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Lesson No.

- 2.1 : Attention & Selective Attention**
- 2.2 : Perception : Nature, Factors and Laws of Perception**
- 2.3 : Perception of Form**
- 2.4 : Perception of Space and Depth**

Department website : www.pbidde.org

Attention & Selective Attention**Lesson Structure:-**

- 2.1.0 OBJECTIVE
- 2.1.1 INTRODUCTION
- 2.1.2 NATURE OF ATTENTION
- 2.1.3 TYPES OF ATTENTION
- 2.1.4 DETERMINANTS OF ATTENTION
- 2.1.5 INTRODUCTION: SELECTIVE ATTENTION
- 2.1.6 THEORIES: BROADBENT'S BOTTLENECK THEORY
- 2.1.7 TREISMAN'S FILTER ATTENUATION THEORY
- 2.1.8 DEUTSH AND DEUTSH MODEL
- 2.1.9 NORMAN AND BOBROW'S MODAL
- 2.1.10 NEISSER MODAL
- 2.1.11 COCKTAIL PARTY PHENOMENON
- REFERENCE BOOKS.

2.1.0 OBJECTIVE -

This chapter will introduce some important things about attention, which help us to notice and register the information that our sense organs carry to us. Nature of attention will be described along with the factors that influence it.

The objective of this lesson is to give information about the nature of selective perception. At first selective Attention as a concept will be introduced, then theories will be discussed. In the last an important aspect of selective Attention cocktail party phenomenon will be described.

2.1.1 INTRODUCTION-

The world is full of variety of stimuli. We observe birds, flowers, grass and plants in a garden but we don't notice all of them at the same time. The sense organs collect information from the outside world as well as from inside the body. When we draw our attention to some qualities of an object then only the information is registered and is sent to brain. Thus attention is basic to cognition.

2.1.2 UNDERSTANDING THE TERM ATTENTION: - NATURE OF ATTENTION

Attention is an important mental process which underlies other processes like memory, learning, forgetting and imagination etc. A large number of stimuli impinge

upon our sense organs simultaneously, but we do not notice all of them at same time, only a few of them are noticed. It means sustained concentration on a specific stimulus, sensation, idea, thought or activity. It makes us able to use information processing system with limited capacity to handle vast amount of information available from the sense organs and memory stores. The word attention has been derived from the Latin word 'attenio' which means to apply the mind to something. Thus it can be said that attention or mental focus, captures only a small portion of the features of stimuli while relegating others to the background.

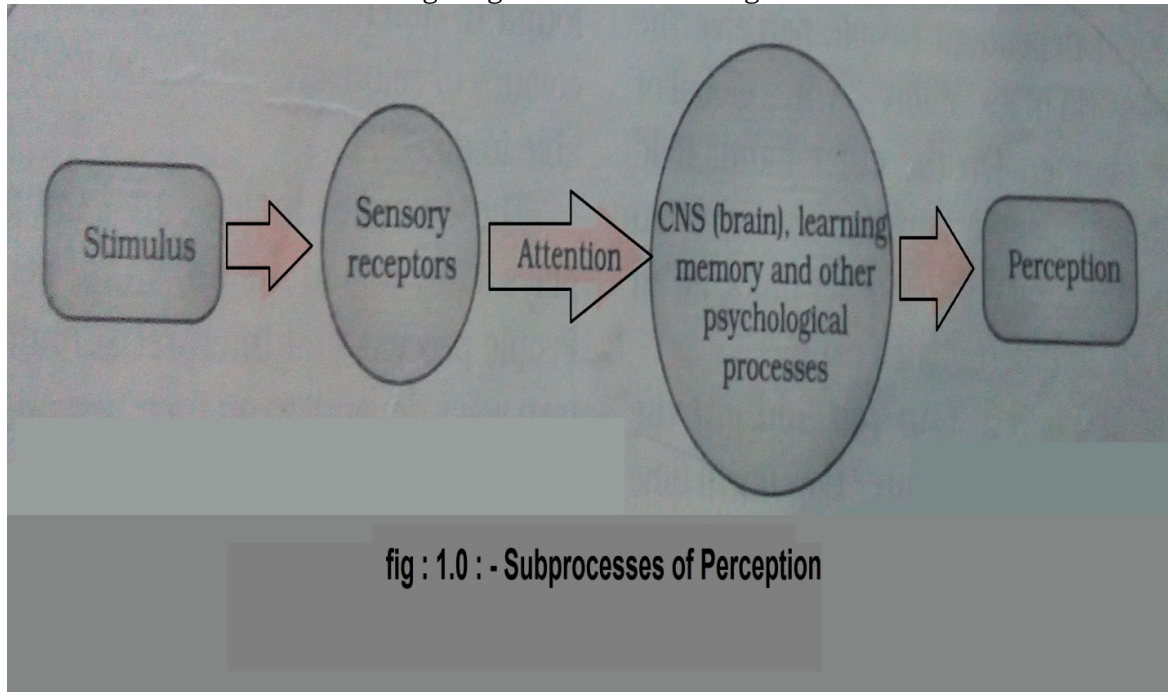


fig : 1.0 : - Subprocesses of Perception

DEFINITIONS-

Psychologists have defined attention in the following ways-

According to Matlin(1983) , “ Attention is a concentration of mental activity.”

“Attention is a selective mental process in which the person by adopting certain bodily postures in set to bring certain stimuli into focus of consciousness.”

“Attention is the term given to perceptual processes that select certain inputs for inclusion in our conscious experience or awareness at any given time”

CHARACTERISTICS -

On the bases of these definitions and researches, following characteristics of attention can be described.

- **SELECTIVITY - Attention is a selective mental process.**

Attention is the process through which certain stimuli are selected from a group of others. While entering a classroom we selectively focus on one or two of the available stimuli though classroom has table, chair, blackboard, Windows, and walls etc. Attention thus may be compared to a spot light on a darkened stage. According to Broadbent the world is made up of many sensations that cannot be handled by perceptual cognitive capabilities of the human observer. So, in order to cope with the flood of available information, humans selectively attend to only some of the cues. Keeping in mind the selective nature of attention, Morgan, King, Weisz and Schopler (1986) has defined attention as follows:-

“Attention is the term given to perceptual process that select certain inputs for inclusion in our conscious experience or awareness at any given time.”

Thus attention is a process of selection among stimuli. By this process of stimuli in peripheral consciousness are brought in to the focus of consciousness. Broadbent is of the similar view. The world according to him is made up of many more sensations that cannot be handled by perceptual cognitive capabilities of human observer. Thus in order to cope with the flood of available information, humans selectively attend to some of the cues.

A number of theories have been developed to explain the selective nature of attention. Broadbent (1958) explained it as the Filter Theory. According to this theory, many stimuli impinge on our receptors creating a kind of Bottleneck situation. These enter Selection Filter which allows only one stimulus and other are rejected. According to Kahneman, 1973, Processing Capacity Theory works here. One has limited capacity for processing of information. That is why we cannot attend to all stimuli simultaneously and attend only processed stimulus. Thus selectivity is a major characteristic of attention.

ATTENTION INVOLVES ALERTNESS CONCENTRATION AND SEARCH. -

Beside selection, attention also refers to many other prospective like alertness, concentration and search. Alertness means an individual's readiness to deal with stimuli that appears before him. For example participants in a race waiting for whistle are in a state of alertness. According to Lefron Cois (1983) attention is a state of high responsiveness.

Concentration refers to focusing of awareness on some specific objects while excluding other for the moment. For example the players in an academy concentrate on their coach's instruction and ignore all other sounds. Search requires some effort on the part of the observer. That's why attention is also called “effort allocation”. For example one looks for his/her friend in a rally.

Selectivity is an important feature which helps one behave in an integrated manner.

