaningfully and systematically the answers that are required for respective questions. The practice of writing help them to organize their thoughts and points in a serial order. They can also learn to allot the required time to long and short answers. They will also realize the grammatical and spelling mistakes they are prone to commit. It is important to pay attention to neatness and legibility of their handwriting.

Points to remember

Meaning of 'learning': We learn motor, mental, perceptual and cognitive skills from the beginning of our childhood to adapt to the changing conditions in the world around us.

Definition of 'learning': "A relatively permanent change in behaviour brought about by experience and practice".

There can be temporary changes in our behaviour due to sickness, injury or medication. This is not considered as learning. Maturation also brings about changes in our behaviour. This is not directly related to learning.

Learning takes place by observing and participating in the events.

Learning can bring positive or negative change in our behaviour.

Learning is continuous and an on going process throughout our life.

Experience and practice makes our learning better day-by-day.

Learning is a complex whole, which depends on the exposure, opportunity, the willingness and the kind of systematic training we receive at the right time and place.

Learning by 'Conditioning': Originally given by Pavlov, classical conditioning occurs, whenever some previously unconnected stimulus arouses such a response as when salivation occurs, at the ringing of the bell. The bell is the conditioned stimulus and salivation a conditioned response. To achieve conditioning the neutral stimulus must be reinforced by pairing it with an unconditioned stimulus such as meat powder in this case. J.B. Watson used Pavlov's principles to human situations.

Learning by 'Insight': Given by Kohler about cognition in learning. He experimented on chimpanzees to explain how a sudden idea can occur to one's mind in finding a solution to the problems.

Trial-and-error learning Given by Thorndike is about the process of trial – and – error learning. The rewarding actions get strengthened and the non-rewarding ones get weakened and disappear on their own. These findings were later refined by Skinner and others.

Operant conditioning: In operant behaviour, the organism voluntarily operates in its environment to get a reward or to avoid punishment.

Observational / Imitational learning:- Observational learning occurs when an organism's response is influenced by the observation of others.

For example: Parents and Peer group.

Learning Disability : (LD) The inadequate learning that can occur in children and can persist throughout life is called Learning Disability.

QUESTIONS

1. What is Learning? / Write the definition of learning.
2. Who conducted the experiment on classical conditioning?
3. Explain classical conditioning experiment.
4. What are the determinants of classical conditioning?
5. Who extended the classical conditioning experiment to human situations?
6. What is the speciality of Watson's experiment?
7. What is 'insight'? Who conducted the experiment on 'insight learning'?
8. What is 'Insight'? Give an example.
9. Explain Insight method of learning
10. Who devised the trial and error experiment?
11. Explain Trial and error learning.
12. Explain the experiment on Instrumental conditioning?
13. What are the determinants of operant conditioning?
14. Name the person who conducted the experiment on operant conditioning.
15. What is learning by imitation?
16. What is positive transfer of learning? Give an example.
17. What is negative transfer of learning? Give an example.
18. Explain the factors influencing learning.
19. Mention different types of learning disability.

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CHAPTER VII

MEMORY

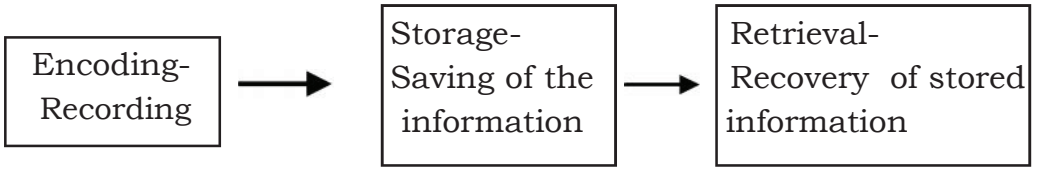
Meaning and Nature:

Memory is related to the process of recording any learning that takes place in one's life and allows later access to the same as and when required. Without memory there would be no learning. We would react to each occurrence of a situation as though it had not been experienced, each performance would require re-learning. At the same time, without learning there would be nothing to remember. Hence learning is the process of 'building up' memories for future use. Memory concerns the storage and retrieval of information and learning is 'trace' formation.

The study of memory is fascinating because we can understand how we store some information and why we forget some things very soon.

Information processing approach – the stage model:

According to psychologists, memory is 'the process by which we encode, store and retrieve information



We can understand memory by imagining it as that of a computer system. For example, a computer keyboard (encoding), disk (storage) and screen (retrieval). But human memory is far more complex than this.

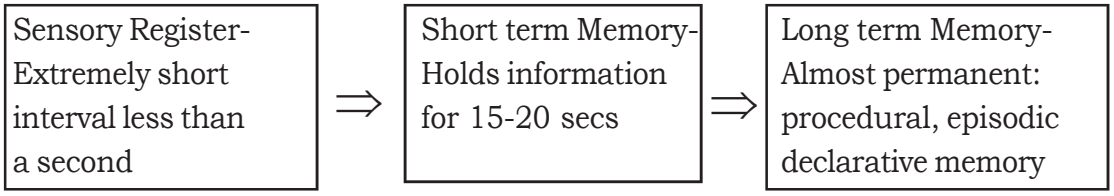
The three main processes involved in memory are:

Encoding: This is the process by which sensory information is converted into a form that can be entered into memory traces. All information is converted into visual images called as 'Iconic images', or auditory codes called as 'Echonic images'. In the same manner there may be codes relating to olfactory, gustatory, cutaneous and so on.

Storage: Learning brings about changes in the neurons in the brain. These neural changes are called 'Engrams' or memory traces. These changes remain in the brain and whenever we need to remember / recall the information, they are activated.

Retrieval: This is a process by which information stored in the memory is located for use. If the information is not encoded properly, or stored adequately, we will not be able to retrieve it correctly.

The nature / systems of memory:- Atkinson and Shiffrin (1968) have presented the following 'Modal Model'



The above model gives us an idea of how information travels from one mode to another through certain active control processes. The three types of memories are not separate store houses located in different parts of the brain. They simply represent the stages of memory.

Types of memory

Sensory memory: This operates as a kind of snapshot that stores information, which may be of a visual, auditory or other sensory nature for a brief moment of time. This snapshot is destroyed or replaced with a new one, unless the information in the snapshot is transferred on to some other type of memory before it is lost.

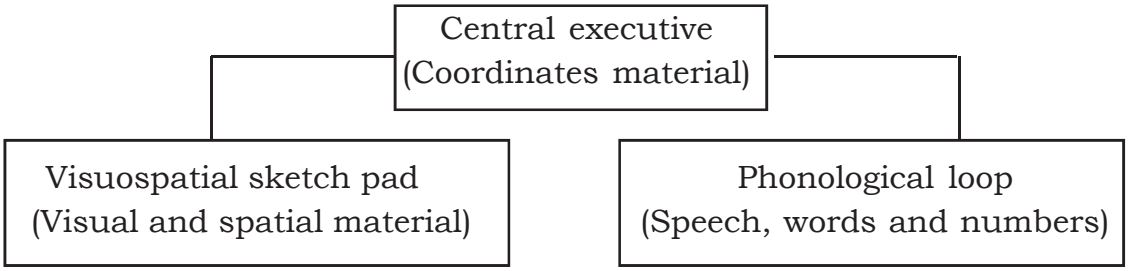
Short-term memory / working memory: The information in the sensory memory is of 'raw' sensory stimuli and is not meaningful. In order to store over time, it has to be given meaning. This is done in the short term memory by coding 'acoustically'. It means that the information is converted into sounds. The STM is capable of holding 7 ±2 chunks or items.

A 'chunk' is a meaningful grouping of related information that can be stored as a unit in short term memory. Chunking increases the storage capacity of STM. In mnemonics, it refers to a strategy, for making efficient use of STM by recoding information. It is a technique used to remember numbers. Though the idea can be used for remembering other things as well. The concept of a chunk of information should be flexible, consistent with logical organization. The nature of the content suggests how it should be subdivided and linked.

The information in STM lasts for about 15-20 seconds. During this time it has to be deeply processed to reach LTM. To do this, the information is sent to a 'rehearsal buffer'. Whether the transfer is made from short-to-long term memory seems to depend largely on the kind of rehearsal that is carried out. If the material is simply repeated over and over again like a telephone number, just to pass on some information, it is kept current in STM, but it will not necessarily be placed in LTM. The moment the purpose is served, it will be completely forgotten.

On the other hand, if the information is rehearsed using a process called **elaborative rehearsal**; it is likely to be transferred into LTM. Elaborative rehearsal occurs when the material is organized in some fashion. For example, a list of vegetables to be purchased at a store could be woven together in memory, as items being used to prepare an elaborate 'salad'.

Short term memory is also called 'working memory', According to a psychologist Alan Baddeley (1992) STM has three part working memory:



One component is the central executive, which coordinates the material to focus on during reasoning and decision-making.

The central executive makes use of two subcomponents. The visual spatial sketch pad and the phonological loop.

The visuospatial sketchpad concentrates on Visual and spatial information.

Phonological loop is responsible for holding and organizing information relating to speech, words and numbers.

It is important to note that the function of the STM is to organize information that is being retrieved from LTM for use in cognitive functions such as perception, decision making, reasoning and so on. Information from LTM is brought back into STM for this purpose. For example when we see a new object, we have information from our sensory organs about the object. But to give meaning to this object, we need to use information that is stored in our LTM. Hence the respective information from LTM is brought back into the STM. This is combined with the information that already exists in the STM, and this helps us to understand the new object better. This is the reason why STM can be called 'working memory'.

Long term memory – The final storehouse

Information that is rehearsed well, passes on to the LTM where it is stored on a more or less permanent basis. LTM is a storehouse of unlimited capacity. Here the information is classified, organized and stored just like the books in a library.

Organisation in LTM:

Long term memory can further be classified as 'declarative memory'

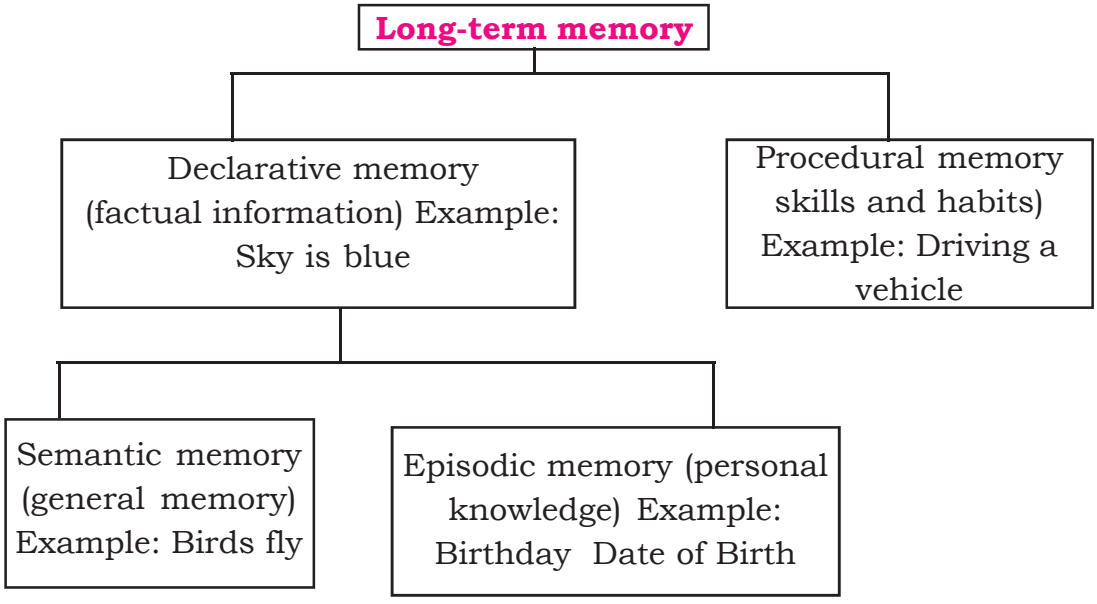
and 'procedural memory'. Declarative memory is memory for factual information, names, faces, dates and the like. In contrast, procedural memory refers to memory for skills and habits such as riding a bike, dancing and swimming. Information about things is stored in declarative memory: information regarding how to do things is stored in procedural memory.

Declarative memory can be further divided into 'semantic memory' and 'episodic memory'.

Semantic memory is memory for general knowledge. It includes rules of grammar, rules of logic for deducing facts. It helps us to remember spellings, multiplication tables and codes of places.

Constructive memory is an interesting characteristic of semantic memory. It refers to the process of integrating information from small pieces of information into meaningful whole. For example we combine individual sentences into a meaningful whole like a lesson in a text book. This helps in forming an organized body of knowledge.

Episodic memory is all about our personal experiences. It is also called autobiographical memory and holds a lot of details about events that have occurred in our lives. It is influenced by our moods, past experience and perceptions.



The retrieval from long term memory:

The ability to retrieve depends on the type of performance being measured. The information can be retrieved or brought out in two ways namely 'recognition' and 'recall'.

Recognition involves stating whether we have memory of a place, person or incident. For example, identifying a suspect in a police line up or answering true or false of a few statements, matching two lists of words, pick and choose the correct alternative of the four or five words, or phrases in the examination. If we are familiar with the person or answer, the memory traces for that information are activated again, enabling us in recognizing.

Recall involves retrieving specific pieces of information on our own. For example, asking a witness of a theft to describe the appearance of the thief - the color of his dress or complexion and so on. We have to depend on several kinds of retrieval cues. Stimuli that help us to remember information that we feel unable to recall otherwise are called retrieval cues. These cues can be some aspect of external environment also called 'context dependent' cues like a place, a sound, an item or a smell. The cues can be internal (state dependent cues) in nature, like a mood, an emotion or illness.

It has been discovered that there are more forms of memory. They are:

(a) 'Explicit memory' which refers to intentional or conscious recollection of information like remembering dates and events.

(b) 'Implicit memory' refers to memories of which people are not directly aware, but this can affect subsequent performance and behavior. For instance, a student may always underline and margin while writing the answers but may not remember, when he learnt to do this and who taught him to do so.

Our memory can be understood in some more forms:-

a) Roger Brown and James Kulik (1977) labeled vivid recollections of surprising, shocking or tragic events that hold a special place in memory as "flashbulb memories". For example: Earth quakes - events like this

remain in memory especially when we are personally involved in the event. But there are chances of these facts getting mixed with a little fiction. So remembering is an 'active' process we tend to put two and two together to reconstruct the past.

b) **Autobiographical memories**: Memory provides us with a sense of identity that evolves and changes, as we build up a store of episodic memories about events we have experienced. For most of us, the memories we have of our own lives are fascinating. (some even publish them). We analyze them to learn more about ourselves (Ross, 1989).

c) **Prospective memory**: This involves planning ahead for whatever we need to do later. We set the alarm clock to wake us up the next day morning, to attend to some important work, or for catching an early morning flight.

Improving memory

Following a specific method of learning facilitates memory. These methods ensure passage of information from STM to LTM. The following are some of the important techniques used to improve memory.

Mnemonics: (Greek word, meaning memory techniques) is an effective organizational strategy. This can help us in improving our retention of information. For example, while learning the rhyme, Thirty days hath September, April, June and November and all the rest have Thirty-one days except February, helps us to remember all the months with 30 days and others with 31 days.

1) Use of **mnemonics** devices, i.e., memory techniques, the creative part of the brain i.e., the right brain that can greatly improve our recalling capacity. For example: visualizing the learnt information, making use of flow charts, diagrams, charts, using colors, writing difficult formulae on separate cards in block letters in color pens and going through the same frequently.

2) **Organization**: A large mass of information can be shaped into a small meaningful structure. This can enable us to recall the whole when required. This is especially helpful in answering questions in examination. For example VIBGYOR, UNESCO, UNICEF etc.

3) **Associations**: When newly acquired information has to be recalled, they can be associated with readily available cues. To differentiate between reptiles and mammals, the first can be remembered as animals that slide on the ground and the second as those, walking on all fours.

4) **The method of loci (meaning location):** The most practical way is to use a series of places which are visited habitually and then to place each of the items to be memorized at different locations along this route.

Economical methods of memorization:

1) **Massed and spaced learning:** If a learning material is easy and short like a poem with 4 to 5 stanzas we read it in one sitting several times, till it is mastered. This is called massed learning. If the material is long and difficult, it is better to space the learning periods. Spacing learning helps in strengthening the engrams. This can avoid fatigue and boredom.

2) **Part and whole learning:** When the learning material is like a short story, it is better to read it as a 'whole' and appreciate the meaning, characters and implications. But if the material is lengthy and difficult, it is better to learn one part, understand that small portion properly and go to the next part. This gives confidence to learn further and further. For example: The syllabus in each semester for a class is divided into 5 to 6 units. Each unit has to be learnt in a month's time. So that by the end of the semester the student is ready to face the examination.

3) **Over learning:** By studying and rehearsing material even after we are able to reproduce it 100%, it is possible to recall after a long time. Practice and rehearsal give better results than just stopping after learning the material fully.

4) **Repetition and Relearning:** In academic learning, given the volume of learning, it is difficult to retain the learned material. In learning a full chapter, the connections between the parts of the material can be strengthened, by asking questions or rehearsing the answers in an active manner. This will aid in later recall by providing ample retrieval cues.

5) Rote learning: All children start learning without understanding exactly what they are learning. For example, when a 3 year old recites the poem "Twinkle, Twinkle little star, How I wonder what you are, Up above the world so high, like a diamond in the sky". This child is only imitating the lip movements and actions of the teacher. Many a times even high school children by heart the formulae in mathematics or chemistry. Rote memory helps in recalling at the time of examinations.

Planning, rehearsal, organization, feedback and review can see us through the course examination. 'Practice makes perfect', over learning helps us to reduce the amount of forgetting.

P.O.W.E.R Learning

P – prepare: This is the first stage in learning where the student has to set specific goals, from learning a new material.

O – organize: This stands for having a frame work within which the matter has to be learned.

W – work: This signifies reading and understanding the material, as a whole.

E – evaluate: The student has to check whether, s/he is understanding the material being learned.

R – re-think: Reviewing, reanalyzing, asking questions to her/himself. In other words the student needs to do critical thinking.

Forgetting

Meaning:

Forgetting is essential to the proper functioning of memory. The ability to forget unimportant details about experiences, people, and objects allow us to avoid being burdened and distracted by the storing of meaningless data. For example, it is not useful to form separate memories of the way friends look every time we met them. So we tend to forget their clothing, facial blemishes and other unimportant matters that change from one occasion to the next. Instead our memories are based on a summarization of various important features. Forgetting unnecessary information is as essential to proper functioning of memory as is remembering material.

So forgetting is 'great gift'. It helps us to cope with loss and disappointment. It is because of forgetting that we can overcome grief when we lose a loved person. While learning a new task we tend to commit many mistakes. But after we have perfected the task we forget all the wrong movements. So forgetting is advantageous.

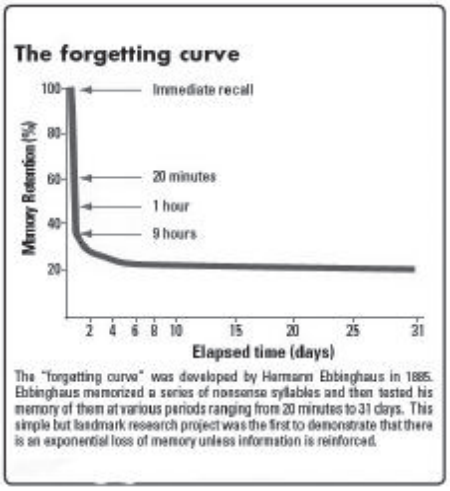
Forgetting is our inability to retrieve information when we need it. At times, it can be disadvantageous. Many a times much of what we think we have 'forgotten' was never encoded and stored in the first place. This can be attributed to lack of attention. If we have not paid attention while learning a lesson, it may not reach the STM from the sensory register; or it is forgotten because we did not do the required rehearsal to transfer it on to LTM.

It is also possible that we may not be able to retrieve the information because of lack of proper cues. If the question asked is not clear we may not be able to retrieve the required answer.

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

Why do we forget?

Hermann Ebbinghaus (1885/ 1913) memorized long lists of nonsense syllables, such as BOK, WAF, GED, and then tested his retention over a period of several weeks. Most of his forgetting occurred soon after initial learning and then leveled off.



The "forgetting curve" was developed by Hermann Ebbinghaus in 1885. Ebbinghaus memorized a series of nonsense syllables and then tested his memory of them at various periods ranging from 20 minutes to 31 days. This simple but landmark research project was the first to demonstrate that there is an exponential loss of memory unless information is reinforced.

According to Ebbinghaus most forgetting occurs during the first nine hours after learning, especially during the first hour. After that, forgetting continues, but at a much slower rate.

Of course, some memories never lose their distinctiveness. Events that are significant in our lives like graduating from school/college, getting a first job, marriage are more memorable than others. But why do we forget many of the details? Psychologists have proposed different mechanisms to account for forgetting.

Kinds of forgetting:

Forgetting can be classified as normal and abnormal forgetting. In **normal forgetting**, forgetting occurs with the lapse of time in a normal way without any intention, of forgetting by the learner. In **abnormal forgetting**, one deliberately tries to forget something. This can also be called wishful forgetting. Let us learn more about the kinds of forgetting.

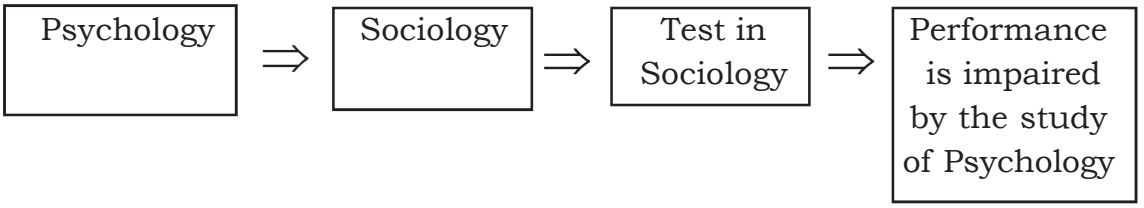
A: Normal forgetting

1. **Decay theory:** According to this theory we tend to forget with the passage of time. Every piece of information that enters LTM forms a trace with constant use; the trace gets strengthened and is remembered over long periods of time. But when a trace is not used, it simply fades and thus the information is forgotten. For example, we are able to remember many telephone numbers which are in use. But those which we have not used for long is forgotten. The trace of the old number has slowly faded from the memory.
2. **Interference**: This can take two forms (a) Retroactive interference (b) Proactive interference.

Proactive Interference

Study of the subject

Retroactive inhibition



In retroactive interference, a new learning interferes with information already present in our memory. If learning the rules of a new game causes us to forget the similar game rules we knew earlier, we are experiencing retroactive interference.

Proactive interference occurs when previously learned information, interferes with the present learning. For example, if we are used to one keyboard of the computer, any small change in the new keyboard may hinder our present learning.

3. **Accident:** Temporary disturbances in the blood supply to certain parts of the brain can also cause forgetting. Use of certain drugs, during illnesses, also accounts for forgetting. A fall from a height, brain damage as a result of an automobile accident and concussions (a violent shock as from a heavy blow on the head) can cause forgetting.

4. **Emotional shocks:** Emotional factors can also play role in the retrieval failure. Sudden, unexpected death of near and dear ones can result in difficulties with, the retrieval of unpleasant, anxiety - provoking information stored in LTM.

5. **State dependent memory:** If we encode information while in one emotional state and try to retrieve it in another, our recall may suffer.

B : Abnormal forgetting:3

6. **Alzheimer's Disease**

Alzheimer's disease involves severe memory loss, as a result of disconnection in the network of brain cells. Initially the short term memory is affected. People start forgetting names, dates, faces and so on. Slowly it increases in intensity and even simple routine tasks are forgotten.

7. **Motivated forgetting:** Sigmund Freud, in his book 'Psychopathology of everyday life', reports that people forget because they block from consciousness those memories that are too threatening or painful to live with. He called this self-protective process 'repression'. Today many psychologists use a more general term, 'motivated forgetting' . Individuals might be motivated to forget events for many reasons like embarrassment, guilt, shock, and a desire to protect their own pride.

8. **Amnesia:** It means a profound memory loss of what has been stored. It can also be inability to form new memories. Amnesia also refers to abnormal forgetting. Amnesia can be of two types, **'retrograde'** and **'anterograde'**. In **retrograde amnesia**, memory of incidents before a particular event is lost. *For* example: An accident resulting in brain injury. The lost memory can be regained after some days, months or years depending on the impact of the accident to that part of the brain. It may also be possible that a person loses the memory for past event totally till the end of his/her life.

   In **Anterograde amnesia**, loss of memory occurs for events following the injury. This results in an inability to learn or remember any new information. But they are able to remember what has already been stored in LTM before the accident.

9. **Psychological amnesia:** It is interesting to learn that every one of us have amnesia of our early childhoods. As children, we encode memories in a non verbal form, storing our images and feelings. Early childhood memories are not available to us. There is no retrieval cue, suiting to gain access to, the image and feeling memories, of our childhood.

   Researchers believe that childhood amnesia occurs because brain areas involved in the formation or storage of events are not well developed until few years after birth. As we grow, much of our memory is encoded verbally and tied into networks or schema that is based on language. Language development and the richness of memory go together.

10. Drugs, Alcohol and toxic effect: Use of prescribed drugs because of sickness can result in temporary forgetting. Once the person gets well and stops using the drugs the toxic effects disappear and hence the memory is regained. When people get addicted to drugs one of the effects can be loss of memory.

Heavy drinking may cause amnesia for the events that occurred while the person was under the influence of alcohol. Heavy drinking over a period of years can result in irreversible brain damage known as the Korsakoff's syndrome. Korsakoff's syndrome is caused by thiamine deficiency (vitamin B1), characterized by apathy, confusion and memory impairment.

Time management

All of us have 24 hours in a day which can be divided into three parts of 8 hours each. One part of the time is spent for sleep. Human beings need sleep for 8 hours (± 1 hour). Another part is spent for school / official work. The third part of 8 hours is required for all our activities like daily chores, relaxation, recreation, exercise / sports / games and the development of some special talent like, dance, music, art and general reading. We should always implement a time schedule and follow the same. When we cannot do this, we start complaining of lack of time. There are all the chances of time being wasted and hence when there is a demand for time bound projects, we tend to feel hard pressed for time.

ACTIVITIES

Activity - 7.1:

Administer the following simple test to some of your peer group and discuss their results:

I Series : 1, 9.2.5, 4, 9.8.1, 1.2.1

II Series: 1, 9, 25, 49, 81, 121

IV Series: 1^2, 3^2, 5^2, 7^2, 9^2, 11^2

Points to remember

Memory: The process by which information is recorded, stored and retrieved from our brain as and when we require.

Stage model: The process by which we encode, store and retrieve information.

Modal model: Consists of Sensory Memory, Short - term Memory and Long term Memory.

Short - term memory: Is also called working memory.

Long – term memory: Consists of Declarative and Procedural memory.

The three systems namely sensory register, STM and LTM, makes us understand how information travels from one mode to another.

There are two forms of memory namely Explicit and Implicit Memory.

Autobiographical and prospective memory are two more forms of memory.

Memory can be improved to applying the following methods: Mnemonics, Organization, Association and Loci

Forgetting Forgetting is failure to recall at the given moment.

The causes of forgetting are explained by: decay theory and interference; because of brain injury and emotional shocks and Alzheimer's disease.

Forgetting can also be caused by amnesia, drugs and alcohol and motivated forgetting also is possible.

It is possible to make learning effective and memory stronger by being disciplined in our management of time and commitment to work.

QUESTIONS

1. What is Memory?
2. Explain the stage model of memory.
3. Explain the types of memory.
4. What is sensory memory? Give example.
5. Mention the types of long-term memory.
6. What is episodic memory? Give example.
7. What is forgetting? Mention the kinds of forgetting with examples.
8. Mention the two kinds of interference. Give examples.
9. Explain the causes of forgetting.
10. What is Amnesia?
11. What are the ways of improving memory?
12. Expand STM. Give an example.
13. What is declarative memory? Give examples.
14. What is Iconic memory?
15. What is Episodic memory?
16. What is Autobiographical memory?
17. What is Korsakoff 's syndrome?

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CHAPTER VIII

THINKING

Introduction and definition

In psychology , thinking is a core subject area with an independent existence and a meaning of its own. We are thinking during most of our waking hours and even when we are asleep and dreaming. There is no time when we are not thinking. Thinking may be defined as **'the manipulation of mental representations of information'.** Thinking consists of cognitive rearrangement or manipulation of information from the environment and symbols stored in long term memory. A symbol is a representation of an object or event in the environment. We use images and language symbols in thinking. The quality of our thinking depends upon our understanding of the world around us.

Gilmer (1970), has defined thinking as "a problem solving process in which we use ideas or symbols in place of overt activity".

Nature of thinking

Thinking is the base of all cognitive activities or processes and is unique to human beings. It involves manipulation and analysis of information

received from the environment. For example, while seeing a painting we are not simply focusing on the colour of the painting or the lines and strokes, rather we are going beyond the given text in interpreting its meaning and we are trying to relate the information to our existing knowledge. Understanding of the painting involves creation of new meaning that is added to our knowledge. Thinking, therefore, is a higher mental process through which we manipulate and analyse the acquired or existing information. Such manipulation and analysis occur by means of abstracting, reasoning, imaging, problem solving, judging, and decision making.

Thinking is mostly organized and goal directed. All day-to-day activities, ranging from cooking to solving a math problem have a goal. One desires to reach the goal of planning, recalling the steps that one has already followed in the past if the task is familiar or inferring strategies if the task is new.

Thinking is an internal mental process, which can be inferred from overt behaviour. If you see a chess player engrossed in thinking for several minutes before making a move, you cannot observe what he is thinking. You can simply infer what he was thinking or what strategies he was trying to evaluate, from his next move.

Building Blocks of Thought

Thinking relies on knowledge we already possess. Such knowledge is represented either in the form of mental images or words. People usually think by means of mental images or words. Suppose we are travelling by road to reach a place which we had visited long back, we would try to use the visual representation of the street and other places. On the other hand when we want to buy a storybook, our choice would depend upon our knowledge about different authors, themes, etc. Here our thinking is based on words or concepts. Hence mental image and concepts are the foundations of human thought.

Mental image

Suppose a teacher asks a student to imagine a cat sitting on a tree with its tail slightly raised and curved. The student would most likely

try to form a visual image of the whole situation, something similar to what the girl in the picture is doing.

The Girl forming a Mental image

Or think of another situation where one is asked to imagine oneself standing in front of the Taj Mahal and describe what one sees. While doing this s/he is actually forming a visual image of the event. S/he is probably trying to see through her/his mind's eye, just like the way s/he would see a picture.

It is useful to draw a map while giving directions to someone. A student while reading a map, remembering the different places and subsequently locating them in a physical map in the examination, in doing this s/he was mostly forming and using mental images. An **image** is a **mental representation** of a sensory experience. This can be used to think about things, places and events.

Concepts:

We try to identify the object or event by extracting its characteristics, matching it with the already existing category of objects and events. For example, when we see an apple, we categorise it as fruit, when we see a table we categorise it as furniture, when we see a dog we categorise

it as an animal and so on. When we see a new object, we try to look for its characteristics, match them with characteristics of an existing category, and if matching is perfect we give it the name of that category. For example, while walking on the road we come across an unfamiliar quadruped of a very small size, with a face like a dog, wagging its tail and barking at strangers. We would no doubt identify it as a dog and probably think that it is of a new breed, which we have never seen before. We would also conclude that it would bite strangers. A concept thus, is a mental representation of a category. It refers to a class of objects, ideas or events that share common properties.

The need to form concepts: Concept formation helps us in organizing our knowledge, so that whenever we need to access our knowledge, we can do it with less time and effort. It is something similar to what we do to organize our things at home. Children who are very systematic and organized, put their things such as books, note books, pen, pencil and other accessories in specific places in their cupboard, so that in the morning, they don't have to struggle to find a particular book or the geometry box.

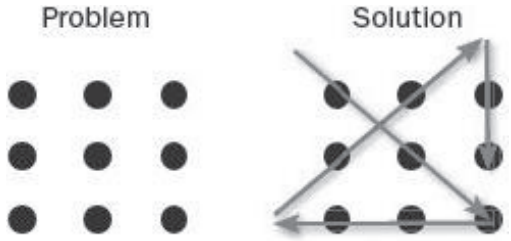
In the library too we have seen books organized as per subject areas and labeled so that we would be able to find them quickly with less effort. Thus, for making our thought process quick and efficient, we form concepts and categorise objects and events.

The processes of Thinking:

1. Problem solving:

How do we proceed while repairing a broken cycle, or planning a summer tour or patching up a broken friendship? In some cases the solution is reached quickly as in repair of a bicycle based on immediately available cues. Whereas others are more complex and require time and effort. Problem solving is thinking that is goal – directed. Almost all our day-to-day activities are directed towards a goal. Here it is important to know that problems are not always in the form of obstacles or hurdles that one faces. It could be any simple activity that we perform to reach a defined goal. For example, preparing a quick snack for a friend who

has just arrived at our place. In problem solving there is an initial state (i.e., the problem) and there is an end state (the goal). These two anchors are connected by means of several steps or mental operation. The table would clarify our understanding of various steps through which one solves a problem.