ATTENTION INVOLVES BODILY ADJUSTMENTS-

When we concentrate on some object we have to adjust body accordingly. Three main adjustments are -

1. Adjustment in sense organs.
2. Adjustment in bodily posture.
3. Change in muscle tension.

For example, a student listens to a lecture carefully. He adjusts his eyes, ears etc according to the change in the position of the teacher. He also changes his body posture after some time. Sometimes he places his hands on desk and at other times on his bench. He also bends his body left or right. Changes in muscle tension also take place.

Morgan (1962) studied the muscle tension in the fingers if a typist while typing when a sound is produced to distract his attention. It was found that the finger pressure on the typewriter's keys was equivalent to 305 gm before the sound. It was 438 gm while the sound was produced. In the calm atmosphere it reduced to 293 gm. It can be concluded from this study that change in muscle tension takes place in the situation when more attention is needed.

ATTENTION as LIMITED SPAN of ATTENTION-

The number of items a person can attend at one time which in turn determines the number of items that can be stored in a short term memory. It is also called span of attention. Our attention has a limited capacity to receive stimuli. The number of objects one can attend to a brief exposure (i.e. a fraction of a second) is called span of attention. It is the amount of information an observer can grasp from a complex array of stimuli at a single momentary exposure. This can be determined by the use of an instrument called 'tachistoscope'. On the basis of several experiments Miller has reported that our span of attention varies within the limits of seven plus or minus two. This is also known as 'magic number'. Span of attention can be extended from five to nine numbers.

EARLY EXPERIMENTS -

Some of the oldest experiments in psychology were inspired by the question whether the mind could apprehend more than one object at a time. First experiment in this field was done by Sir William Hamilton (1859). He found that if a handful of marbles were thrown on the floor, the subjects were able to see only six at a time.

Jevons(1871) a logician and economist also studied span of attention. He placed a flat white tray in the middle of a large black tray. He estimated them when they came to rest and then counted the actual number was nine and less than one percent when it was twelve. Thus span is a kind of threshold to be computed by the methods of constant stimuli in psychophysics.

Span of attention is determined by organismic factors such as mental set, intelligence, practice, fatigue and motivation of the person who pays attention. Practice and motivation enhance span of attention and fatigue has adverse effect on it. Thus external environment remain constant, individual difference, are there in a span of attention as it is influenced by organismic factors.

ATTENTION HAS THE PROPERTY OF FLUCTUATION AND SHIFTING. -

When one's attention shifts from one aspect of a stimulus to another aspect, it is called fluctuation. Shifting, means that attention tends to shift quickly from one object to another. Woodworth accepted the shifting nature of attention. When we see some stranger, our attention fluctuates from his hair to his face. Then we see his dress or expression for a while. This feature of attention termed as fluctuation. On the other hand, when we are sitting in a shop our attention shifts from one article to another. This is called shifting of attention. According to Woodworth "The object of our attention is always shifting". Suppose one person is looking at a fairly complex picture, he will look at different parts of the picture. A landscape or group of people. He will look at different parts of the picture one after another. Rate of shifting per object will be 2-3 per second. When an eye movement is photographed, the fixations are found to vary in duration between 100ms to 2 sec. According to Buswell (1935) the modal value of 230ms per fixation can be accepted.

Some psychologists have explained fluctuation and shifting on the bases of organismic factors. Some are of the view that both of these are influenced by respiration, fatigue and brain waves etc.

THERE OCCURS DIVISION IN ATTENTION

Attention has a divisible character. When a person performs several activities simultaneously there seems to be division of attention. It has been found in research studies that tasks involving cognition does not involve this division. There is usually rapid succession or alteration between the two tasks as can be seen in the switch board of a telephone operator or in a cockpit. According to Woodworth and Schollosberg, "Division of attention would mean a simultaneous focusing upon two separate activities." If one activity is automatic and goes forward smoothly without any conscious control. No division of attention is visible.

Experiments on this problem began in 1887 when Paulhan tried to recite one familiar poem orally while writing another and found it possible to do so.

COCKTAIL PARTY PHENOMENA

Cherry (1953) has exemplified the perceptual behavior that occurred in a crowded room with many conversations surrounding the listener. Conversation recorded on audiotape in similar situation is harder to understand. The listener can attend to one among these several equally loud conversations occurring simultaneously, factors such as voice quality and directional cues facilitating the task. This phenomena selective attention was termed cocktail party phenomena.

2.1.3 Types of Attention :-

1. Voluntary Attention
2. Involuntary Attention
3. Habitual Attention

Voluntary Attention: It is a process when individual diverts his attention towards a particular activity or situation with the conscious effort.

Involuntary Attention : It is a process when individual diverts his attention towards other activity or situation without the conscious effort. It may be against the will of the individual.

Habitual Attention : It is a process when individual react to a stimulus automatically because attending to a stimulus becomes a habit.

2.1.4 DETERMINANTS OF ATTENTION

OBJECTIVE DETERMINANTS

Some determinants are related to the features of stimuli. These are termed as objective determinants. Following are the major objective determinants of attention-

NATURE OF STIMULUS -

There is different kind of stimuli based on different sense organs. Usually visual stimuli attract our attention more than auditory stimuli (Munn, Fernald & Fernald, 1772). Picture of humans, coloured pictures and pictures of great and known personalities attract more attention.

INTENSITY OF STIMULUS -

A sharp, strong and intense stimulus will be noticed easily than a weak one. When we see at sky in night. The brightest of the stars we draw our attention. A loud sound, a strong smell do the same.

NOVELTY OF THE STIMULUS -

Newness attracts attention. According to Murphy "human nature is greedy of novelty". When one sees new arrangement of furniture in his friend's home, he immediately notices it. Also, new fashion new voice, new coins, new stamps attract our attention.

SIZE OF STIMULUS -

Large objects readily draw attention. Headlines are written bold in newspaper advertisements are given in capital letters. In research studies, it has been found that doubling the stage of objects, up to 50 percent attention value is increased. For e.g. a student writes the title in capital so as to attract attention of examiner. In the same way an elephant catches our attention more readily than a dog when both are walking in same way.

MOVEMENT OF STIMULUS -

A moving object catches our attention more readily than a still object. A moving rope gets attention quickly than a still live snake.

REPETITION OF STIMULUS -

When a stimulus is represented many times. When a stimulus is presented time and again before us, it more readily catches our attention than those which are presented one time. It is factor of great importance in getting attraction. A stimulus when repeated is easily attended. That is why advertisements on T.V. are also repeated.

LOCATION OF STIMULUS -

It has been found that anything in the centre always gets more attention. A small picture when placed in middle of the printed pages is likely to draw attention. The title on the first page of newspaper than on any other page easily catches our attention.

CONTRAST IN THE STIMULI -

When we see two opposite stimuli. They draw our attention. We are more likely to see red words written on a green sheet than the red word written on red sheet, in the Same way.. A fair person sitting with a dark complexion man is noticed easily.

SUBJECTIVE DETERMINANTS -

These are those determinants which are related to the characteristics of the person.

INTEREST:

We attend to those objects in which we are interested. Interest and attention go hand in hand. A player reading newspaper is attracted to sports news, an electrician on entering a room sees electrical appliances.

HABIT:

A person gets easily attracted to the things he is habituated. An alcohol addicted person notices readily a liquor shop.

MOTIVE AND NEED:

A hungry person looks for a hotel or food point. Another person who wants to buy a book is attracted towards book shops than other shops.

MIND SET OR READINESS:

Mental readiness is very crucial for attention. It helps to concentrate better. The students who are mentally prepared for study, will respond better in class.

ATTITUDE:

Attention is determined by our attitude also. A person with positive attitude attends to all happy and bright things. Negative attitude makes a person attend to faults and short comings.