Mental Operations Involved in Solving a Problem

Let us look at the problem of organizing a play in school on the occasion of Teachers' Day Problem solving would involve the following sequence.

Mental Operation	Nature of problem
1. Identify the problem	A week is left for teacher's day and students are given the task of organizing a play.
2. Represent the problem	Organising play would involve identification of an appropriate theme, screening of actors, actresses, arranging money etc.,
3. Plan the solution:	Search and survey various available themes for a play set sub-goals and consult teachers and friends who have the expertise. (The play to be decided, based on such considerations as cost, duration,suitability for the occasion etc.,)
4. Evaluate all solutions (plays)	Collect all the information / stage rehearsal.
5. Select one solution and execute	Compare and verify the various options to get the best solution (the play)
6. Evaluate the outcome	If the play (solution) is appreciated, think

	about the steps students have followed for future reference.
7. Rethink and redefine problems and solutions	After this special occasion you can still think about ways to plan a better play in future.

Factors affecting problem solving:

The way we approach a problem is central to how effective we are at solving it. Other factors also influence our effectiveness at problem solving. Three such factors - our level of expertise, whether we fall prey to a mental set, and whether we develop insight into the problem - reside within us. A couple of characteristics of the problem also affect our ability to solve them effectively, the extent to which the elements of the problems are fixed in function, and the way the problem is defined.

a) Expertise: Experts solve problems more efficiently and rapidly than novices do. Generally speaking, people who are experts at solving a certain kind of problems share the following characteristics

- They know the particular area well.
- They have a good memory of the elements in the problems.
- They form mental images or representations that facilitate problem solving,
- They relate the problems to similar problems and
- They have efficient methods for problem solving.

These factors are interrelated. Also the experts apparently use more efficient methods than the novices. Experts seem to use parallel processing i.e., they deal simultaneously with two or three elements of the problem. Novices are more likely to engage in serial processing; that is, handle one element of two problems at a time.

b) Mental set

The tendency to respond to a new problem with the same approach that helped solve similar problems is termed a mental set. Mental sets usually make our work easier, but they can mislead us when the similarity between problems is illusory.

c) Insight

In Gestalt psychlology , this is a sudden perception of relationships among elements of the 'perceptual field', permitting the solution of a problem. It seems as though the pieces of information in the problems have suddenly been reorganized so that the solution leaps at us in a flash. The Gestaltists term this the "Aha ! experience".

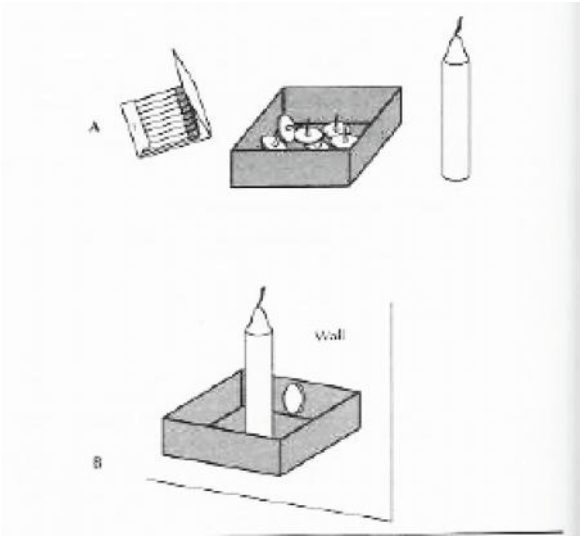
d) Incubation

In problem solving, this is a hypothetical process that sometimes occurs when we stand back from the frustrating problem for a while and the solution 'suddenly' appears.

e) Functional fixedness

Functional fixedness may also hinder problem solving. Functional fixedness is the tendency to think of an object in terms of its name or

familiar functions. It can be similar to a mental set in that it makes it difficult to use familiar objects to solve problems in novel ways.



Functional fixedness

Duncker's (1945) candle problem: The subjects are asked to attach a candle to the wall and are given a box of tacks, candles and matches as shown in panel A. The solution is shown in Panel B.

2. Reasoning:

Reasoning is a cognitive activity that transforms information in order to reach specific conclusions and make decisions. In order to understand reasoning, we need to distinguish between formal reasoning and everyday reasoning. In formal reasoning, all the required information is supplied, the problem to be solved is straight forward, there is typically one correct answer, and the specific method of reasoning is followed. Everyday reasoning involves planning, evaluating arguments etc. Here some premises are implicit and not stated, some may not be supplied at all. The problems usually have several possible answers and they are complicated because they relate to many issues and questions. Hence, everyday reasoning is far more complex and less definite than formal reasoning. Formal reasoning may be **inductive** or **deductive.** This is

also called **syllogistic reasoning.**

a **Deductive reasoning** is a form of reasoning in which the conclusion must be true if the premises are true. Premises provide the assumptions or basic information that allow people to draw conclusions. The conclusion is said to be 'deduced' from the premises. for ex:

1) All human beings die one day.

   I am a human being, I will die one day.

2) All oranges are fruits, all fruits grow on trees. Therefore, all oranges grow on trees.

b) **Inductive reasoning,** on the other hand, does not permit us to draw absolute conclusions. Yet inductive reasoning is used all the time. We conclude that a certain type of food will or will not make us feel sick because of our experiences on earlier occasions. Although the conclusion may not be logical, inductive conclusions are correct, often enough for us to get on with our daily lives with some degree of confidence.

For example,

1) "Every time you eat shrimp, you get cramps.

   Therefore you get cramps because you eat shrimp"

2) All the tigers observed in a particular region have yellow black stripes, therefore all the tigers native to this region have yellow stripes.

c) **Analogy,** Analogy is another form of reasoning which involves four parts. A is to B as C is to D with the relation between the first two parts being the same as the relation between the last two. An analogy is a partial similarity among thinks that are different in other ways.

The analogy applied the solution of an earlier problem to the solution of a new one. For example, water is to fish as air is to human; white is to snow as black is to coal. Analogies can be helpful in solving problems. They help us in identifying and visualizing the salient attributes of an object or event which would otherwise go unnoticed.

d) Problem solving A problem exists when there is any conflict or difference between one situation and another situation. In trying to reach a solution, we use information available to us from long term memory and also from immediate perception. So problem solving is a form of rule guided, motivated information processing. Many rules used in problem solving refer to the changes that can be made in going from one situation to another. Two major types of rules are algorithms and Heuristics.

An **algorithm** is a rule, if applied appropriately, guarantees a solution to a problem. We can use an algorithm even if we cannot understand why it works, algorithms yield correct answers to problems as long as the right formula is used. Finding the right formula to solve a problem may require scanning one's memory for all formulas that contain variables that represent one or more of the elements in the problem.

A systematic random search is an algorithm for solving problems in which each possible solution is tested according to a particular set of rules.

Heuristics

Heuristics are shortcuts that enable us to simplify and solve problems. In contrast to algorithms, heuristics do not guarantee a correct solution to a problem. But when they work, they permit more rapid solutions. One type of heuristic device is the 'means-end-analysis'. In using this heuristic device, we assess the difference between our current association and our goals and then do what we can to reduce the discrepancy.

3. Decision making

Decision making is a kind of problem solving where one solution has to be chosen from a number of alternatives. Most times, decision making is risky because we cannot be sure of the outcome. Decision making is influenced by a number of factors. Some of which are :

a) Heuristics – These are mental rules of thumb that helps us to make decisions in a rigid and efficient manner. They reduce the effort needed in decision making. They are derived

from past experience and serve as simple guidelines. For example: buying a branded product, though more expensive than a non-branded one, involves less risk and assurance of quality.

b) Framing in decision making - Framing is presentation of information concerning potential outcomes in terms of gains and losses. When the emphasis is on gains, people preferred to avoid risks. But they prefer taking risks to accepting losses. Effects of framing influence the type of choice that we make. Example for gains: the money is invested in Nationalized Banks, with lesser interest than investing in some private company's shares with higher interest rates which may suddenly get closed due to loss of production in the company. Example for taking risks ; people who have invested their money in private company may come to know that the company is under loss. The investors can take 50 percent of their investment immediately or wait for the company to recover and get their full money back. In such instances majority of the people rush to get atleast 50 percent of their investment back than facing the risk of loosing all their money.

c) Escalation of commitment - This is a tendency to become increasingly committed to bad decisions even as the losses associated with them increase. The person gets trapped in bad decision. This is very common in many areas of life. For example, some of the airlines which are running under loss continue to fly airplanes for the reason of commitment and prestige.

4. Creative Thinking

Creative thinking is distinguished from other types of thinking by the fact that it involves the production of novel and original ideas or solutions to problems. Sometimes, creative thinking is understood just as a new way of thinking or thinking differently. However, it is important to know that besides novelty, originality is also an important characteristic of creative thinking. Every year new models of household appliances, tape-recorders, cars, scooters, and television sets produced may not be original unless unique features are added to these products. Creative thinking thus refers to originality and uniqueness of ideas or solutions

that did not previously exist. Creative thinking is also generally characterized by what Bruner calls "effective surprise'. If the product or idea is unusual, the response of most who experience it is one of instant surprise or of being startled.

Another important criterion that characterises creative thinking is its appropriateness in a particular context. Simply thinking of being different without any purpose, doing things in one's own ways, being non-conformist. Indulging in fantasy without any purpose or coming out with a bizarre idea, is at times mistaken for creative thinking. Researchers tend to agree that thinking is said to be creative when it is reality-oriented, appropriate, constructive and socially desirable.

J.P. Guilford, a pioneer in creativity research, proposed two types of thinking; **convergent** and **divergent.** Convergent thinking refers to thinking that is required to solve problems which have only one correct answer. The mind converges to the correct solution. To illustrate, look at the question given below. It is based on a number series, where you have to find the next number; only one right answer is expected.

Q. 3. 6. 9……. What will come next?

Ans: 12

Now you try to think of certain questions for which there is no one right answer but many answers. A few such questions are given below:

- What are the various uses of cloth?
- What improvements will you suggest in a chair so that is becomes more comfortable and aesthetically pleasing?
- What will happen if examinations are abolished in schools?

Answers to the above questions require divergent thinking which is an open-ended thinking where the individual can think of different answers to the questions or problems in terms of her/his experiences. Such kind of thinking helps in producing novel and original ideas.

Divergent thinking abilities generally include fluency, flexibility, originality and elaboration.

- **Fluency** is the ability to produce many ideas for a given task or a problem. The more ideas a person produces, the higher his fluency ability. For example, more the number of uses of a paper cup, more would be the fluency.
- **Flexibility** indicates variety in thinking. It may be thinking of different uses of an object, or different interpretation of a picture, story or different ways of solving a problem. In case of uses of a paper cup, for example, one may give an idea to use it as a container or to draw a circle, etc.,

Thinking Divergently

- **Originality** is the ability to produce ideas that are rare or unusual by seeing new relationships, combining old ideas with new ones, looking

at things from different perspectives etc. Research has shown that fluency and flexibility are the necessary conditions for originality. The more and varied ideas one produces, the greater the likelihood of original ideas.

- **Elaboration** is the ability that enables a person to go into details and workout implications of new ideas.

Divergent thinking abilities facilitate generation of a variety of ideas which may not seem to be related. For example, what are the common ideas for enhancing food production? The likely answers would be relate to quality of seeds, fertilizers, irrigation, and so on. If someone thinks of cultivation in a desert for extracting protein from weeds, it would be a remote idea. The association here is between 'food production' and 'desert' or ' weeds'. Ordinarily, we do not associate these together . But, if we let our mind free to seek new and remote associations, a number of combination of ideas may arise out of which one or two may turn out to be original. One must remember that both convergent and divergent thinking are important for creative thinking. Divergent thinking is essential in generating a wide range of ideas. Convergent thinking is important to identify the most useful or appropriate idea.

Stages in creative thinking

The steps involved in the thinking of outstanding creative thinkers have been studied through interviews, questionnaires and introspection. Though each of these persons has his own way of thinking, their thinking seems to have a recurring pattern. It tends to proceed in five stages (1) preparation (2) incubation (3) illumination (4) evaluation and (5) revision.

In stage 1. **Preparation,** the thinker formulates his problem and collects the facts and materials he considers necessary for its solution. Very frequently he finds that he cannot solve the problem even after hours or days of concentrated work. Often he deliberately or involuntarily turns away from the problem ; he is then in stage 2) – **Incubation,** during this period, some of the ideas that were interfering with the solution of the problem tend to fade. On the other hand, things he experiences or learns in the meantime may provide the clue for the solution. During incubation, unconscious processes may be at work. In stage 3.

Illumination, the thinker often has an insight experience. An idea for the solution may suddenly dawn on him. Next in stage 4, **Evaluation**, he determines whether the apparent solution is in fact the correct one. Frequently, it turns out to be wrong and the thinker is back to where he started. In other cases, it is the right idea, but it needs some modification or requires the solution of other relatively minor problems. Thus stage 5, **Revision**, is reached.

Characteristics of creative thinkers

Some evidence obtained from objective and projective personality tests indicate that creative people share common personality characteristics.

1. They prefer complexity and some degree of apparent imbalance in phenomena.
2. They are more complex psychodynamically and have greater personal scope.
3. They are more independent in their judgment.
4. They are more self assertive and dominant.
5. They reject suppression as a mechanism for the control of impulse.

Tips to improve creativity:

1. Develop a broad and rich knowledge base.
2. Foster independence.
3. Encourage the use of analogies.
4. Encourage curiosity.
5. Enhance positive affect.

Lateral Thinking

Edward de Bono has used the term 'lateral thinking' to what Guilford termed as divergent thinking. He makes a distinction between vertical thinking and lateral thinking. Vertical thinking involves mental operations that move in a straight line back and forth between lower and higher level concepts whereas lateral thinking involves looking for alternative ways of defining and

interpreting problems. He states 'vertical (logical)thinking digs the same hole deeper i.e., thinking deeper in the same direction: lateral thinking is concerned with digging a hole in another place' De Bono suggests that lateral thinking can help make mental leaps and is likely to create more number of ways of thinking.

De Bono developed the 'Six thinking hats' technique to stimulate different modes of thinking. One can put on or take off these hats according to the type of thinking required to be used.

- White hat means gathering information, facts, figures and filling gaps in information.
- Red hat covers expression of feelings, and emotions on the subject.

- Black hat represents judgment, caution and logic.
- Yellow hat covers thinking on what will work and why it will be beneficial.
- Green hat is for creativity, alternatives and changes.

- Blue hat represents thinking about the process and not the ideas as such.

The 'six thinking hats' reflect different perspectives from which an issue or problem is viewed. The technique can be used individually as well as in groups.

ACTIVITIES

Activity 8.1:

List out some strategies relating to traffic management corruption, ragging and punishment in schools.

Activity 8.2:

Do the SWOT analysis of yourself.

S - List out your strengths and try to develop them.

W - List out your weaknesses / limitations / drawbacks and try to get over that.

O - Thank the opportunities you have got and make use in the best possible way.

T - List out your threats. Find out how you can reduce them (fear, anger, aggression, laziness.

Activity 8.3:

Take a piece of cardboard and cut triangles, circles and squares of three different sizes each small, medium and large. Then colour them yellow. Similarly prepare a second set and colour them green and a third set and colour them red. Now you have a set of 27 cards varying in shape, size and colour. Ask a child of five to six years of age to group the similar cards together.

If we try the above activity with a group of small children, we observe that there are a number of ways in which the child would respond. S/he would pile them up into different groups based on:

1. size : all small triangles, squares, and circles together, all medium sized together, and so on.
2. shape : all triangles together, all circles together, and so on.
3. colour: all reds together, all yellows together, and so on.
4. Both size and shape : all small triangles together, all medium triangles together, and so on.
5. size, shape and colour: all small circles, squares and triangles of red colour together, all medium circles, squares and triangles. of yellow colour together, and so on.

Points to remember

1. Thinking is a higher mental process through which we manipulate and analyse the acquired information.
2. The clarity of thinking depends on mental image and the concepts.
3. Problem solving thinking is goal directed.
4. Mental set, lack of motivation, functional fixedness are obstacles in problem solving.
5. We indulge in two kinds of reasoning mainly deductive and inductive reasoning.
6. A systematic random search is algorithm for solving problem in which each possible solution is tested according to a particular set of rules.
7. Heuristics are shortcuts that enable us to simplify and solve problems. Though it is a method to find rapid solutions, they do not guarantee correct solution to a problem.
8. An analogy is a partial similarity among things that are different in other ways. For example : good is to bad, as white is to black.
9. creative thinking involves the production of novel and original ideas or solutions to problems.
10. Thinking is said to be creative when it is reality – oriented, appropriate, constructive, and socially desirable.

11. Convergent thinking refers to thinking that is required to solve problems which have only one correct answer.
12. Divergent thinking includes fluency, flexibility, originality, and elaboration.
13. Preparation, incubation, illumination, evaluation and revision are different stages of creative thinking.
14. Lateral thinking is another form of divergent thinking. Where an alternate solution is found to a problem which has a solution already existing.
15. Independent thinking, assertiveness, dominance, innovative nature are some of the characteristics of creative thinkers.

QUESTIONS

1. What is thinking?
2. What is a mental image?
3. What is a concept? How is it formed?
4. What are the mental operations involved in solving a problem?
5. Discuss the obstacles to solving problem.
6. Mention the two kinds of reasoning.
7. Explain convergent and divergent thinking.
8. What are the steps involved in creative thinking?
9. Mention the characteristics of creative thinkers.
10. What is lateral thinking?
11. What are algorithms?
12. What are Heuristics?

* * * * * *

HAPTER IX

MOTIVATION AND EMOTION

Introduction

Gowri a girl from a little known town, puts in 10-12 hours of hard work everyday in order to get through the various engineering entrance examinations. Raju a physically challenged boy, wants to take part in an expedition and trains himself extensively in a mountaineering institute. Krishna saves money from his scholarship so that he can buy a gift for his mother. These are just a few examples, which indicate the role motivation plays in human behaviour. Each of these behaviours are caused by an underlying motive. Behaviour is goal-driven. Goal-seeking behaviour tends to persist until the goal is achieved. For achieving their goals people plan and undertake different activities. How is Gowri going to feel if after all the hard work she has put in, she does not succeed or Krishna's scholarship money gets stolen. Gowri perhaps, will be sad and Krishna angry. This chapter will help us to understand the basic concepts of motivation and emotion, and related developments in these two areas. We will also get to know the concepts of frustration and conflict. The basic emotions, their biological bases, overt expressions, cultural influences, their relationship with motivation and some techniques to help to manage our emotions better will also be dealt with.

Nature of Motivation

The word motivation comes from 'movere', the Latin word meaning to 'move'. Most behaviors except simplest reflexes are considered to be motivated. Before trying to understand 'motivation', psychologists turned to instincts. Instincts are inborn patterns of behavior that are not learned, but are biologically determined.

According to this, people and animals are born with programmed sets of survival that are essential to their existence.

Both 'emotions' and 'motivation' refer to the organization of behavior over time. In motivation, we focus on the consequences of our motives. Hunger leads to eating and thirst to drinking. In emotions we focus our attention to what precedes our emotion, disappointment leads to sadness and frustration leads to anger. The relationship between the two can become very complex, as they are mutually influenced by each other.

By 1940, motives were considered as internal state that set behavior in motion. They control behavior and are regarded as having two aspects. It energizes behavior and directs it towards some goal. The two important related concepts are need and drive. **A need can be defined as the lack of some biological essentials like water and food**. A need is an activating force that pushes an individual to move or act to obtain a specific goal. Needs are general desires or wants that cause a person to act.

Drive is a state of motivational arousal that is produced by a need. It energizes behavior to satisfy a need. Incentives are rewards that an individual seeks to attain. Drives and incentives can work together in a motivating behavior. When an individual experiences a drive, he tries to lessen the tension, by satisfying the need that gives rise to the drive. Supposing a person is thirsty, he asks for water or places an ice cube in his mouth. If these behaviors reduce his thirst, he no longer feels motivated.

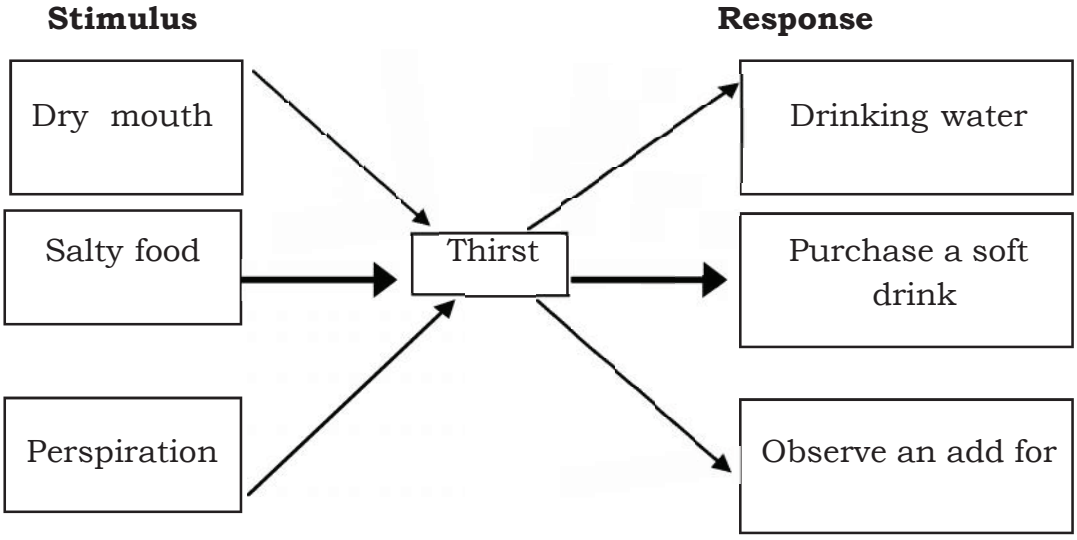
For need theorists, all motives work in the same way. For example,

A need occurs.

A corresponding drive is aroused.

Goal oriented behavior takes place.

The goal is achieved and the drive is reduced.



Motivation is an internal process that activates, guides and maintains behavior over time. It prompts, energizes and compels an individual to act or behave in a particular fashion, at a particular time for attaining a specific goal. Motivation refers to the forces within or external to an individual that arouse enthusiasm, a commitment to pursue a certain course of action. It is the desire to accomplish a goal or participate in an endeavor. It is the driving force that make individuals act as they do. The study of motivation involves in the identification of why people seek to do things they do.

Finally, motivation refers to the initiation, intensity, direction and persistence of behavior. It is a temporal and dynamic state that should not be confused with emotion. It can be positive, negative, subtle or obvious, tangible or intangible.

Motivation can be intrinsic or extrinsic. Intrinsic motivation is the thrill of an activity for its own sake. It is participation in an activity for our own

enjoyment. Extrinsic motivation refers to motivation that is determined by an external reward.

Classification of motives

Drives are classified as either **primary or secondary**. **Primary drives** are related to the biological needs of the body like hunger, thirst or sex. They are based on a fundamental need and involves certain physio-chemical processes. In **secondary drives**, there is no obvious biological need to be satisfied. Some individuals have strong needs to achieve, gain prestige, power and recognition. These are reflected in a secondary drive that motivates behaviour.

Types of motivation

Biological motives

a) Hunger:

The likely stimuli to hunger are

1) An empty stomach signified by stomach contractions.

2) Lowering of the glucose level in the blood.

The general belief is that we feel hungry when there is no food in the stomach. Hunger pangs caused by the contractions of stomach are taken as hunger signal. To study the role of the stomach, Walter Cannon trained a subject to swallow a deflated balloon. This had a rubber tube attached to it. The balloon in the stomach was inflated through the rubber tube. The other end of the tube was connected to a 'kymograph'. This is a recording mechanism that marked each spasm of the stomach muscles. The subject reported strong hunger pangs when the contractions were strong and few pangs when the contractions were weak or absent. The results of this experiment supported the idea that hunger pangs are related to stomach movements. However, it did not clarify what caused hunger.

The physiological cause of hunger lies in the chemical composition of the blood and the hypothalamus, which is a structure in the brain.

One factor to know whether one is hungry or not is the change in the chemical composition of the blood. A sugar called glucose is present in the blood and helps to provide energy to the body. A small quantity of it can be stored only for a short while in the liver. When the amount of glucose in the blood falls below a certain level, a message is sent to the hypothalamus, which alerts the organism to its need for food. After eating, the sugar level rises and the hypothalamus works for the inhibition of hunger messages. Changes in levels of glucose regulate the feelings of hunger. There is evidence to suggest that the hypothalamus acts as the brain's 'feeding center' being primarily responsible for monitoring the intake of food. There are two areas in the hypothalamus that have been involved in the hunger mechanism. The **lateral hypothalamus** sends out hunger signals, that give the 'on' command and the **ventromedial hypothalamus** gives the 'off' signal and performs the task of inhibition.

The external states that influence hunger are the taste and appearance of food. These may stimulate the desire to eat. Sometimes we eat when the clock tells us that it is time for lunch, or other people near us happen to be eating. Thus, numerous events in our bodies, both inside and outside, trigger hunger. There are many factors that work in combination with one another for the inhibition of hunger.

b) Thirst

We experience thirst when our bodies are low on water. We go in search of a liquid and drink. We stop drinking once we get filled up. There are different mechanisms that produce thirst. First, when the volume of fluid inside the cells of our body become too low, and second when the volume of fluid outside the cells of our body become low. This theory is called the double depletion theory, because it specifies two routes intracellular and extra cellular reduction of fluid.

Man can survive without food for sometime but deprivation of water for over a few days can be fatal. It is found to be stronger than hunger motive. Dryness in the mouth and the tissues of the throat result in thirst. Thirst is satisfied with an intake of fluid. As we drink, the fluid is slowly absorbed into our body. We generally keep track of the amount of fluid we drink, so we don't overdo it. We drink until the volume of fluid in and around

our cells is adequate. As water begins to enter the cells of our body, our feelings of thirst are inhibited.

We sometimes keep drinking even when our thirst is satisfied. This happens when we gulp down water faster than our body's system can react and inhibit thirst. This results in discomfort. Though the chemical imbalance of the body is responsible for hunger or thirst drive, the centres of its control lie in the central nervous system particularly the hypothalamus. The physiological factor of the thirst motive lies in the imbalance of fluid in the hypothalamus and the body tissues. The level of salt in the body is related to the imbalance of the fluid in the body. Salt causes dehydration. The high content level of salt in the blood disturbs the fluid balance in the tissues. The body tissues have to be supplied with fluids. When the message reaches the lateral hypothalamus, the thirst drive is activated. The body's chemical balance is restored after being supplied with a fluid.

The social learning part of it says that why, when, where and, how we drink and eat depend on our own personal, social, cultural and environmental factors.

c) Sex

It is different from other primary motives. **Sex drive is a powerful psychophysical motive and is not as essential as food and water.** Thirst and hunger are present in full strength at birth, but sex drive develops only as one grows older: With lower animals like cats, rats, dogs, there is a direct link between hormones and sex. Sex drive is regulated by hormones, androgen in males produced by the testes, and estrogen in females secreted by the ovary. These hormones are responsible for the development of secondary sex characteristics during adolescence and sexual behavior. In humans, sexuality depends less on hormones and more on experience. It has been found that men and women, who had their sex glands removed surgically, may not show any loss of sexual interest. The social significance of sexual behavior is that the ways in which people satisfy their sexual drives show what they have learned in a given time and place while growing up.

d) Maternal drive

The motive that involves the care and protection of the offspring by the females is called maternal drive. The maternal behavior energizes a woman to indulge in taking care of the young ones. This drive is stimulated by the biological and psychological factors. The role of hormones is very important.

Progesterone, a hormone is found to be important during pregnancy. Estrogen helps in birth. Prolactin, another hormone produced by the pituitary gland helps the mammary glands to secrete milk for the new born.

Later maternal behaviour is controlled and guided by the learning components of the maternal drive. The stimulations of the maternal drive arise from a lot of factors like physical environment, socio cultural background, from movies, from books and from observing the behavior of others.

Psychosocial motives

David Clarence McClelland (1917-1998) an American personality psychologist asserts that human motivation comprises of three important dominant needs. They are need for achievement, need for power and the need for affiliation. The importance of each of these needs vary from individual to individual.

a) Need for achievement

Henry Murray (1938) defined achievement motivation as “the need to accomplish something difficult in situations that are characterized by a standard of excellence”. Achievement motivation has no biological basis.

Need for achievement refers to an individual's desire for significant accomplishments, mastering of skills, control on high standards. Individuals with a high need for achievement were careful in measuring, where they were most likely to attain mastery. They do not select problems that are too close to make the task ridiculously easy or too far away to make it impossible to achieve. They do not gamble, but prefer to work on a problem rather than leave the result to chance. Achievement motivated people take the middle path, preferring a moderate degree of rise. They feel that their efforts and abilities will probably influence the outcome. They are characterized by a tendency to seek challenges and a high degree of independence. They achieve excellence through individual efforts. Such people set challenging goals and assume personal responsibility for goal accomplishment. They are highly persistent of these goals and take calculated risk to achieve them.

Another characteristic of the achievement motivated people is that they appear to be more concerned with their personal achievement than with the rewards of success. They do not reject rewards, but rewards are not as essential as the accomplishment itself. They get total satisfaction out of winning or solving a difficult problem than they get from any money or fame or praise they receive. To these people 'money' is valuable, as a measurement of their performance. Money provides them with a means of assessing their progress and comparing their achievement with those of other people. Normally, they do not seek money for status or economic security. Their most satisfying reward is the recognition of their achievement.

They desire to get a concrete and regular feedback. The nature of the feedback is important to achievement motivated people. They respond favorably to any information about their work. They are not interested in comments about their personal characteristics, such as how helpful or how cooperative they are. They prefer to work alone or with other like minded people. Achievement motivated people tend to get more raises and promotions because they are constantly trying to think of better ways of doing things.

People with low achievement motivation tend to look out for easy tasks.

They sometimes seek out very difficult tasks because almost everyone would fail at them. Individuals with a high fear of failure will stay away from tasks of intermediate difficulty, because they may fail where others succeed.

b) Affiliation

Seeking other human beings and wanting to be close to them both physically and psychologically is called Affiliation. It involves motivation for social contact. Need for affiliation is aroused when individuals feel threatened or helpless and also when they are happy.

It is the need to form friendship and maintain it. It is an interest in establishing and maintaining relationships with other people. The need to be with other people and the desire for affection develops early in life. Those with a high need for affiliation need to establish a harmonious relationship with other people and need to feel accepted by other people. They tend to conform to the norms of their work group. Individuals with high need for affiliation prefer work that provides significant person interactions. They enjoy being parts of groups and make excellent team members. They can perform well in customer service and client interaction situation.

The need for affiliation is characterized by a desire to belong, an enjoyment of team work and a concern about interpersonal relationships.

c) Need for power:

Power motivation is defined as the concern for acquiring status, having an impact on others and to be in charge of people and situations. It is a

tendency to look for control or influence over others and the desire to be seen as a powerful individual. It is a need to have an impact on others, to be in charge of people and situations, to win arguments, to persuade and prevail. A person's need for power can be of two types-personal and institutional. Those who need personal power want to direct others and this need is often perceived as undesirable. Persons who need institutional power (also known as social power) want to organize the efforts of others to further the goal of the organization. Managers with a high need for institutional power tend to be more effective than those with a high need for personal power. Power motive is also used as a measure of social influence on behavior. It is important for leadership effectiveness.

People who have power motive belong to organizations and assume high office posts. They belong to professions where power needs can be fulfilled. Men who are high in power needs tend to show high levels of aggression. Women, in contrast, display their power needs in a more restrained manner. They tend to channelize their power needs in a socially responsible manner such as showing concern for others etc.

d) Curiosity and Exploration

Often people engage in activities without a clear goal or purpose but they derive some kind of pleasure out of it. It is a motivational tendency to act without any specific identifiable goal. **The tendency to seek for a novel experience, gain pleasure by obtaining information etc., are signs of curiosity.** Hence, curiosity describes behaviour whose primary motive appears to remain in the activities themselves.

What will happen if the sky falls on us? Questions of this kind (What will happen if ….) stimulate intellectuals to find answers. Studies show that this curiosity behaviour is not only limited to human beings, animals too show the same kind of behaviour. We are driven to explore the environment by our curiosity and our need for sensory stimulation. The need for varied types of sensory stimulations is closely related to curiosity. It is the basic motive, and exploration and curiosity are the expressions of it.

Our ignorance about a number of things around us becomes a powerful motivator to explore the world. We get easily bored with repetitive experiences. So we look for something new.

In the case of infants and children, this motive is very dominant. They get satisfaction from being allowed to explore, which is reflected in their smiling and babbling. Children become easily distressed, when the motive to explore is discouraged.

Maslow's Hierarchy Theory

An important attempt to systematize human motives was made by psychologist Abraham Maslow (1970). A key aspect of Maslow's model has different motivational needs placed in a hierarchy. The model can be conceptualized as pyramid. The basic needs are at the bottom and the higher level needs are at the top of the pyramid.