EDUCATION AND TRAINING:

We are trained to observe things due to our involvement in our professions. A teacher in library pay attention to his subject books and journals. A barber's attention is easily attracted by different hair cut in a crowd.

EMOTION:

All human behavior including his attention gets influenced by emotions. When one is apprehensive about some person, he tends to give attention to the ways of protecting himself from that person. If a newly married couple is emotionally attached, they attend to each other properly.

TEMPERAMENT:

People of different temperament attend to different objects differently. A religious person attends to the objects related to his religion. On the other hand a business man pays attention to all kind of business news.

SOCIAL DETERMINANTS

Human beings live in society so their behavior including attention is influenced by society. That is why they are called social animals. They have to follow social norms so that they can live a respectful life. His parents, friends and society as a whole plays a significant role in influencing his attention. According to Boring "society plays an important role in establishing the objects for our attention."

2.1.5 Introduction: Selective Attention :- several stimuli impinge on our sense organs and we are usually immersed in a sea of potential stimuli each of which is capable of eliciting one or more responses. We select some inputs for inclusion in our awareness at any moment at any given time. That is why one is able to behave in a consistent and integrated way. Attention, according to Oxford dictionary of psychology, is sustained concentration on a specific stimulus, sensation, idea, thought, or

activities, enabling a person to use information processing system with limited capacity to handle vast amount of information available from the sense organs and memory stores. In simple words "Attention is the process through which certain stimuli are selected from a group of others". Athletic players wait in an alert state on the standing line for the whistle sound in order to run. They hardly hear any other sound in the play ground. Thus in the process of attention, certain stimuli are selected from a group of stimuli. Selective attention is focusing concentration on a single stimulus or class of stimuli to the exclusion of others. According to William James (1890) in his 'principles of psychology' this ability must be acquired; 'the baby assailed by the eyes, ears, nose, skin and entrails all at once, feels it all as great blooming, buzzing confusion' (p.488) our perceptual system can deal with only few stimuli at a given moment.

Factors:-Selective attention has been a matter of interest for psychologists for the last forty years. Several factors have been found to be important determinants of selective attention.

According to Matlin 'selective attention is a phenomenon in which we concentrate over only one activity and notice very little about other activity.

(a) External factors :-The size, intensity and motion we features of stimuli are important external determinants of attention bright, large, sized and moving stimuli, easily get our attention, people are more responsive to human photograph than other inanimate objects photographs. The external determinants of attention like the size of the stimulus, intensity, brightness', movement of the stimuli, easily get our attention. It has been observed that people notice moving objects more than the stationary objects.

(b) Internal factors lie within the individual. They can be divided into two main categories.

(I) Motivational factors: These are related to our biological or social needs. When one feels hungry, even a faint smell of food will be noticed.

(II) Cognitive factors:-these include factors like interest, attitude and mental set. A carpenter, on entering a room, observes furniture instead of electricity appliance.

Cherry did important studies in the field of selective attention. He introduces shadowing technique. In it subject repeats out loud words as they all being heard. This technique is used in experiments on dichotic listening. To prevent rehearsal of words presented simultaneously to the other ear. Cherry recorded two different messages in the voice of some speaker he gave different messages to different ear. Subject was asked to repeat the information of one specific ear subject were able to recall only one information .they could not recall the information provided to the rejected ear .i.e.unattended message .It was found also that any change in the nature of method can make subject able to attend unattended message such as changing male voice to female voice.

Moray (1959) found in his studies that adding one's own name in unattended message draws subjects attention he then becomes conscious and is able to attend such messages .

It is evident from research studies that subjects cannot ignore their own name and their city name they perceived it automatically .This automaticity has been termed as stroop effect as stroop was the first to find this effect in his research studies in 1935.

Besner and Stole, 1999 found in his studies that it is easy to read a word with the help of automatic perception.

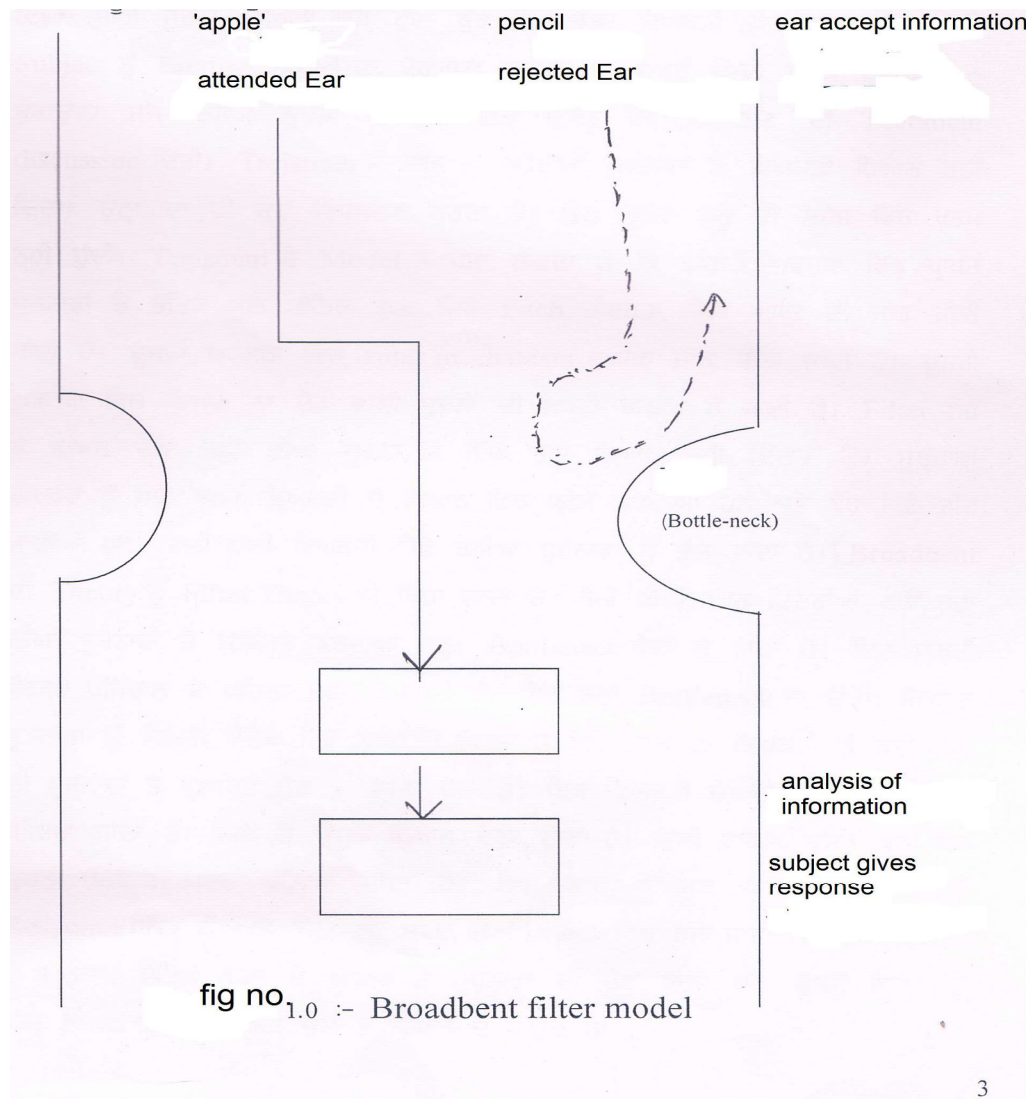
But when a colour's name is written with another colour, this automaticity poses difficulty. Thus Stroop effect indicates short coming of selective perception.