At the base of all the needs, are the physiological needs, such as need for food, water, sex and sleep. The basic needs must be fulfilled before a person moves up the hierarchy. The lower the needs in the hierarchy, the more fundamental they are and the more a person will tend to abandon the higher needs in order to pay attention to sufficiently meeting the lower needs.

Next in the hierarchy is the safety needs. People need a secure and safe environment to function effectively. We constantly predict the future in order to help decide what we should do next. When we predict that we are likely to come to some harm, then we feel unsafe.

Maslow's Hierarchy of needs

Physical safety means freedom from physical harm. Such harm can come from other people, such as, when someone threatens us, or it can come from the environment such as when we are standing in a burning building.

Psychological safety-Although Maslow does not highlight this we can feel just as unsafe when faced with the taunts of our peers as we do when threatened by somebody.

Belongingness is the next need. It would mean the need to give and obtain affection, to love and to be loved. Being below esteem shows how we first want to join a group before we gain its esteem. This need is stronger than esteem need. We prefer to be in a social position within a group than leave and try to find another group. When we have friends and family, and are happy with life we still need to reach out to find out how high we can go. Maslow thinks of esteem as relating to the need to develop a sense of self worth. It is about feeling good about ourselves. One can get esteem in two ways. firstly, by seeking social approval and recognition from others and secondly by judging themselves by what others think of them. Once we belong to a group we will then tend to set about climbing up the group hierarchy or maintaining our position in the group by seeking the esteem and approval of group members.

It is not an easy task to achieve these four sets of needs. The person then strives for the higher level, self actualization. Self actualizing people realize their highest potential in their own way and then achieve a state of self fulfillment. Initially Maslow suggested that self actualization occurred in only famous individuals, but later agreed that it was found in ordinary people also. For example, a teacher who is responsible for the success of every of her students and a parent with the best nurturing skills. The significant feature here is that people are using their talents to their fullest.

Emotion and its Nature

Sneha is very happy as her examination result has been declared today and she has topped the class. She is feeling euphoric. However her friend Pranav is feeling sad, as he has not done well. Among her friends some are feeling jealous of Sneha's achievement. Gopal who has not performed up to his expectation is angry with himself; he feels unhappy that his parents would be very disappointed.

Joy, sorrow, hope, love, excitement, anger, hate, and many such feelings are experienced in the course of the day by all of us. The term emotion is often considered synonymous with the terms 'feeling' and 'mood'.

- Feeling denotes the pleasure or pain dimension of the emotion, which usually involves bodily functions.
- Mood is an affective state of long duration but of lesser intensity than emotion.
- Both these terms are narrower than the concept of emotion.
- Emotions are a complex pattern of arousal, subjective feeling, and cognitive interpretation.
- Emotions, as we experience them, move us internally, and this process involves physiological as well as psychological reactions.

The word 'emotion' is derived from a Latin word 'emovere' meaning 'to

set in motion'. Initially it referred to the idea of physical movement and later assumed a figurative meaning, associated with mental movements. Emotions are generally accompanied by some degree of internal changes, excitement as well as strong evaluative components.

Emotion is a term commonly used to denote subjective and individual feelings which dictate moods.

- In psychology, emotion is considered as a response to stimuli that involves characteristic physiological changes such as increase in pulse rate, rise in body temperature, lesser or greater activity of certain glands, change in rate of breathing and tends itself to motivate the individual towards further activity. Thus, emotional life is varied. It involves bodily processes, as well as mental states.

- Emotions have feelings that have both physiological and cognitive elements influencing behaviour.

- In common use and psychology, emotion is the language of a person's mental state of being tied to the person's internal (physical), external (social) and sensory feeling.

Emotions are the heart and soul of human life. It is difficult to imagine life without the experience of emotion. Life would be less satisfying, if we lacked the capacity to express emotion. They provide life with excitement, intensity and misery. Life would be dull without emotions, as one would never worry about a job interview, or a test result. Without it, one cannot experience anger, if one is scolded or feel sad if a loved one dies. We experience reactions on a less intense level throughout our daily lives like the enjoyment of a movie and the pleasure of a friendship. Thus, all of us experience the strong feelings that accompany both pleasant and unpleasant experiences.

Emotions can also be understood in terms of primary and secondary emotions.

- Primary emotions are universal and biologically based. They include anger, fear, joy, sadness and disgust.

- Secondary emotions like guilt, humor, love are blends of primary emotions and formed by the combination of various basic emotions.

Cannon defines emotion as "the bodily changes that follow directly the perception of the exciting situation and our feelings of the same changes, as they occur." According to him the peculiar quality of the emotion is added to sensations that are simple, when the thalamic processes are aroused.

Psychologists have identified a number of important roles that emotions play in our daily lives.

1. **Preparing for action:** It acts as a link between events in our environment and our responses. For, example, if we see a dog chasing us, an emotional reaction (fear) is associated with physiological arousal of the sympathetic division of the autonomic nervous system. The sympathetic division prepares us for emergency action, which helps us to get away from the dog's way quickly.

2. **Shaping our future behavior:** Emotions provide us with information that helps us to make appropriate responses in the future. The emotional response that occurs when we experience something unpleasant - such as chasing of the dog - teaches us to avoid such circumstances in the future. Likewise, pleasant emotions act as reinforcement for our prior behavior and this helps us to seek out such similar situation in future.

3. **Helping us to interact more effectively with others**: When our emotions are communicated to others through verbal and non verbal behavior, the behaviours act as a signal to others, allowing them to understand what we are experiencing. This promotes effective social interaction.

It can be recognized that in all emotions, there are two well differentiated components. One is the qualitative component that is expressed by means of the word that is used to describe the emotion (love, friendship, fear, insecurity etc) that determines the positiveness or negativeness of the emotional sign. The other is that all emotions possess

a quantitative component that is expressed by means of words of magnitude (little, quite, enough, a lot, great, some, much etc).

Types of emotion

Pleasant Emotions:

a) Joy, Happiness and Elation

Joy is a pleasant emotion. In its milder form it is known as pleasure, delight or happiness. Among babies the emotion of joy comes from physical well being. Pleasure is exhibited by a three month old baby by smiling and laughing. Stroking the child, tickling it, also produce pleasurable sensation. The happiest moment in the child's life is when it sees its parents. The child craves for physical contact, which gives him immense happiness. Other situations from which the child draws joy is playing with toys and pulling things apart. A little later, children respond to more stimuli and experience joy when their achievements surpass those of their age mates. In older children the common cause of joy is successful achievement of goals that they have set for themselves. The joyful emotions are accompanied by smiling, laughing, and a general relaxation of the entire body.

joy

Happiness is a positive emotion in which a person experiences feelings varying from contentment and satisfaction to intense joy and bliss- a condition dominated by pleasure satisfaction. In happiness, we see the expression of good luck and good fortune. For example, the birth of a new baby brings great joy and happiness to a family. The student is happy with his exam results. Good personal and social adjustment leads to happiness. Joy and happiness are experienced at different times of our life. Though different things give us pleasure, there is one thing that is common to all of us i.e. the realization of a goal.

- The physiological changes experienced during happiness are, increase in blood pressure, and heart rate.
- Changes in breathing provide a boost to the immune system.
- The facial expressions show drawn back lips (parting of lips to show teeth), raised eyebrows, and wrinkles from the nose to the corner of the lips.

b) Love

Love is a strong positive emotion of regard and affection. This complex emotion of love makes the world go around and keeps psychologists busy, trying to understand it. The love for a child by the parent, and the love for a parent by a child are different types of love.

Love has different meanings-from something that gives us pleasure (I love my parent) to something that one would die for (patriotism). The love that we show to our parents is different from what we show to our country. The first is warm and personal and the other is abstract.

Love

Passionate love is an intense emotion. When a person is in 'love', it can be specifically called passionate love. One becomes involved in the other person, excited in his or her presence and miserable when the person leaves. Compassionate love is a sober emotion. It is characterized by concern and affection. It can perhaps be called as the mature form of passionate love.

Love can also be described as an intense feeling of affection. In ordinary use, it generally refers to inter personal love. Due to its psychological relevance, love is one of the most common themes in music and art. Love is inherent in all human culture. **It is because of the cultural differences that make any universal definition of love difficult to establish.**

c) Affection

Affection is a pleasant emotional reaction, shown towards a person, thing or animal. It indicates warm regard, helpfulness, sympathy and friendliness. The child responds to those individuals and objects that satisfy his needs. Children are attached to those family members who show affection. They also have favorite toys that are hugged and patted and have deep affection for their pet animals. It can take a physical or verbal form. Affection must be reciprocal if it has to contribute to good adjustment. As they grow older, they realize that physical demonstration of affection is childish and prefer verbal expressions.

Affection

At the adult level, the person's choices are limited because of cultural influences. Affection is shown in the kind of mutual reinforcement that adults provide each other.

d) Sympathy and Empathy: Sympathy refers to an interdependent relationship in which, individuals are expected to attune themselves empathically to the feelings and thoughts of others. Attunement means taking the perspective of others and acting in manner that both

anticipates and serves their needs and desires. As children grow, they learn how to adjust themselves to others, so as to enhance and maintain harmonious social relationships. Both these emotions play significant role in social relationship. When they are expressed at the right time, place and way, help in promoting friendship, harmony and understanding.

Unpleasant Emotions:

a) Anger

Anger is a negative emotion. It is a common emotional reaction to a perceived threat, of pain to self. The threat may be due to a physical conflict, negligence, injustice, betrayal, humiliation among other contentions. It is a strong feeling of displeasure and annoyance, accompanied by hostility. The intensity can range from mild irritation to intense fury. Anger is aroused in children by frustrating situations.

1. Anger arises in children when they are not allowed to do things that they want to do and making them to do things that they do not want to do. As the children grow older, social situations assume greater significance.

2. Children, exhibit their anger, by screaming, crying, bullying and throwing themselves into temper tantrums.

3. Thwarting of self assertion and frequent interference with their plans can be a source of anger for college going boys and girls. We get angry when we are snubbed and humiliated by others and also when we fail to achieve social ambitions. The cause and expression of anger change with age.

4. The anger shown by adults is more subtle. They fight with their tongues and not with their fists. Some express their anger in a controlled way, while others become aggressive. This can lead to bullying and intimidating behavior, endangering others and property.

Anger can be expressed through active and passive behavior.

- In the case of active behavior, the angry person "lashes out" physically or verbally at a target.
- When anger is passive it is characterized by sulking silently.

During anger, the body's muscles tense up.

- The neurotransmitters in the brain are released causing a burst of energy lasting up to several minutes.
- The heart beat increases.
- The blood pressure, goes up.
- The rate of breathing increases.
- The face flushes.
- The hormones, adrenalin and nor-adrenalin are released, which trigger a lasting state of arousal.

1. Anger is neither a stress reducer nor a safe way to express feelings. It is not a good way to motivate behavior changes in ourselves and others.

It is not an effective way to express a message. It is an emotional disturbance with distorted thinking. Expression of anger is unhealthy and can make us physically ill.

2. Anger is psychologically harmful, because in the long run, it can increase our frustration and anxiety.
3. Anger can spoil our career, relationship and every other aspect of our life.

Some tips for anger management:

a) Breathe deeply from your diaphragm in long, slow breaths, giving the heart beat a chance to slow down.

b) Give yourself time to think. Try to get out of the situation. If necessary, talking over with someone who will help you calm down.

c) Think logically about the cause of anger.

d) Try to be carefully assertive, rather than sarcastic or aggressive.

e) Regular exercises can help to prevent the accumulation of tension.

f) Relaxation exercises such as yoga with meditation also helps to release tension in a controlled healthy way.

g) Anger has to be expressed in a healthier way, so that it becomes helpful and a controlled reaction to our everyday frustrations.

b) Fear

Fear is a negative emotion, caused by anticipation of some specific or probable, pain, situation, event or danger. It is usually accompanied by a desire to flee or fight.

- The main causes of fear in a child are loss of support, loud noises and unexpected occurrences.
- They are also afraid of darkness and being stranded in lonely places.
- Some children consider animals as a threat. As they grow older and enter the adolescence stage, they develop fears incidental to the social situations. They are frightened of non conformity by being an odd person out in dress and manners.

Common facial expressions seen during fear are :

- A scared face, with raised eyebrows, widened eyes and dilated pupils.
- Lips generally drawn back and stretched horizontally with a slightly open mouth and wrinkles in the middle of the forehead.
- A scared body, with arms and shoulders forward, as if ready to defend, is also another expression of fear.
- At other times, there is a momentary loss of voice and shaking of limbs.
- It can also lead to freezing. Under fear heart beat goes up, nervousness is experienced and muscles become tensed.

To sum up, we must identify the situations that trigger fear, become aware of it, discover ways of expressing it and understand just how destructive they can be. Behavioral techniques can be used to reduce fear and stress. It may help to share our fears with others, so that they can empathize with us and in return alter their behavior that will lessen our fear.

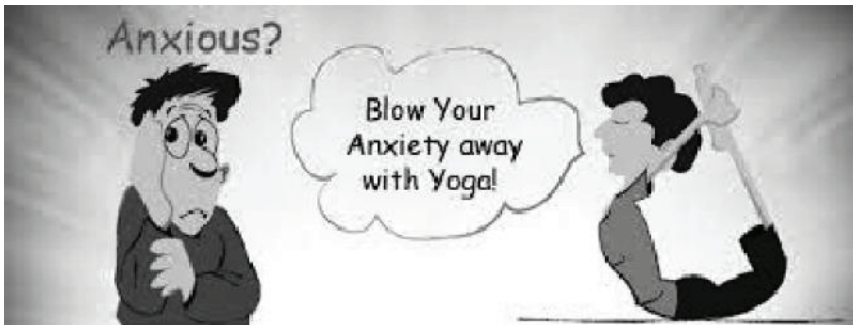
c) Anxiety

1. Anxiety is an unpleasant and vague emotion that is experienced in anticipation of some threat. The anxious individual feels threatened, but the sense of danger is not specific.

   Anxious people feel uneasy. Their reactions are aroused, with fast breathing, racing pulse, moist hands, frequent urination, diarrhea and a feeling of lump in their throat.

2. Externally, the signs of anxiety may include, pale skin, trembling and papillary dilation. Physical symptoms include nausea, headache, chest pain, stomachache and heart palpitations.

3) Blood pressure, heart rate and sweating increases. The functions of the digestive system are inhibited.



Psychotherapy is helpful when the anxiety is too high and chronic, interfering with day to day life. In more severe cases anti anxiety medication also is administered. Relaxation therapy can help go a long way in bringing down anxiety.

Management of examination anxiety

Any situation which involves performing a task and is being evaluated for the performance is anxiety provoking. A certain level of anxiety is helpful to motivate and push us into our best performance. High level of anxiety can become an obstacle in performance and hence achievement. An examination is a stress provoking time. Hence taking effective measures to control the level of stress is essential, this can be done by following measures.

- Good preparation : Answering question papers of previous years without referring to the notes and text books will help the student to learn about her / his strengths and weaknesses. It is also possible to understand the time required to answer each question and speed with which the answers need to be written.
- Rehearsal: Any number of rehearsals by taking mock examinations and repeating writing the answers for questions requiring for long and short answers can induce confidence in a student.

- Combined study: Allotting some time well in advance before the examination time to sit with like-minded classmates for combined study, discussion, clarification and role play can go a long way in good performance in the examination.

- Diet, sleep and relaxation: The students are required to be conscious about what they eat, when they eat and how much they eat, they need to practice eating light. Sufficient amount of sleep is absolute requirement to have a calm and composed mind, muscular and mental relaxation with the help of recreation and physical exercise channelize the energy level of students.

During the examination time students need to pay attention to the following important aspects.

- They need to settle down in the examination center atleast 15 minutes before the time of examination.
- Once they enter the hall they need to sit in the allotted place, close the eyes and take a few deep breaths, this will calm the nerves and muscles.
- Once they receive the answer sheets they should make it a point to fill in the necessary details asked on the facing sheet.
- After receiving the question paper they need to read the paper carefully and mark the answers they know very well and then start answering legibly paying attention to the question number and the marks allotted to it.
- Before handing over the answer booklet they need to underline important points, draw a line at the end of each answer using sketch pen. Check if they have answered all the questions properly.

d) Jealousy

Jealousy is a response to actual, threatened or supposed loss of affection. A jealous pattern involves some fear combined with anger towards people. Many a time it is a social situation that calls for jealousy in a person.

Childhood jealousies are homegrown. The new born baby takes much of the time and attention of the parents. Hence the older children become accustomed to feel neglected. They become resentful towards the mother and the new baby. It involves the fear of not being important anymore and being excluded. A feeling of abandonment and losing the attention, love and affection of parents are the fears of the child. Jealousy has a significant impact on one's self esteem and leads to insecurity. The child uses self defeating behaviors to ward off these painful feelings. There is no reason for the older child to love the new baby at first sight. The new baby is at best a novelty and at worst an intruder or enemy. He needs considerable and visible reminders of love from parents particularly in the beginning.

Parental favoritism can result in a similar situation. Social situations in school also contribute to jealousy in children. When children feel that they have been deprived of material possessions that other children possess, it may make them jealous of these children. Jealousy cannot be completely prevented but a great deal can be done to minimize it and convert it to positive feelings. The stress and strains of coping with new sibling can be transformed into new skills by teaching the child cooperation, sharing and genuine altruism. Parents must spend more time with the older child and prepare him/her for the arrival of a brother or sister. This will minimize sibling rivalry at the outset.

In adults, jealousy can typically refer to the feelings, thoughts and behaviors that occur when a person believes that a valued relationship is being threatened by a rival. The rival may have no knowledge of threatening the relationship. A jealous person feels insecure in the relationship of a loved one. He is frightened of losing his status in that person's affection. A major consequence is that, it leads to a severe breakdown in the level of intimacy and trust between two individuals. These two people are the core ingredients for a healthy relationship to last. Jealousy can create the very outcome that is feared and dreaded the most, the ending of a relationship. It can torment and consume a person destroying him of all security and contentment. It is a recurrent pervasive trend that seems to dominate the climate of a relationship.

Changes during emotion:

a) Physical changes during emotion:

i) Voice

The human voice consists of sounds made by a human being using the vocal cord for talking, singing, laughing, crying and screaming. The tone of voice may be modulated to suggest emotions such as happiness, surprise or anger. A loud voice expresses anger.

ii) Shallow Breathing

Shallow breathing is the drawing of minimal breath into the lungs. Several emotions like anxiety, stress and panic attacks often accompany shallow breathing.

iii) Facial Expressions

Our faces reveal emotions, opinions, and moods better than other body parts. Sometimes when we try to manipulate some expression, certain unconscious facial expressions reflect our hidden attitudes. It becomes impossible to avoid an expression for certain emotions even when it is necessary. A person, who is trying to avoid insult to an individual, shows only a brief expression

of disgust, before assuming a neutral expression.

A facial expression results from the movements of the muscles of the face.

iv) Stammering i.e., the flow of speech is disrupted when a person is emotionally upset.

b) Physiological changes in emotion

'Divya is desperate to get a job. She has prepared well for the interview and feels confident. As she enters the room and the interview begins, she becomes extremely tense. Her feet go cold, her heart starts pounding, and she is unable to answer appropriately.'

Why did this happen? Try thinking about a similar situation that you have faced sometime in your life. Can you describe probable reason for this? As we will see a great deal of physiological changes happen when we experience emotion. When we are excited, afraid or angry, these bodily changes might be relatively easy to note.

Sophisticated equipment has made it possible to measure the exact physiological changes that accompany emotions. Both autonomic as well as somatic nervous system play important roles in the emotional process. The experience of emotions is a result of a series neurophysiological activations in which thalamus, hypothalamus, limbic systems, and the cerebral cortex are involved significantly. Individuals with extensive injury in these brain areas have been known to demonstrate impaired emotional abilities. Selective activation, of different brain areas, has been experimentally shown to arouse different emotions in infants and adults.

One of the earliest physiological theories of emotion was given by James (1884) and supported by Lange, hence, it has been name the James – Lange theory of emotion. (See the figure given below) The theory suggests that environmental stimuli elicit physiological responses from viscera (the internal organs like heart and lungs), which in turn, are associated with muscle movement. For example, startling at the unexpected intense noise triggers activation in visceral and muscular organs followed by an emotional arousal.

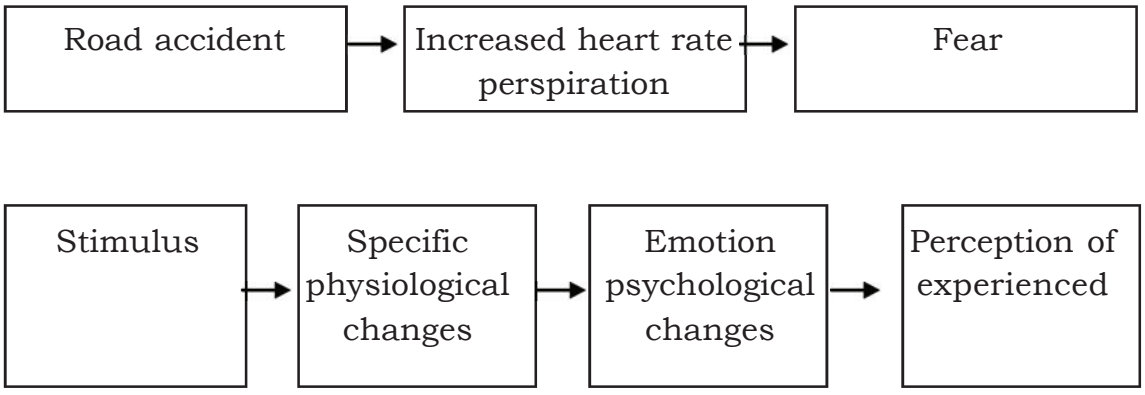


Figure: James - Lange Theory of emotion

Another theory was proposed by Cannon (1927) and Bard (1934).

The Cannon – Bard theory claims that the entire process of emotion is mediated by Thalamus which after perception of the emotion – provoking stimulus, conveys this information simultaneously to the cerebral cortex and the skeletal muscle and sympathetic nervous system. The cerebral cortex then determines the nature of the perceived stimulus by referring to past experience. This determines the subjective experience of the emotion. At the same time the sympathetic nervous system and the muscles provide physiological arouse and prepare the individual to take action (See the figure below)

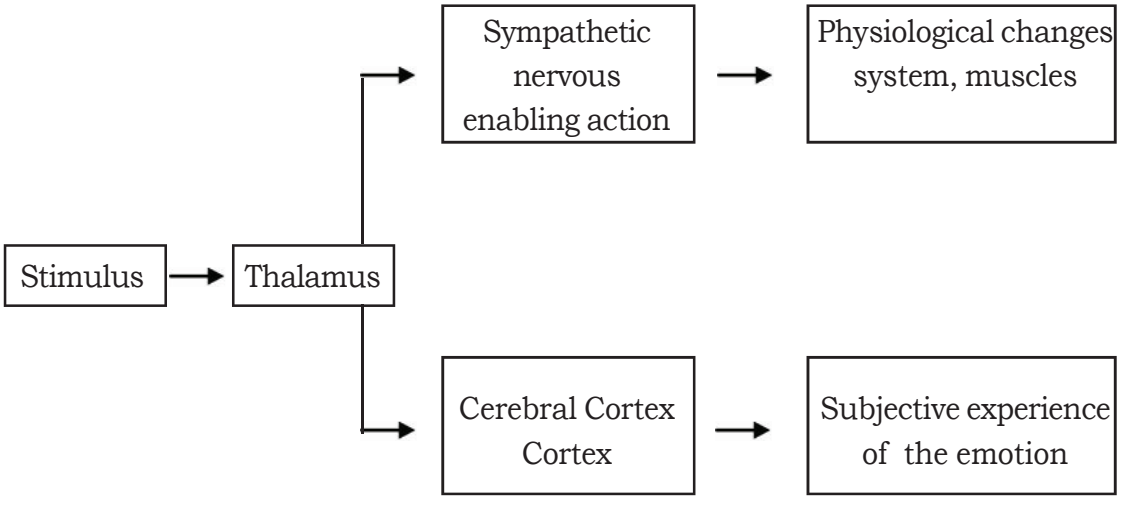


Figure: Cannon – Bard Theory of emotion

Cognitive bases of emotions

Most psychologists today believe that our cognitions i.e., our perceptions, memories, interpretations are essential ingredients of emotions. Stanley Schachter and Jerome Singer have proposed a two-factor theory in which emotions have two ingredients: physical arousal and a cognitive label. They presumed that our experience of emotion grows from our awareness of our present arousal. They also believed that emotions are physiologically similar. For example, our heart beats faster when we are excited are scared or angry. We are physiologically aroused and look to the external world for explanation. Thus, in their view an emotional experience requires a conscious interpretation of the arousal.

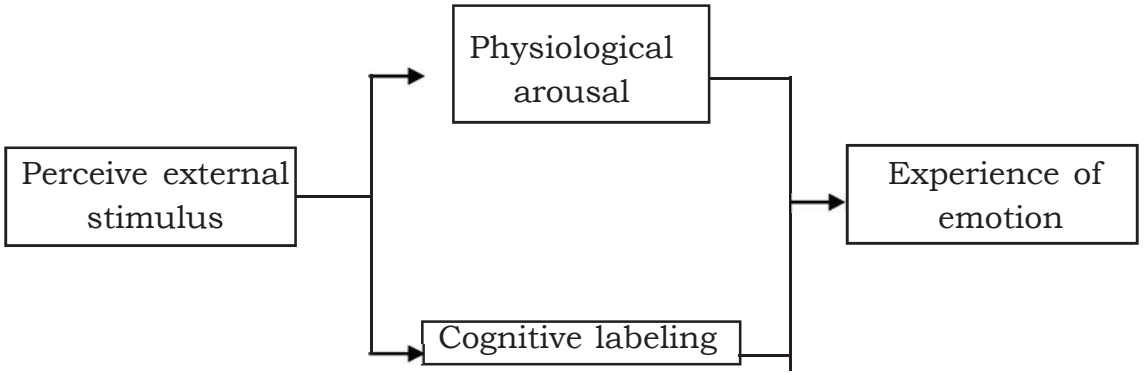


Figure: Schachter – Singer Theory of emotion

If you are aroused after physical exercise and someone teases you, the arousal already caused by the exercise may lead to provocation. To test this theory, Schachter and Singer (1962) injected subjects with epinephrine, a drug that produces high arousal. Then these subjects were made to observe the behaviour of others, either in an euphoric manner (i.e., shooting papers at a waste basket) or in any angry manner (i.e., stomping out of the room). As predicted, the euphoric and angry behaviour of others influence the cognitive interpretation of the subjects' own arousal.

Psychological changes

In the psychological area, changes are visible in certain mental functions. Memory, concentration and performance are negatively affected when a

person is emotionally disturbed. Reasoning errors are more frequent for emotional states than for normal arguments.

Expression of emotions

Body Language

Emotions can be expressed by body language. Body language is an important part of communication, and can communicate 50% of what we are communicating. Body languages come in clusters, of signals, gestures and postures, depending on the emotions and other mental states. Body language is worth a thousand words.

A person's body movements that convey emotions through facial expressions are called 'affect displays'. They indicate whether an individual is open and receptive, angry, distracted or a number of other emotions. Some 'affect displays' are commonly interpreted. For example, individuals who sit in a slumped position are supposed to be unhappy and disinterested. Those who smile sit upright and have raised eyebrows are happy and interested.

A great deal of information is conveyed even without speaking. This is called non- verbal communication. Non-verbal communication can convey as much as verbal communication. Human beings read and react to these non verbal signals accurately. The non verbal signs of gesture, posture and body movements are countless.

Body language in non-verbal communication involves body movements and gestures, which communication researchers call kinesis. The non-verbal cues given through facial expression, touch, eye contact and personal space influence the individual's interaction. If sign language is rigid, it can be assumed that the person is anxious or terrified. Sometimes people lie about how they feel, but then body reveals what they have in mind. Body language reveals pleasure or displeasure, like or dislike, tension or relaxation. When non-verbal signals are sent, they suggest attitude, understanding and empathy.

Psychologists claim that the influence an individual makes on others depends on what he says (7%) how he says it (38%) and by his body

language (55%). Since how we say is important in conveying a message, 93% of emotion is communicated without actual words. Generally it is not what we say that has impact on other people, but it is what we don't say that becomes significant.

Though the body language is fairly understood, in general, there are cultural differences in non-verbal communication.

Managing negative emotions:

Emotions are a part of our daily life and existence. They form the very fabric of our life and interpersonal relations. We cannot imagine life without emotions.

Emotions exist on a continuum. There are various intensities of an emotion that can be experienced by us. We can experience extreme elation or slight happiness, severe grief or just pensiveness. However, most of us usually maintain a balance of emotions.

When faced with a conflicting situation, individuals attempt to adjust and derive a coping mechanism either with task or defense oriented reactions. These coping patterns help them prevent abnormal emotional reactions such as anxiety, depression etc., **Anxiety** is a condition that an individual develops in case of failure to adopt an appropriate ego defense. For example, if the individual fails to adhere to a defense of rationalization for his immoral act (like cheating or stealing), he may develop intense apprehension about the outcomes of such an act. Anxious individuals find it difficult to concentrate or to make decisions even for trivial matters.

The state of depression affects an individual's ability to think rationally, feel realistically and work effectively . The condition overwhelms the mood state of the individual. Because of its enduring nature, the individual who suffers from depression develops a variety of symptoms like difficulty in falling asleep, increased level of psychomotor agitation or retardation, decreased ability to think or concentrate and loss of interest in personal or social activities.

In daily life, we are often faced with conflicting situations. Under demanding and stressful conditions, a lot of negative emotions like fear, anxiety, disgust etc. develop in an individual to a considerable extent. Such negative emotions, if allowed to prevail for a long time, are likely to affect adversely the person's psychological and physical health. This is the reason why most of the stress management programmes emphasise emotion management as an integral part of stress management. The major focus of emotion management technique is the reduction of negative emotions and enhancing positive emotions.

Though most researchers focus their attention only on negative emotions like anger, fear, anxiety, recently the field of 'Positive Psychology' has gained much prominence. As the name suggests, positive psychology concerns itself with the study of features that enrich life like, hope, happiness, creativity, courage, optimism, cheerfulness.

Effective emotion management is the key to effective social functioning in modern times. The following tips might prove useful for achieving the desired balance of emotions:

- **Enhance self-awareness:** Be aware of your own emotions and feelings Try to gain insight into the 'how' and 'why' of your feelings.
- **Appraise the situation objectively:** It has been proposed that emotion is preceded by evaluation of the event. If the event is experienced as disturbing, your sympathetic nervous system is activated and you feel stressed. If you do not experience the event as disturbing, then there is no stress. Hence, it is you who decides whether to feel sad and anxious or happy and relaxed.
- **Do some of monitoring:** This involves constant or periodic evaluation of your past accomplishments, emotional and physical states, real and vicarious experiences. A positive appraisal would enhance your faith in yourself and lead to enhanced feeling of wellness and contentment.
- **Engage in self-modelling :** Be the ideal for yourself. Repeatedly observe the best parts of your past performance and use them as an inspiration and motivation to perform better in the future.

- **Perceptual reorganization and cognitive restructuring:** Try viewing the events differently and visualize the other side of the coin. Restructure your thoughts to enhance positive and reassuring feelings and eliminate negative thoughts.
- **Be creative:** Find and develop an interest or a hobby. Engage in an activity that interests and amuses you.
- **Develop and nurture good relationships:** Choose your friends carefully, in the company of happy and cheerful friends you will feel happy in general.
- **Have empathy:** Try understanding other's feelings too. Make your relationships meaningful and valuable. Seek as well as provide support mutually.
- **Participate in community service:** Help yourself by helping others. By doing community service (for example, helping an intellectually challenged child learn an adaptive skill), you will gain important insights about your own difficulties.

Enhancing positive emotions:

Our emotions have a purpose. They help us adapt to the ever changing environment and are important for our survival and well-being. Negative emotions like fear, anger or disgust prepare us mentally and physically for taking immediate action towards the stimulus that is threatening. For example, if there was no fear we would have caught a poisonous snake in our hand. Though negative emotions protect us in such situations, excessive or inappropriate use of these emotions can become life threatening to us, as it can harm our immune system and have serious consequences for our health.

Positive emotions such as hope, joy, optimism, contentment, and gratitude energise us and enhance our sense of emotional well-being. When we experience positive affect, we display a greater preference for a large variety of actions and ideas. We can think of more possibilities and options to solve whatever problems we face and thus, we become proactive.

Psychologists have found that people who were shown films depicting joy and contentment, came up with more ideas regarding things they would like to do as compared to those who were shown films evoking anger and fear. Positive emotions give us a greater ability to cope with adverse circumstances and quickly return to a normal state. They help us set up long term plans and goals, and form new relationships. Various ways of enhancing positive emotions are given below:

- **Development of personality traits** of optimism, hopefulness, happiness and a positive self regard.
- Finding **positive meaning** in dire circumstances.
- Having **quality connections** with others, and supportive network of close relationships.
- **Being engaged** in work and gaining mastery.