2.1.6 Theories of selective attention :-

Broadbent's filter theory or Bottleneck theory this theory was developed by Broadbent (1956) according to this theory many stimuli stimulate our receptors creating a kind of "bottleneck" situation moving from the short term memory system they enter the selective filter which allows only one stimulus to pass through levels of processing other stimuli were screened out at that moment of time. Thus we become aware of only that stimulus which gets access through the selective filter. Broadbent's Filter model has been explained in fig. 1.0. It depicts that the word 'apple' is received by one ear of subject which is to be attended. This information crosses the Bottleneck and is analyzed to enable the subject to respond. At the same time he is made to hear the word 'pencil' for which no instruction is given to receive it so this word cannot get access to the Bottleneck. According to Broadbent high pitched voices are more readily attended to than low pitched voice as low pitched voice cannot pass through higher level of processing.

Broadbent's theory is also termed as 'Filter Theory'. Several information stimulate our sense organs. Then the situation of Bottleneck appears. It appears before pattern recognition. That is why Broadbent's theory is called 'Early Selective Model'. Selection takes place immediately after sensory registration. This model assumes that attention restraints are determined by physiological restraints. Bottleneck aims at resisting entrance of sensory information to the focus of attention. It thus protects a person from attending numerous information effecting him simultaneously so he select any one information.

Broadbent model clearly explains that how one can attend to certain characteristics of information and not on others. One of the drawback in that it cannot explain how a subject become able to attend to an unattended information when his /her name is added to it.



2.1.7 Filter Attenuation Theory:-

This theory was developed by Treisman (1964) by modifying Broadbent's theory. It proposes that stimuli not getting access to the selective filter at a given moment of time are not completely blocked. The filter only attenuates (weakens) their strength. Thus some stimuli manage to escape through the selective filter to search higher level of processing. Personally relevant stimuli for example one's name in a collective dinner can be noticed even at a very low level of a sound. Such stimuli even if they are fairly weak may also generate response occasionally by slipping through the selective filter.

Treisman a lady psychologist was a student of Broadbent. She modified Broadbent's model so that it could become more useful. Her model was termed as Filter Attenuation Model.

According to this model, information recieved by the rejected ear is not completely blocked but it becomes weak after processing. It can only be partially analyzed. Treisman unlike Broadbent, belived that information does not get lost due to bottleneck. Subjects get acquainted with some of its qualities.

Treisman in her experiment made her subject listen English paragraph. which was to be recalled by subjects. Second information was a paragraph consist of biochemistry. She found that information which not recieved, are also analysed. It does not get lost at early stage. At this stage pitch, intensity, etc physical quality are analyzed. At the second stage, filter mechanism takes place. Here this power of unaccepted information gets weaknes and powerful information get access to the attention focus, other stay behind, after then a person forgets weak information. Attenuated and non attenuated information reach deeper level of nervous system- here exist dictionary analyzer. subject does not feel much difficulty while differentiating first information from the second.

This can be concluded from the above study that information recieved from rejected ear does not get lost. It under goes analysis. Levis (1970) also got similar results of his experiment. Treisman's model and "how information flows" has been depicted in figure: 2.0

Treisman also observed that contextual factors cause changes in perceptual analysis units' threshold. As a result a person can respond to the information which was attenuated during process of filtering.

Thus Treisman has modified Broadbent's model which the later also recognized. Now days this model is known as Broadbent Treisman Filter Attenuation Model.

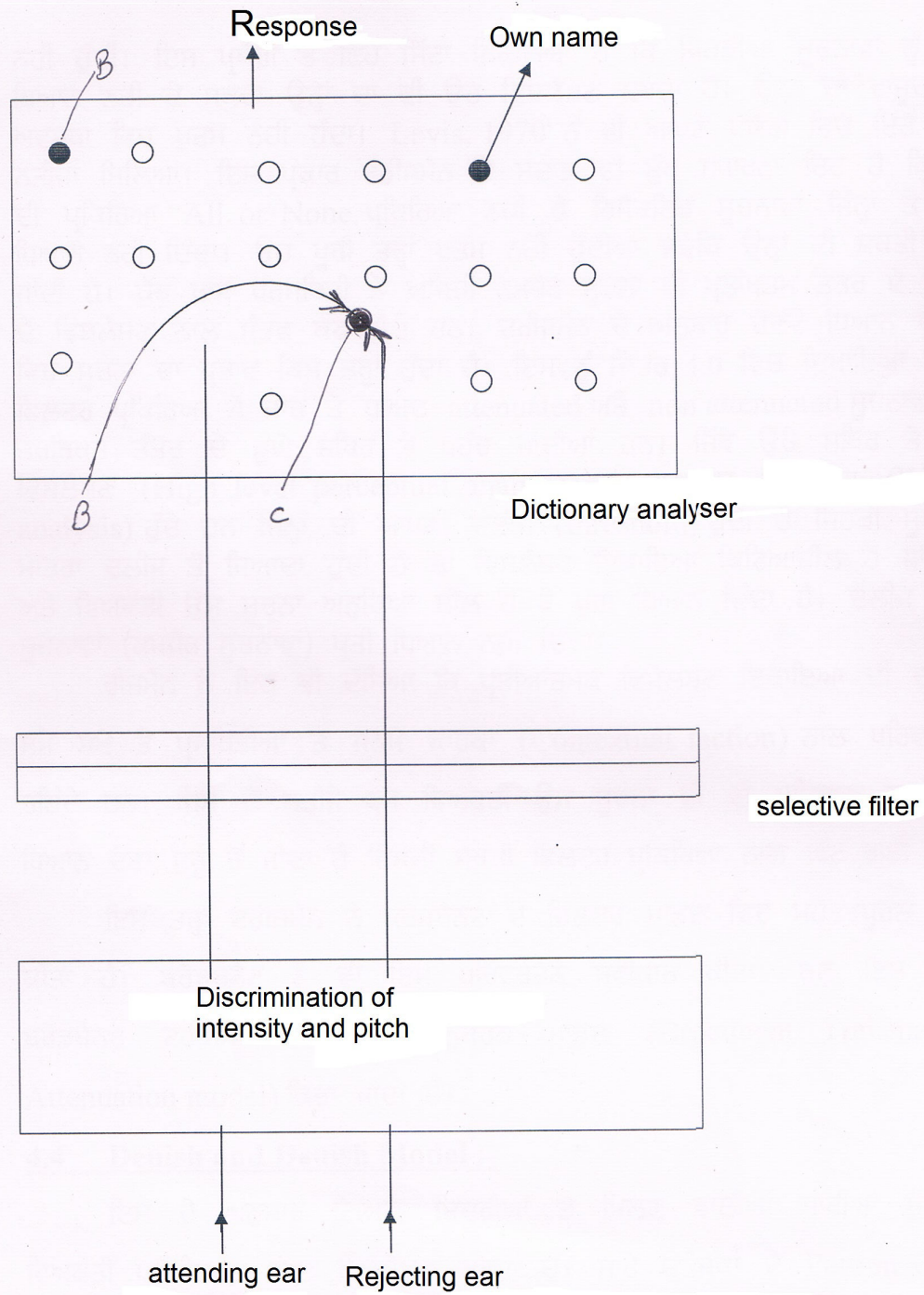


fig no.2.0

Treisman Filter Attenuation Model

2.1.8 Deutsh & Deutsh Model (1968):-

They presented a modified form of Bottleneck Model. They are of the view that a person analyses perceptually all the information received by sense organs. Then he recognizes the patterns of all the stimuli. When he is to give response, it is then Bottleneck comes in picture. As he has limited memory, he selects stimuli for memorizing as well as for forgetting. He attends the information which are to be remembered and does not attend to the information which are to be forgotten.