  A **faith** having in the social support system leads to hope and purposeful life.
- **Giving Positive interpretations** to daily life happenings.

Emotional Intelligence:

The concept of emotional intelligence was originally formulated by Peter Salovey and John Mayer in 1990. Emotional intelligence consists of the ability to monitor, access, express, and regulate one's own emotions, the capacity to identify, interpret, and understand other's emotions ; and the ability to use this information to guide one's thinking and actions.

Emotional intelligence includes 4 essential components according to Mayor and Salovey, 1997. They are :

1. Accuracy in the perception of emotions of oneself and others, and the ability to express emotions effectively.
2. The awareness of the influence of emotions on thinking, memory, decision making and coping behaviour.
3. Understanding and analyzing emotions: This is often complex and even contradictory. Emotions have wide social implication.

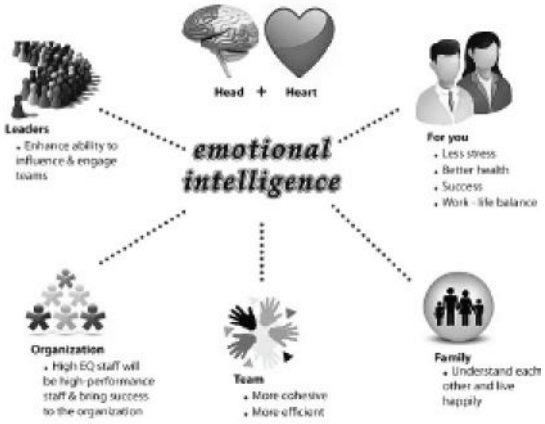
4. Capacity to regulate one's emotions in such a way that negative emotions are ignored and positive emotions are encouraged.

Daniel Goleman 1995, a Psychologist and a journalist who writes about the behavioural sciences for the New York Times, explains that Emotional Intelligence (or EI for short) is more important for a happy, productive life than IQ. Goleman suggests Emotional Quotient (EQ) consists of 5 major parts :

1. Knowing our own emotions,
2. Managing our emotions,
3. Motivating ourselves,
4. Recognising the emotions of others,
5. Handling relationships.

According to Goleman each of these elements plays an important role in shaping the outcomes we experience in life. Let us examine each of these elements one –by- one.

1. **Knowing our own emotions:** Emotions are powerful reactions, so it is important for everyone of us to recognize our feelings. If we are not aware of our own feelings, we cannot make intelligent choices. For example, taking up a job, selecting a spouse, buying a house. When we do not recognize our emotions we will not be able to express through face or body language. This can negatively affect our interpersonal relations.



2. **Managing our emotions:** This relates to regulating the nature, intensity and expression of emotions. It is important both for our mental health and interpersonal effectiveness. If we cannot control our temper, people will avoid us, and we may find it difficult to get into suitable jobs and friend circle.

3. **Motivating ourselves:** we need to motivate ourselves to work long and hard on a task, remaining enthusiastic and optimistic about the final out-come. Success can be achieved only if we can delay gratification and put off receiving small rewards immediately in order to get larger ones sometime later.

4. **Recognising and influencing others' emotions:** If we can recognize accurately another person's current mood, we can decide whether it is the right time to ask for a favour. Persons who are skilled in generating strong emotions in others can thrive as leaders or in the promotion of sales.

5. **Handling relationships:** This can also be termed 'interpersonal intelligence' (Hatch 1990), Skills of being able to coordinate the efforts of several people and to negotiate solutions to complex interpersonal problems, being good at giving others feed back in a way that does not offend them, can be important in life outcome.

To sumup, social poise, social skill, strong motivation and persistence, optimism and conscientiousness need to be developed with utmost care. These traits when well developed will enable an individual to achieve best things in life.

ACTIVITIES

Activity 9.1:

Great people like Mahatma Gandhi, Swamy Vivekananda are exceptions to the theory of sequential development of wants of Maslow. Discuss the reasons. Name some more personalities like Mahatma Gandhi.

Activity 9.2:

Prepare a schedule to manage your time and resources successfully. Find out from your peer group what kind of schedule they have made.

Points to remember

1. Motivation is an internal process that activates, guides and maintains behaviour.
2. Motive is considered as an internal state that sets behaviour in motion.
3. Need is the lack of some biological essentials like water and food.
4. Drive is a state of motivational arousal that is produced by a need.
5. Primary drives are the biological needs of the body like hunger, thirst and sex.
6. Secondary drives are the needs to achieve, gain prestige, power and recognition, curiosity and exploration.
7. Maslow's model can be conceptualized as a pyramid, where the basic needs are at the bottom and the higher level needs are at the top.
8. Emotion is considered as a response to stimuli that involves physiological changes.
9. Primary emotions are universal and biologically based. Example: anger and fear.
10. Secondary emotions are formed by the combination of various basic emotions. Example : guilt.
11. Roles that emotions play:
    a. They prepare us for action.
    b. They shape our future behaviour.
    c. They help us to interact more effectively with others.
12. Physiological and psychological changes are very common during emotions. The nervous system and the endocrine glands play a significant role during emotion.
13. Emotions can be communicated through verbal and non verbal ways for ex: body language and gesture.
14. Pleasant emotions are joy, happiness, love and affection.
15. Unpleasant emotions are anger, aggression, fear and jealousy

16. Central and Autonomic nervous system play a major role in the regulation of emotion.

17. Culture strongly influences the expression and interpretation of emotions.

18. In order to ensure physical and psychological well being we need to manage emotions effectively.

QUESTIONS

1. What is motivation?
2. Mention the types of motives.
3. Explain hunger drive.
4. What are osmoreceptors?
5. Explain the need for affiliation.
6. Discuss the importance of achievement.
7. Explain Maslow's Hierarchy of needs.
8. What is the nature of emotion?
9. Mention two types of emotion. Give examples.
10. Explain the physiological and psychological changes during emotion.
11. Explain expressions of emotions.
12. How are negative emotions managed?
13. What are the various ways for enhancing positive emotions?
14. What is anxiety?
15. Expand EQ.
16. Who wrote about Emotional Intelligence?
17. Explain the elements of Emotional Quotient as given by Daniel Goleman.

EXPERIMENTS
INTRODUCTION
EXPERIMENTAL PSYCHOLOGY

Wilhelm Wundt established the first psychological laboratory at Leipzig (Germany) in 1879. The application of experimental techniques to study the various processes of psychology, gave it a scientific status. Wundt's laboratory at Leipzig helped in developing it into an independent science. G. Stanley Hall of America was a student of Wundt. He was instrumental in bringing psychology to United States.

During the same time, Francis Galton of England also contributed to experimental psychology.

Needs for experiments in psychology:

An experiment begins with a problem. A problem is the phenomenon or the relationship which the experimenter wishes to study between two or more variables.

An experimenter then makes a tentative statement about the relationship between the variables being studied. This is a hypothesis. Hypotheses are based on the knowledge that already exists in the field of study. To test a hypothesis, the relationships between variables are examined. Variables are factors that can change. Some of the variables are:-

a) The independent variable: This is the variable i.e., manipulated by the experimenter.

b) The dependent variable: It is the variable which is measured and is expected to change as a result of changes caused by the experimental manipulation.

c) The intervening variable: There are other extraneous factors that are likely to affect the experiment. In all experiments measures are taken to hold such factors constant.

An experimenter usually works with two groups or he may subject the same group to two conditions. The groups are :-

a) The experimental group: A group subjected to the independent variable of the experiment.

b) The control group: A group that is not exposed to the independent variable.

While reporting an experiment, the problem, hypothesis, variables and controls must be clearly stated. The procedure adopted to conduct the experiment and the statistical analysis must be explained. The results of the experiments must be discussed with reference to the hypothesis and theoretical background. Conclusion must be drawn regarding the relationships between the variables tested.

EXPERIMENT – 1

DIRECTED OBSERVATION

Problem: To study the effect of directed observation on the accuracy of report.

Plan : Conduct the experiment in two series. In each series, expose a picture for 60 seconds. Obtain the answers for the 30 questions in each series. Compare the number of correct answers in both the series.

Materials: A picture mounted on a cardboard and covered with a flap, a list of 30 questions on the picture, a key to the questions, stop clock and writing materials.

Procedure: The experiment is done in two series:-

Series -1 – Casual observation:

Seat the subject comfortably in front of a table. The cardboard with the flap, covering the picture is placed on the table. Instruct the subject to be ready and observe the picture carefully. With the 'start' signal, open the flap to expose the pictures and start the stop clock simultaneously. After a lapse of 60 seconds, say 'stop' and close the flap. Present the subject with the list of questions and ask him/her to answer the questions about the picture, in one or two words.

Series – II – Directed observation:

In this series expose the same picture for the second time. The time duration is 60 seconds. Give the same set of questions and obtain the responses. Find out the number of correct answers with the help of the key. (Note : The answers should be corrected only after the second series is done).

Instructions: "With the 'start' signal. I will show you a picture for a short duration. Observe the picture carefully. Later, I will give you a set of questions about the pictures and you have to answer each question in one or two words. (Note: Give the same instructions in both the series).

Precautions:

1. The answers to the questions must be brief. It should be in one or two words / phrases.
2. When the subject is answering the questions in the directed observation series, do not allow her/him to consult the answers that s/he has written in the first series.
3. The answers to the questions must be checked only after the completion of the second series.
4. The subject should not know that s/he has to answer the same set of questions twice.

Data analysis:

1. Find out the number of correct answers in each series and find the difference

   between the two.
2. Find out the percentage of accuracy in each series.
3. Tabulate the results of all subjects.
4. Find out the maximum and minimum score in each series.
5. Calculate the mean in each series.

Table showing the percentage of accuracy of report before and after directed observation.

Sl.No.	Name	Number of correct answers		
		Casual observation I	Direct observation II	DifferenceII - I II-1
1	A			
2	B			
3	C			
4	D			
	Total			
	Mean			
	Max.			
	Min.			
	Range			

Points for discussion:

1. Generally, we find that the subjects give more number of correct answers in the second series.
2. Discuss whether directed observation has influenced the accuracy of report.
3. Discuss the mean performance and the individual differences.

Conclusion: State whether directed observation has improved the accuracy of report.

EXPERIMENT – 2

DIVISION OF ATTENTION

Problem: To determine the possibility of division of attention between two tasks.

Plan: Conduct the experiment in two parts i.e., I) two muscular tasks II) two mental tasks. Compare the indices of the two parts with each other.

Materials: Stop watch and writing materials.

Procedure: The experiment is conducted in two parts.

Part 1 : Two Muscular tasks

Series – a : Muscular task No.1 : Instruct the subject that at the start signal, s/he should draw as many triangles as s/he can with her/his right hand. Allow 30 seconds to do the work. At the end of 30 seconds, stop the work and count the number of neatly drawn triangles. This is S_1 (Single task – 1).

Series – b : Muscular task 2 : Now, instruct the subject, to draw as many circles as he can with her/his left hand. The time allowed is 30 seconds. The same procedure as in the first series is followed. Note down the score. This is S_2 (Single task 2).

Series – c : Two muscular tasks. Here, instruct him to draw triangles with her/his right hand and circles with her/his left hand simultaneously at the start signal. The time allowed is 30 seconds. Note down the number of triangles and circles drawn separately. The score for triangles is double task number 1(D_1) and circle is double task number 2(D_2). From the above scores, calculate the index of divisibility by applying the formula.

Index of divisibility $ID = \frac{D_1 + D_2}{S_1 + S_2}$

The loss of efficiency is calculated by using the formula : 1 – ID.

Part – II – Two Mental Tasks:

Series – I : Mental Task No.1 : Instruct the subject to start writing the alphabets in the reverse order i.e., z to a at the ready signal. The time allowed is 30 seconds. Note down the number of correctly written alphabets. This is single task 1 (S_1).

Series – II : Mental task No. 2 : Give the subject a number say 6. This will be called as the 'base number'. Then give her/him another number say 3. This will be called as the 'given number'. At the ready signal, instruct her/him to add the given number to the base number loudly. S/he has to add the given number to every resulting total i.e., 6 + 3 = 9 + 3 = 12 = 15 + 3 = 18 and so on. The time allowed is 30 seconds. Note down the number of correct answers and this is single task 2(S_2).

Series – III : Two mental tasks : Given her/him another base number and given number. Instruct him, that at the start signal, s/he has to start writing the alphabets in the reverse order and at the same time, go on adding the given number to the base number orally as fast as possible. The time limit is 30 seconds. The alphabets written will be D1 and the adding will be D2. Apply the same formula ; calculate the index of divisibility and loss of efficiency.

Instructions: Muscular Task 1 – "At the start signal, using your right hand, draw as many triangles as you can".

Muscular task – 2: "At the start signal, draw as many circles as you can with your left hand".

Muscular task 1 & 2 : "At the start signal, draw circles with your left hand and triangles with your right hand.

Mental task – 1 : "At the start signal write the alphabets in the reverse order".

Mental task – 2 : "At the start signal, as explained to you earlier, add the given number to the base number and continue to add the given number to the resulting answer. Give the answers orally.

Mental task 1 & 2 : "At the start signal, write the alphabets in the reverse order and also add the given number to the base number orally".

Precautions:

1. Care must be taken to see that both tasks are done simultaneously.
2. Answers to the problems should be audible to the experiment.

Data analysis:

1. Calculate the index of divisibility and the loss of efficiency for Part-1 and Part – 2 separately.

Table – 1 showing scores of S_1, S_2, D_1, D_2 index of divisibility and loss of efficiency of the group for Muscular Tasks.

Sl.No.	Name	S_1	S_2	D_1	D_2	Index of divisibility	Loss of efficiency
1	A						
2	B						
3	C						
	Total						
	Mean						
	Max.						
	Min.						
	Range						

Table – 2 showing scores of S_1, S_2, D_1, D_2 index of divisibility and loss of efficiency of the group for Mental Tasks.

Sl.No.	Name	S_1	S_2	D_1	D_2	Index of divisibility	Loss of efficiency
1	A						
2	B						
3	C						
	Total						
	Mean						
	Max.						
	Min.						
	Range						

Table – 3 showing the index of divisibility and loss of efficiency for muscular and mental tasks.

Sl.No.	Name	Muscular tasks		Mental tasks	
		Index of divisibility	Loss of effeciency	Index of divisibility	Loss of effeciency
1	A				
2	B				
3	C				
	Total				
	Mean				
	Max. Min.				
	Range				

Points for discussion:

1. Maximum index of divisibility is 1.0. This means that division of attention is perfect.
2. Discuss the index of divisibility of muscular tasks, with that of the mental tasks. Discuss factors that contribute to the high I.D.

Conclusion: State the index of divisibility in two parts.

EXPERIMENT – 3

FLUCTUATION OF ATTENTION

Problem: To study the effect of will on fluctuation of attention

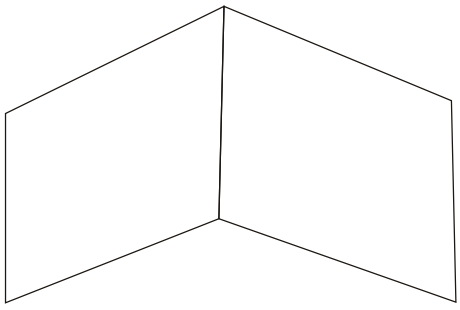
Plan : Conduct the experiment in three series.

1) With a neutral attitude
2) With a positive attitude and
3) With a negative attitude.

Compare the number of fluctuations occurred in the three series with each other.

Materials: A double perspective book figure, stop clock and writing materials.

Procedure: Before starting, show the double perspective book figure to the subject and find out whether s/he sees the figure once as half opened and another time as half closed book. Also tell her/him that the shift from one aspect to the other in the same figure is known as fluctuation.



The experiment is conducted in three series.

Series -1 – Neutral attitude : Show the double perspective book figure to the subject, with the instructions that it appears once as half open and another time as half closed book. S/he is further told to have a neutral attitude and while observing her/his attention would shift from one aspect of the book to the other. In this series, s/he should not try to get fluctuations nor resist it. If they still occur voluntarily S/he should put a dot in her/his book for every fluctuation that occurs. Her/his

attention should not be taken away from the book figure, while making a mark in the book. For the experiment to begin, the start signal is given and the stop watch is started simultaneously. 30 seconds are allowed for observation. At the end of it, the number of fluctuations that occurred are noted down;

Series – II : Positive attitude: Here the subject is instructed to assume a positive attitude. that is, try to get as many fluctuations as possible. Follow the same procedure as in the above series.

Series – III: Negative attitude : Here the subject is instructed to resist the occurrence of fluctuations, but if they still occur, s/he should note it down. Then follow the same procedure as in the above series.

Instructions:

Series – I: "Here is a double perspective book figure, which appears once as half opened and another time as a half closed book. The oscillation between the two aspects of the figure is fluctuation. Look at the book with a neutral attitude . Do not try to get fluctuations, nor try to resist it. If they still occur, make a dot in your book for every fluctuation that occurs. While doing so, do not withdraw your attention from the book figure".

Series – II : "Assume a positive attitude that is, try to get as many fluctuations as possible and note it down as done in the previous series."

Series – III : "Assume a negative attitude, that is resist the occurrence of fluctuations to the extent possible. If they still occur, note it down as done in the previous series".

Precautions:

1. The subject should not withdraw her/his attention from the book figure, when he notes down the fluctuations.
2. The attitudes must be strictly assumed by the subject.

Date Analysis:

1. Find out the number of fluctuations occurred in the neutral, positive and negative series.
2. Calculate the mean for the group in each of the series.

Table showing the number of fluctuations under neutral, positive and negative attitude.

Sl. No.	Name	No. ofFluctuation under			Difference		
		Neutral I series	Positive II Series	Negative III Series	Neutral II-I	Neutral III-1	Positive II-III
1.	A						
2.	B						
3.	C						
	Total						
	Mean						
	Max.						
	Min.						
	Range						

Points for discussion:

1. Discuss individual differences.
2. Discuss whether "will" has any control over fluctuations.

Conclusions:

State the number of fluctuations occurred in the three series.

EXPERIMENT – 4

MASSED AND DISTRIBUTED LEARNING

Problem: To determine the effect of distribution of learning period on retention.

Plan : Conduct the experiment in two series. Massed method and Distributed method. Present the list five times in each series orally and compare the number of words correctly recalled in each series.

Materials: Two lists of words. List A and List B, containing twenty words in each, stop watch and writing materials.

Procedure: Conduct the experiment in two series.

Series – 1 : Massed method: (List A):

Seat the subject comfortably and instruct her/him that a list of words will be read out to her/him five times. S/he is further told that S/he will be given a few multiplication problems at the end of the reading. S/he should then recall, the words read out to her/him. With the ready signal, the stop clock is started.

- The list is read out to the subject five times, at the rate of 2 seconds a word.
- An interval of 5 seconds is given between the presentations of lists.
- After the fifth presentation, 60 seconds are given, for the subject to work on the multiplication problems.
- The subject is asked to recall the words from the list.
- Note down the correct responses.

Series – II : Distributed method (List B):

- Present the words from the list B orally at the rate of 2 seconds a word and 5 seconds interval between two readings.
- After the second presentation, introduce 5 minutes distraction period.
- Present the list twice again as before.

- Give 5 minutes distraction period.
- Give present the list once again and allow 60 seconds distraction.
- Ask the subject to recall the words from the list.
- Note down the correct responses.

Instructions for both the series: "Listen carefully to the words, I am going to read. You will have to recall them after I finish reading".

Precautions:

1. The time spent on learning the lists A and B should be the same, leaving out the interval and the distraction periods.
2. The list should be presented at an uniform rate and in an even tone.

Data analysis:

Find out the number of words correctly learnt in each series.

Table showing the number of words correctly learnt in each series.

Sl.No.	Name	Number of words correctly recalled		
		Massed (I)	Distributed (II)	Difference(II-I)
1	A			
2	B			
3	C			
4	D			
	Total			
	Mean			
	Max.			
	Min.			
	Range			

Points for discussion:

1. As per theory, distributed method is advantageous and economical.
2. Study the group table and indicate the trend.
3. Explore the causes for the results obtained.

Conclusion: State whether distributed method of learning facilitates retention.

EXPERIMENT – 5
MEANING AND RETENTION

Problem: To determine the effect of meaning on retention.

Plan: Conduct the experiment in two series. Present each list five times orally. Compare the number of words recalled in each series.

Materials: a list of 20 nonsense syllables, a list of 20 words, stop watch and writing materials.

Procedure: Conduct the experiment in two series.

Series -1 : Nonsense syllables: Seat the subject comfortably and instruct her/him that a list of nonsense syllables will be read out to her/him. S/he has to listen carefully as s/he will have to recalls the syllables later. Read the list of nonsense syllables at the rate of 2 seconds each syllables in an even tone. Thus present the list 5 times with an interval of 5 seconds in between each presentation. After the fifth reading, allow one minute distraction time, during which period, the subject is kept busy with some unconnected work. After this, ask the subject to recall the list of nonsense syllables. The subject need not necessarily maintain the original sequence. Note down the number of nonsense syllables recalled by the subject.

Series – II : Words: Here, use the list of words and follow the same procedure as in the I – Series.

Instructions: Series – I: "At the ready signal, I will read out a list of 20 nonsense syllables. A nonsense syllable is a combination of letters, but not a word. Here is an example. I will read the list 5 times with a pause at the end of each trial. Listen carefully as you will have to reproduce the nonsense syllable at the end of the reading".

Series – II : 'I will read out a list of words now. Listen carefully for you will have to reproduce them at the end of 5 readings".

Precautions:

1. The rate of presentation and the tone must be constant throughout the experiment.
2. The subject should be kept busy during the distraction time.

Data analysis:

1. Find out the number of words correctly recalled from each list.

Table showing the number of words correctly recalled by the subjects.

Sl.No.	Name	Number of correct answers		
		Nonsense syllables I	Words II	Difference (II-1)
1	A			
2	B			
3	C			
4	D			
	Total			
	Mean			
	Max.			
	Min.			
	Range			

Points for discussions:

1. State in what way the material learnt in the two series differ from one another in their meaningfulness.
2. Give reasons for the better performance in the second series.

Conclusion: Specify the influence of meaning on retention.

EXPERIMENT – 6
EMOTION AND FREE ASSOCIATION

Problem: To study experimentally the effect of emotion on the speed of responses.

Plan : Conduct the experiment in two series. Compare the responses and reaction time of the emotional words with those of the non emotional words.

Materials: 2 lists of stimulus words (List A and List B). Each list has 20 words (non emotional and emotional words), stop watch and writing materials.

Procedure: The experiment is conducted in two series.

Series 1 – List A (Non Emotional words)

Seat the subject comfortably and place List A before her/him. Instruct her/him. that at the start signal, s/he has to read the first stimulus word mentally and then write the first word that comes to her/his mind. In this way, s/he has to respond to as many stimulus words as possible with only a single response for each word. With the 'start' signal the subject is allowed to give the responses. The time allowed is 40 seconds. The 'stop' signal is given and the number of response words written by the subject is noted down.

Series – II List B (Emotional words)

The same procedure as in the I series is followed, but using List B. The number of response words written by the subject is noted down.

Instructions: "With the 'start' signal, read each stimulus word and write down the first response that comes to your mind, against it. Continue till you are asked to stop". The same instructions are repeated for the II series also.

Precautions:

1. To make sure that the subject has understood the instructions, give her/him 2 or 3 words as a trial.

Data analysis:

1. Note down the number of responses for emotional and non emotional series separately.

2. Calculate the reaction time (RT) by using the following formula, separately for the two series.

$$RT = \frac{\text{Time Taken}}{\text{Number of responses}}$$

3. Calculate the mean for responses and reaction time for the two series separately.

Individual Result:

Table 1: Showing the number of responses in the first and second series of the experiment.

Sl. No.	Name	List A (non emotional)	List B (emitonal)	Difference (B- A)
1	A			
2.	B			
3.	C			
	TOTAL			
	MEAN			

Table 2 : Showing the reaction time of the first and second series of the experiment

Sl. No.	Name	List A (non emotional)	List B (emitonal)	Difference (B- A)
1	A			
2.	B			
3.	C			
	TOTAL			
	MEAN			

Points for discussion:

1. Usually long reaction time, out of the way responses and failure to respond to some words may be indicators of some complexes.
2. Reaction time is generally more in the case of emotional responses than for non emotional responses.
3. Depending upon the individual experiences, the emotional responses tend to vary from person to person.

Conclusion: State whether the effect of emotion on the speed of responses has occurred.

GLOSSARY

A

- **Attention** : Is a cognitive process of focusing on one thing and ignoring other things in the environment.
- **Attachment** : The close emotional bond of affection that is found between infants and caregivers.
- **Adolescence** : A stage of the onset of puberty through the completion of teens.
- **Adulthood** : Is a stage of responsibility, independence and self supporting.
- **Amnesia** : Profound loss of memory.
- **Affiliation** : The need or want experienced for the company of others.
- **Achievement** : The desire of a person to meet standards of excellence.
- **Anger :** Anger is experienced when faced by frustration, resulting in sadness and depression.
- **Artificial Intelligence :** refers to the use of machines like computers or robots to perform complex tasks, programmed by experts in the respective field.

B

- **Brain :** Soft, spongy, pinkish gray, nerve cells, floating in cerebrospinal fluid.
- **Brain Storming:** Free thinking and holding the judgments till all the ideas are exhausted.
- **Convergent Thinking :** Thinking to solve problems which have definite answers.
- **Curiosity:** Tendency to seek for novel experience, gain pleasure by obtaining information.

- **Chromosomes :** Threadlike structures found in pairs. There are 22 pairs of autosomes and pair of sex chromosomes (23rd)
- **Consciousness :** meaning being aware of the present.
- **Case Study :** History of an individual with a problem.
- **Cerebral Cortex :** The gray matter and the highest evolved structure.
- **Corpus Coliseum :** White fatty tissue connecting the left and right hemispheres.
- **Chunking :** Meaningful grouping of related information that can be stored in STM.
- **Concepts :** Symbolic representation of a class of objects with some similarities. For eg: Furniture, Fruits.
- **Creative Thinking :** Innovations through music, painting, art and science.
- **Conflict :** Whenever a person has to choose between two or more desires, motives or demands. Example, choosing between higher studies and job on hand.

D

- **Development :** It is the pattern of progressive, orderly and predictable changes that begin at conception and continue throughout life.
- **Decision Making :** Making judgments by drawing conclusions, forming opinions, evaluating events or objects based on evidences.
- **Divergent Thinking :** thinking in different ways to arrive at a novel solution. For eg., Fusion Music.
- **Dyslexia :** A general term referring to difficulty in reading.

E

- **Episodic Memory :** This holds a lot of details about important events in one's life.
- **Emotion :** Excited state of mind.

F

- **Frustration :** is experienced when there is an obstacle between the desire and a goal. Eg., Polio afflicted child wanting to run a race.
- **Functional Fixedness :** The tendency to think of things only in terms of their usual functions. This can be a limitation in solving a problem.

G

- **General Psychology :** is concerned with the basic principles of human behavior.
- **Glands :** are cells which secrete hormones
- **Growth :** refers to the physical aspect for example, height and weight.

H

- **Hormones :** Chemical substances that play a role in growth and development of an individual and also process metabolism.
- **Hallucination :** Perceiving objects or events that are not present.
- **Hemispheres :** The symmetrical halves of the cerebrum and cerebellum
- **Homeostasis :** The physiological tendency to maintain an internal bodily state of balance in terms of food, water, air, temperature and sleep.
- **Hypothesis :** A tentative statement of the relationship between variables. The statement is made with the help of strong guess work or hunch.

I

- **Introspection :** Self examination or internal inspection.
- **Illusion :** Perceiving the object in a wrong way.
- **Insight :** A solution for a problem that occurs in a flash/suddenly.
- **Incubation :** A stage in the creative process or assimilation of

the learned material to be stored in the brain.

- **Instinct :** A complex universal behaviour that is rigidly patterned throughout a species. It is inborn or unlearned behavior. For eg.: sucking reflex in the newborn.

L

- **L - Learning :** Modification in behavior as a result of experience, training, exposure and opportunity.
- **Learning Disability :** Children with normal intelligence but having problems in reading, writing or learning numbers.

M

- **Mind :** is a subjective experience.
- **Myelin sheath :** A layer of fat and proteins covering - to enhance the speed of neural transmission.
- **Maturation :** refers to changes that are orderly and related to growth and development. Example, talking and walking in an infant.
- **Mnemonics :** Organizational strategy to remember. Eg.: NCERT
- **Motive:** That moves an organism into action

N

- **Neuron** : A Nerve Cell-basic unit of the nervous system.
- **Neurotransmitters :** Chemicals released at the synapse.
- **Negative Reinforcement :** Withdrawal of a reward to correct the behavior of a child; this is not punishment.

O

- **Observation :** Watching a person, situation or an incident with a purpose.
- **Over learning** : Studying and rehearsing a material even after 100% learning has taken place.

P

- **Psychology :** is derived from two Greek terms, 'Psyche' meaning **soul, logos,** meaning study.

- **Psychophysics** : is concerned with the relationship between physical properties of stimuli and our psychological experiences of them.
- **Perception** : The process by which sensory information is organized analysed and interpreted.
- **Prenatal :** Periodic development from conception to birth.
- **Problem Solving :** A goal directed thinking. For eg: a child arranging a jigsaw puzzle.
- **Peers :** children of same age group and maturity level.
- **Puberty :** Sexual maturation in early adolescents leading to the appearance of secondary sexual characteristics.

Q

- **Questionnaire :** an instrument consisting of questions designed to measure an aspect of behavior.

R

- **Reflex Action :** Stereotype response taking place at the spinal level. For eg: Eye winking reflex.
- **Retirement :** Is taking leave from active vocational life.
- **Rote learning:** Learning without understanding. Eg: recitation of poems by kids.
- **Repression:** Blocking, threatening or painful memories from consciousness.
- **Reasoning:** Reasoning is selective thinking, either through inductive or deductive reasoning.

S

- **Science:** Is a systematic study the results of which can be clarified at any point of time.
- **Synopse**: a gap between two neurons.
- **Semantic Memory:** refers to general knowledge.

T

- **Threshold:** A certain minimum level of stimulation of sense organ to actually experience the sensation.
- **Teratogens:** Environmental agents that cause deviations in normal development.
- **Thinking:** Is a cognitive activity unique to human beings.
- **Unconditioned Stimulus:** A stimulus that normally produces an involuntary response. Example: Food - Salivation in a hungry dog.
- **Unconditional Response:** The unlearned or involuntary response to a natural stimulus. For example: Eye winking response - stimulus gush of air.

V

- **Variable:** Any measurable condition, event, characteristics or behavior that are controlled or observed in a study.
- **Visual Illusion:** Physical stimuli that consistently produce errors in perception. For eg: A line enclosed by arrow heads is perceived as shorter than the same length of line enclosed by feather heads.

W

- **Working Memory:** Memory processes that preserve recently perceived events or experiences. This is also called STM. For eg: retaining a telephone number to pass on an important message, forgetting the number once the message is passed on.

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I PU Model Question Paper

Psychology [32] - 2013

Time 3 hrs 15 min **Max Marks : 100**

I. Answer the following questions in a sentence each : 1x10=10

1. What is the meaning of Logos?
2. What is case study method?
3. What is an axon?
4. What is Fluctuation of Attention?
5. What are genes?
6. What is development?
7. What is Dyslexia?
8. What is sensory memory?
9. What is concept?
10. Who has explained the hierarchy of needs?

II. A nswer any Ten of the following in 2-3 sentences each: 2x10=20

11. What is the aim of Industrial Psychology?
12. State any two demerits of introspection method.
13. Write the differences between experimental and control groups.
14. What is cretinism?
15. Where is visual centre located in the brain?
16. Define perceptual constancy.
17. Mention the types of thinking.
18. Mention the 3 laws of learning according to Thorndike.
19. Distinguish Genotype from phenotype.
20. What is Adolescence?
21. Distinguish biological need from social need.
22. What is cloning?

III. Answer any 8 of the following in 15-20 sentences each: 5x8=40

23. Explain naturalistic observation.
24. Draw a neat diagram of Neuron and label the parts.
25. Explain the characteristics of sensation.
26. Explain Long term memory.
27. Write a note on mitosis.
28. Write a note on prenatal stage in development.
29. Explain educational psychology.
30. Write a note on creative thinking.
31. Explain subjective factors of attention.
32. Explain the causes of abnormal forgetting.
33. How do you manage anger? Explain.
34. Explain survey method.

IV. Answer any two of the following in 30-35 sentences each: 10x2 = 20

35. Draw a neat diagram of Brain, label its parts and explain their function.
36. Explain learning by classical conditioning.
37. Explain the role of environment on the development of the individual.
38. Explain the factors which influence problem solving in thinking.

Practical Part

V. Answer any two of the following questions. 5x2=10

39. Write the plan and procedure you have adopted to study the effect of directed observation on the accuracy of report.
40. Write the plan and procedure you have adopted to study division of attention between two muscular tasks.
41. Write the plan and procedure you have adopted to study the effect of emotion on thinking by free association.

❖ ❖ ❖ ❖ ❖