Like Treisman, Deutsh & Deutsh has also recognize the existence of central analyzing units. These units recognize all the information and analyzing them too. The person remembers and responds only those information coming from these units which are more important. More important information draws his attention.

Moray (1969) observed in his research studies that contextual and instrumental factors can change the selection of information.

Kahneman (1973) has presented comparison between filter model and that of Deutsh. According to Filter Model "attention controls perception". But Deutsh Model opposes it. Bottleneck situation occurs in Filter Model as well as in Deutsh's. In Filter Model Bottleneck comes in picture before perceptual analysis and Deutsh Model, on the other hand shows its occurrence just before the response is to be given. It is just before selection of responses to the fully analyzed stimuli. Thus Deutsh & Deutsh have recognized selective attention as 'post perceptual process'. The person gives most appropriate response in a given situation.

Norman(1968) and Keele(1973) have supported Deutsh & Deutsh Model. They are of the view that all the information are analyzed completely and the process of selective attention takes place on the basis of response organization and memory.

2.1.9 Norman and Bobrow's model :-

Norman and Bobrow (1957) said that there is no blockage in the way of flow of information. According to them, attention is limited because a person has limited capability of mental efforts while attending a work. Norman and Bobrow have termed it 'resources'. Resources also include memory efforts and communication mediums when a person is to do more than one work at a time, his resources also divide and this leads to decrease in performance. Norman and Bobrow have differentiated two types of tasks – Resource limited and Data limited tasks. Performance on Resource limited task can be increased by providing more resources and vice versa. Data limited tasks are those tasks in which performance is less due to the limited memory ability of resource. Practice has no effect on these tasks whereas Resource limited tasks are effected by practice as is evident from experiments relating to Selective Attention.

2.1.10 Neisser Model -

Neisser (1976) presented a model which explains selective attention. Neisser did not agree with the models of Bottleneck as well as the model given by Norman and Bobrow. He believed that there is no physiologically or mathematically established limitations on "how much information can be picked up at once". This theory encourages many neurophysiologists. They started investigating regarding filtering mechanism in nervous system. These researches revealed that billions of neurons are there in the brain with unlimited capacity. Long term memory has unlimited capacity. Attention to information is also unlimited. At the start of the day one may feel difficulty in doing many tasks but with practice one can do more than

one task with ease. Schaffer 1975 found that a lady typist with practice can type quickly while repeating paragraph at the same time.

There are so many theories / models of selective attention. More research in this field is needed to explain this phenomenon.

2.1.11 Cocktail party phenomenon: -

This phenomenon is related to selective attention. First of all, Collin Cherry, a telecommunication engineer, in 1950's introduced this term. He has explained it by giving the example of Perceptual Behavior that occurs in a crowded room with numerous and different conversation surrounding the listener. We are continuously sampling the acoustic environment for meaningful signals i.e. Selective Attention. Cocktail party phenomenon enables a listener to attend to one among several equally loud conversations occurring simultaneously, factors such as voice quality and directional cues facilitating the task.

EVALUATION SHEET**LONG QUESTIONS**

- Q 1. Discuss nature of attention in detail.
- Q2. Describe determinants of attention.
- Q3. Discuss the different models of selective attentions in detail.
- Q4. Compare models of selective attention.

SHORT QUESTIONS

- Q1. Division of attention.
- Q2. Span of attention.
- Q3. Basic assumptions of bottleneck theories.
- Q4. Treisman's Selective Attention Model.
- Q5. Neisser's Selective Attention Model.
- Q6. Cocktail Party Phenomenon.

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LESSON NO. 2.2

PERCEPTION: NATURE, FACTORS AND LAWS OF PERCEPTION**LESSON STRUCTURE****2.2.0 OBJECTIVE****2.2.1 INTRODUCTION****2.2.2 PROCESS OF PERCEPTION****2.2.3 PERCEPTION IS SELECTIVE ATTENTION****2.2.4 FACTORS AFFECTING PERCEPTION****2.2.4.1 EXTERNAL FACTORS****2.2.4.2 ORGANISMIC FACTORS****2.2.5 ORGANISATION OF THE PERCEPTUAL FIELD****2.2.5.1 PROPERTIES OF FIGURE AND GROUND****2.2.5.2 FACTORS INFLUENCING FIGURE –GROUND RELATION****2.2.6 LAWS OF PERCEPTION****2.2.6.1 LAW OF PROXIMITY****2.2.6.2 LAW OF CONTINUITY****2.2.6.3 LAW OF SIMILARITY****2.2.6.4 LAW OF CLOSURE****2.2.6.5 LAW OF COMMON FATE****2.2.7 SUMMARY****CHECK YOUR PROGRESS****REFERENCES****2.2.0 OBJECTIVE:**

In the previous lesson you have been acquainted with the process of sensation and you have read that it is the first step towards consciousness and perception is the second step in the way of knowing the world. In this lesson the focus of discussion will be on:

- The process of perception
- How various factors affect perception
- Factors influencing Figure and Ground relation
- Laws of Perception

2.2.1 INTRODUCTION:

Perception is the process by which an organism interprets sensory inputs so that it acquires meaning. Perception refers to the way the world looks, sounds, feels, tastes

or smells. In other words, perception can be defined as whatever is experienced by a person. This complex process involves sensational levels of analysis in the nervous system or sensory system. Impairment of one or more systems affects the others. Blindness, for example, reduces a person's ability to speak clearly.

Perception is the first event in the chain which leads from the receiving of a stimulus to action. Before men act, they usually perceive, they sense, they note what things and events are about them. To understand perception, we must find out just what it is in the world that we respond to. As organisms become more complex, they no longer react just to the stimulus which touches the skin or hears the voice or sees the light, they also acquire an ability to know something about what lies at a distance or what type of voice or light is.

Hence, perception is the experience of objects and events which are here and now. It excludes those things which are elsewhere, things about which we may think clearly but do not sense directly. Further more, it is convenient to use the term perception for more general aspects of this activity, reserving the term sensation for those facts in our experience which depend upon how the sense organ acts.

Perception has been defined as the selective extraction and interpretation of information from the environment. The environment can be both external and internal. The internal environment comprises the cues that we pick up from our own body, such as sensations from our muscles. Selectivity in perception is partly due to the actions of the sensory receptors as illustrated by processes such as adaptation and neural summation. But selectivity is determined largely by attention and organisation, two processes that tell us a great deal about our perceptual functioning in everyday world.

2.2.2 PROCESS OF PERCEPTION

:

Most psychologists are interested in knowing how we extract information from our environment. Most perception is a reasonably accurate replica of stimuli as they exist in the real world. The perceptual world is filled with many stimuli to which our receptors are capable of responding, yet at any given time, we extract only a very small percentage of the total stimulation present. Perception differs from person to person and even within individuals from time to time. Every person perceives the world uniquely.

The apperception of the world through the senses depends upon the information received by the brain. All perception is initiated by stimulation of specialized nerve cells called receptors, which are sensitive to specific chemicals or physical events. Sense organs are adapted for the reception of events or stimuli from outside the nervous system. The stimuli may be internal, such as temperature within blood vessels, or external such as auditory or visual stimuli. Each receptor is associated with some kind of mechanism which converts energy into an electric potential by which the receptor cell influences other nerve cell. The receptors within a sense organ convey the message to other cells of the nervous system.

Perception refers to the apparently direct and immediate knowledge of the world, and also of our own bodies by neural signal from the eyes, ears, nose, tongue and many other sense organs which include the skin senses of touch, hot, cold and pain, and also organs of balance in the inner ear and the unconscious monitoring of forces on the muscles and joints to signal to the positions of the limbs. We usually think of own perceptions as our consciousness of the world around us, and of ourselves, but much of the perception by which behaviour is initiated and controlled is totally unconscious, and awareness of the perception of things and state of affairs by which we act is never more than fragmentary.

2.2.3 PERCEPTION IS SELECTIVE ATTENTION:

At any moment, we are exposed to a vast number of stimuli that stimulate our various sense organs. However, it is not possible that we perceive "all" these stimuli. Some stimuli may strike us (depending on various external and internal factors), and we may perceive those stimuli only. For example, when we are waiting for a bus at the bus stand, there may be several people around us. We may not perceive them, but we may suddenly recognize a friend even in the crowd. If asked later, we may not even recall the faces of people around us. We may not even be aware of who was standing nearby. If he/she was not attended to at that time. Similarly, when we are watching T.V. and bring a newspaper to read, it is not necessary that it is only the news items that we are reading that may be a focus of our attention. Just by listening to the sound, we may perceive the song of our choice coming on the television. From the above examples, it is very clear as to why perception is described as selective attention.

2.2.4 FACTORS AFFECTING PERCEPTION

General psychologists have pointed out a set of factors outside and inside the organism that favour the grouping or organisation of the stimulus field in one way rather than another. The external factors are those of similarity, proximity or nearness, common fate, good continuation and closeness. Past experience, momentary set, needs, values and attitudes constitute the organismic factors.

2.2.4.1 EXTERNAL FACTORS :

The external factors of perception are discussed below.

1) Proximity :

Proximity is the main principle of perception. It refers to the fact that when objects are relatively close together, they are readily perceived as a group. Dots that lie close to gether in space are easily seen as group, dots that lie far apart not so easily.

2) Similarity :

The factor of Similarity can easily be observed if the dots or other small patches that are just alike are easily grouped. Given a number of separate items of several different types, some of them if resemble one another in some respect, constitute a group or unit by itself. Things may resemble each other in different qualitative and quantitative ways, e.g. colour, form, intensity, etc.

3) Good Continuation :

Many dots forming a continuous straight line or a simple curve are perceptually grouped as one entity. The continuity may be plugged in by faint lines joining certain dots. In the example of sound, a sequence of notes running up or down the scale makes an easily heard pattern.

4) Inclusiveness :

A group or pattern that includes all the elements has an advantage over perception. Perceptions from such stimuli are usually more full and complete than the stimuli which are often broken and sketchy.

5) Familiarity :

Familiarity of a pattern or object gives advantage over that are less familiar pattern or objects. Picking out a circle or a human profile from mass of lines is made easier by the familiarity of these figures.

6) Whole Versus Part :

Puzzle pictures prove that familiarity is not the only factor determining perception. The whole picture in which the face is hidden is a coherent whole while the hidden face is an isolated fragment. The whole that is perceived gives the advantage to parts coherent with that whole. Here, we stress the whole pattern or situation as determining how the parts shall be perceived. In perception, the whole determines the parts in certain respects by conferring on the parts their respective roles in the whole.

2.2.4.2 ORGANISMIC FACTORS :

Organismic factors in perception, such as past experience, set or readiness, needs, attitudes and value, have been discussed below :

1) Past Experience :

Past experience plays an important role in determining perception. Perception is the knowledge of an object that is 'here' and 'now'. One does not, however, receive all that is 'here' and 'now'. At any moment, one is influenced by a mass of stimuli that impinges upon his external and internal sense organs. He perceives only a small part of the stimulus field which is related with his past experience.

2) Momentary Set or Readiness :

The set or readiness of any moment is a factor in determining what shall be perceived at that moment. If you are set to see a certain pattern or object, or to hear a certain rhythm, that pattern has the advantage over other equally familiar.

3) Context :

The immediate situation also is influential in determining what we perceive. Context is helpful in perception because it prompts us to fit perceived objects and events. One's family, friends and other social groups may play a strong role in determining the manner in which he perceives the world.

4) Interests and Needs :

Interest : natural or acquired, permanent or temporary help in the process of perception. According to Kelly (1955), "Our perceptions come from us, not from our surroundings. The perception decides what an object is He makes it, in the light of his interests and needs". The statement is undoubtedly correct to a considerable extent in situations involving complex judgements and social evaluations.

5) Values :

Values play an important role in the perceptual process of an individual. They are part of an individual's social life. Children of poor homes, while matching sizes from memory, tend to overestimate the sizes of the coins more than do children from well-to-do homes.

2.2.5 ORGANIZATION OF THE PERCEPTUAL FIELD:

There are primitive tendencies which help us to achieve stability in a changing world. The term primitive organization refers to aspects of perception which are determined not so much by past experience as by the nature of the sense organs and the structure of the nervous system. These tendencies concern ways in which objects in the perceptual field are organized or grouped. It is impossible to prove that such perceptual tendencies are inborn. Perceptions are imposed on us by the nature of the stimuli and the way in which our sensory and neural structures are organized. Figure-ground organization is basic to perception. The essential pattern or figure of a given stimulation stands out against a background or ground. The figure and the background are relatively unchanging and, therefore, promote, a stability in the perceived environment.

2.2.5.1 Properties of Figure and Ground :

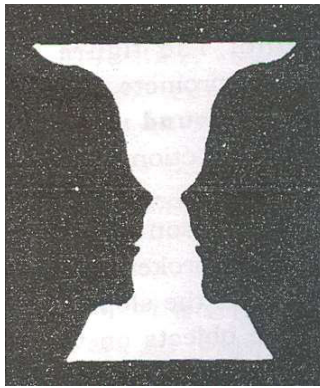
The phenomenal and functional properties of figure and ground are given below:

1. A figure stands in front of the background which seems extending behind it, in an unbroken manner. Figure-Ground are observed when we see a temple on the slope of a hill and an attractive poster against an old wall. The objects on which our perception is centred i.e. the temple, the poster, etc., are the figure and the hill and old wall form the background.
2. The figure is more organized, well-formed and better structured in comparison with the surrounding which is rather unstructured.
3. Figure shares the character of a thing while background is not only relatively intact but is also more like a substance or uniformed material.
4. Figure is always better attended to and is more likely to suggest meaning and excite deep feeling. Relative to background, figure is also better remembered.
5. Colour-detectability limen is higher in the figure sector than in the ground portion of the visual field.
6. Colour-constancy is more pronounced in case of figures, the ground being more amenable to changes in keeping with illumination differences.

2.2.5.2 Factors influencing Figure-Ground Relationship :

The factors influencing figure-ground relationship are discussed below:

1. The sharp brightness differences in the visual field have been found to be facilitative of figure-ground segregation. If a pattern is only a shade lighter or darker than its surrounding, then it can be distinguished as figure only with greater difficulty.
2. Development of figure-ground experience may also be aided by differences in colours.
3. If two surfaces are interlocked in figure-ground way, then the smaller of the two is likely to be perceived as figure. In other words, size influences the figure-ground relationship.
4. A whole continuously bounded field or a closed drawing wins the status of figure more easily in comparison to a broken, open sketch or pattern.



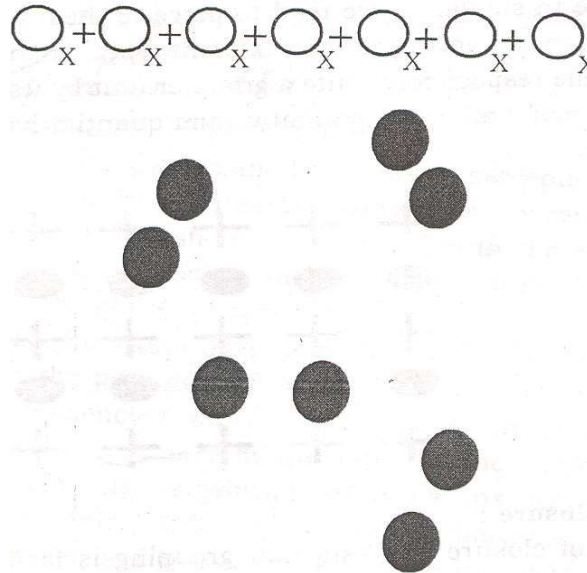
5. The longer the exposure of the stimulus field, the clear and more explicit will be the figure-ground relationship.
6. Familiarity with certain figures and past experiences factors also influence the figure-ground relationship.
7. Certain habits, perceptual sets and preferences develop over time and they predispose us.

2.2.6 LAWS OF PERCEPTION

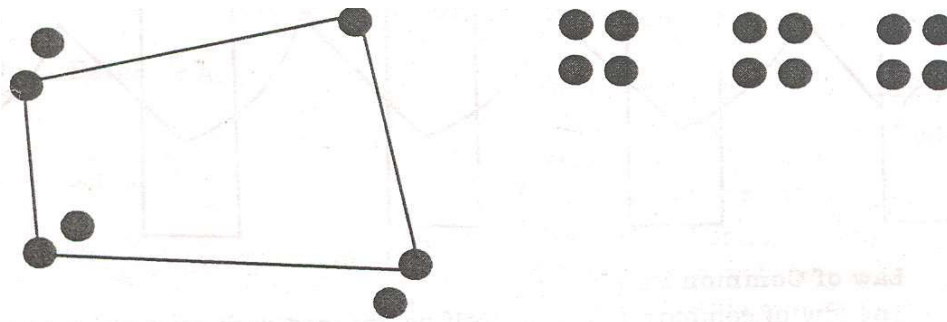
The basic principles that govern how objects are organized and perceived were formulated in the early part of twentieth century and are known as Gestalt laws. Gestalt is a German word for configuration or pattern. The contribution of Gestalt psychologists in this field is noteworthy. The fundamental principle of organization according to Gestaltists is the law of **Pragnanz**: "of several geometrically possible organizations that one will actually occur which possesses the best simplest and most stable shape. Most of the laws put forward by gestaltists can be subsumed under the law of pragnanz. They found that organisms follow certain principles in organising their perception. The laws of perceptual organization are given below:

2.2.6.1 Law of Proximity :

Things that are near to each other readily form units, tending to be grouped together. Nearness may be in space or time, we perceive all the objects together rather than separately. The following figure illustrates that figures that are in close proximity to one another are generally perceived as patterns.

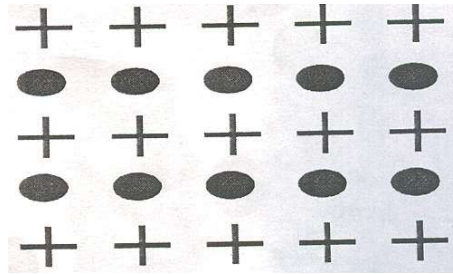
**2.2.6.2 Law of Continuity :**

Many dots forming a continuous straight line or simple curve, are perceptually grouped as one entity. Generally, we tend to perceive the items that continue a pattern to be grouped together with the preceding items setting the pattern. The figure given below as perceptually continuous. Most people do not perceive them as two separate line.

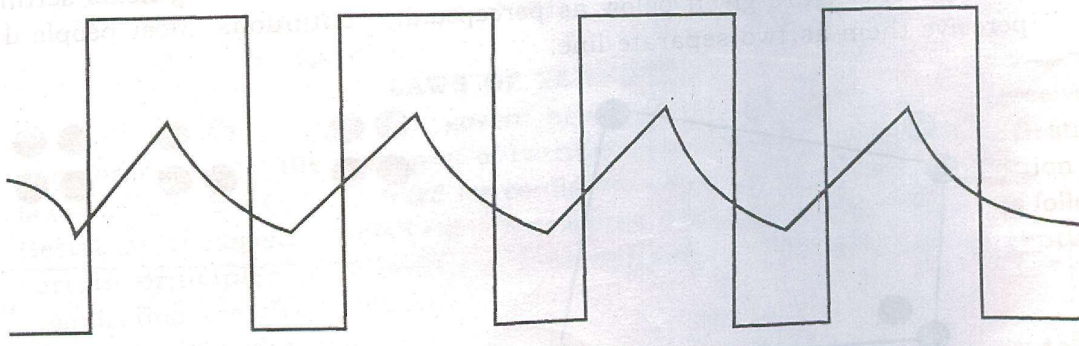


2.2.6.3. Law of Similarity :

The elements that are similar to each other are grouped together and perceived as parts of the pattern. The dots of same colour are readily seen as a group in distinction from squares of same colour which should form another group but due to similarity, we tend to perceive them as single pattern. Given a number of separate items of several different types, some of them resemble one another in some respect constitute a group or unit by itself. Things may resemble each other in many different qualitative and quantitative ways, e.g. colour, form, intensity, etc.

**2.2.6.4 Law of Closure :**

The law of closure suggests that grouping is facilitated by simple closed designs. It refers to the tendency of the individual to perceive the incomplete figures as complete ones. If there are only partial lines, then due to our closure tendency, we tend to fill up the missing lines and perceive the objects as closed or as a whole and not as separate lines. The following figure illustrates this law :

**2.2.6.5 Law of Common Fate :**

The law of common fate can itself be ground with continuity or continuity of direction. Parts which move together are perceived as constituting a united whole. For example, dots which move simultaneously in the same direction are readily perceived as a ground due to the similarity in their sameness of motion. Similarly, the planes flying a precision team are seen as a whole unit irrespective of the clouds behind them.

The Gestaltists explained their laws of perceptual organization by their doctrine of "Isomorphism". According to this doctrine, the experience of visual organisation is mirrored by a precisely corresponding process in the brain. It was assumed that there are electrical field forces in the brain which help to produce the experience of a stable perceptual organisations.

2.2.7 SUMMARY :

1. According to Woodworth and Scholoberg, perception is a psychological function which enables the organism to receive and process information on the state of an alteration in the environment. It is a very complicated process, involving many different sensory elements as well as the effects of past learning.
2. Gestalt psychologists have pointed out the external and organismic factors in the perceptual field.
3. Primitive tendencies, which are also important in perceptual stability appear to be determined by the nature of the human nervous system. They include figure-ground relationships and the principles of primitive grouping such as similarity, proximity, closure and continuity.
4. Perceptual set is a readiness to perceive in a certain manner. It is a way of interpreting stimulation which is determined largely by past experience. The influence of context is important also but it, too is dependent upon past experience. Set influences perception not only in normal awareness but also in altered states of consciousness.
5. The Gestalt psychologists have been particularly interested in figure-ground relationship and other aspects of stimulation. A figure is often distinguished from the ground by its shape or its colour.

Exercise

Q: 1. Write in short the properties of Figure and Ground in perceptual context.

Q:2. Write a note on the internal factors (organismic factors) affecting perception.

SUGGESTED READINGS/BOOKS

- | | | |
|---------------------------------------|---|---|
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PERCEPTION OF FORM**LESSON STRUCTURE**

- 2.3.0 OBJECTIVE
- 2.3.1 INTRODUCTION
- 2.3.2 PRINCIPLES OR LAWS OF ORGANIZATION
 - 2.3.2.1 LAW OF CONTOUR
 - 2.3.2.2 Law of closure
 - 2.3.2.3 Law of figure and back groun
 - 2.3.2.4. Law of grouping
- 2.3.3 Perceptual set
- 2.3.4 Summary
- Check your Progress
- References

2.3.0 OBJECTIVE

In this lesson the students will get acquainted with the concept “ **perception of form**”. This lesson focuses on how the perception of form takes place. After going through this lesson the students shall be able to answer that how do we organise the world by using certain principles and laws as proposed by Gestaltists.

2.3.1 INTRODUCTION

Form perception is what enables us to identify objects and distinguish them from each other. Rather than a loose grouping of apparently separate stimuli, we see the world as organized with interrelated objects having definite shapes and forms. And as with many other perceptual phenomena, the light projected onto the retina from objects cannot account for our visual perception of the world. It seems perceiving form involves certain organizational principles, many of which were discovered by the Gestalt school of psychology. These rules or principles illustrate our tendency to organize and group separate elements of the visual world.

Gestalt psychologists also described a number of perceptual grouping principles. They found that when we perceive various stimuli we tend to group them according to their similarity, or according to their closeness to one another. Another principle, that of good configuration, is a very general organizing tendency that incorporates a number of figural characteristics. These include a tendency toward closure or perceiving a whole figure when there are actually gaps in its contour, and

continuation in form where smooth continuous contours tend to be perceived over uneven or irregular contours.

2.3.2 PRINCIPLES OR LAWS OF ORGANIZATION

Perception of form takes place either through feature analysis i.e. perceiving form by analysing a scene into its parts or by immediately interpreting entire organized patterns (Gestalt view).

According to feature analysis we perceive a form on the basis of a relatively small collection of features, which can be combined, rotated and expanded to form the objects that we see in the world.

According to Gestaltists, we first perceive the object or the words as a unified whole and then understand the parts. Gestaltists hold the view that the perception of form takes place because of brains organising principles. This tendency of the brain to organise the world can be explained by understanding the Principles or Laws of organization. There are four laws of organization.

1. Law of contour
2. Law of closure
3. Law of figure and back ground
4. Law of grouping

2.3.2.1 CONTOUR AND CONTRAST PERCEPTION :

Contours are formed whenever a marked difference occurs in the brightness or colour of the background. Contours give shape to the objects in our visual world because they mark one object off from another or they mark an object off from the general ground. Just because contours give shape to forms does not mean that contours themselves are shapes. Fig 11.1 shows the difference between contours and shape. Although both figures are formed by the same contour, they do not have the same shape.

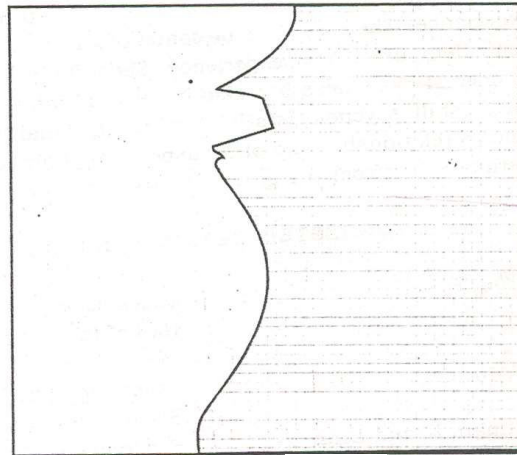


Fig. 2.3.1

BORDER CONTRAST, BRIGHTNESS CONTRAST AND HERMANN GRID :

When looking at a step pattern consisting of a series of uniform bands graded from black to white, as shown in fig.11.2 each vertical band appears to be lighter on the left than on the right side, producing a scalloping effect. This subjective contrast enhancement at the contours is called **Border Contrast**. The enhanced regions - which occur at the points of greatest change in luminance- are called Mach Bands, after the Austrian Physicist-Philosopher, Ernest Mach.

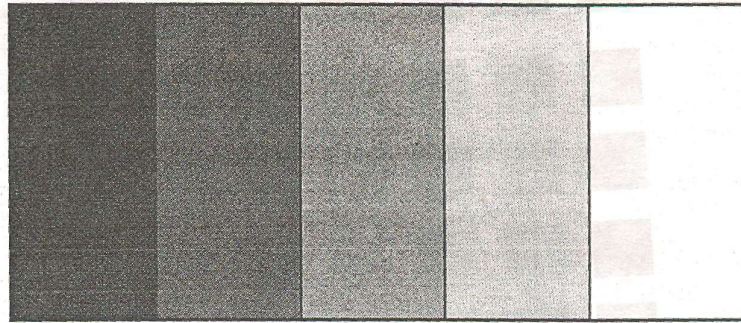


Fig. 9.2

A Step Pattern Consisting of a Series of Uniform Bands graded from Black to White:

Other spatial interaction, in which: contrasting regions are juxtaposed, produce **Brightness Contrast** effects. Fig. 11.3 illustrates this effect. The inner four grey square are identical in the intensity of light they reflect, yet their perceived brightness differs. The inner square on the far right appears to be brighter than on the far left, indicates that the brightness of a region depends on the intensity of its background.

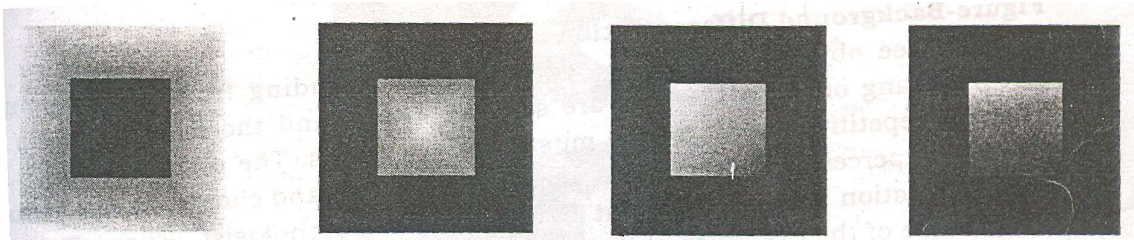


Fig. 11.3 Brightness Contrast effects. Although the physical intensities of the four inner squares are identical, they differ in brightness. That the square on the far right appears brighter than the square on the far left demonstrates that the brightness of a stimulus is affected by the intensity of its background.

Another example of contrast effects is given by **Hermann Grid** pattern (Fig. 11.4). Although the luminance of the white strips is uniform in all regions, faint grey spots are apparent at the intersection. Where there are difference of difference regions interacting with each other.

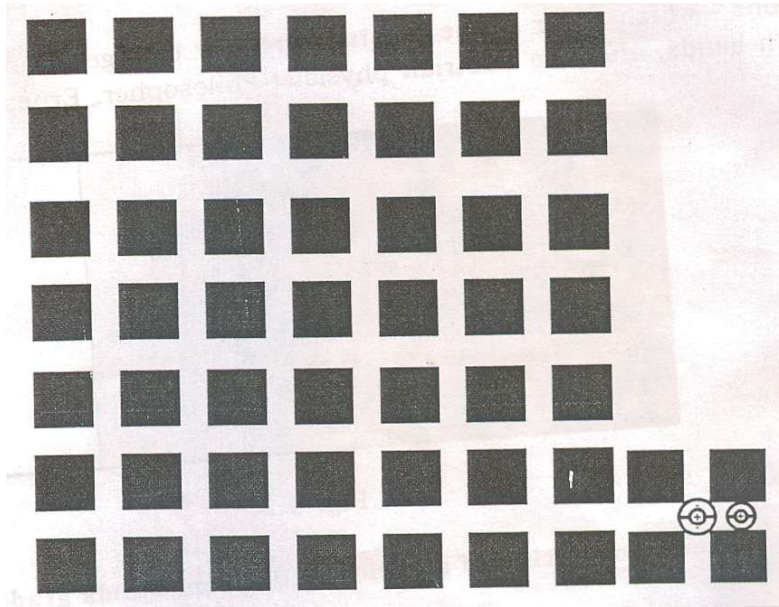


Fig. 11.4 Gray Spots appear at the intersections of the white strips. The concentric circles sketched within the four-rectangle section of the upper right insert suggest the way in which receptive fields of units with excitatory centres and inhibitory surrounds might be illuminated for two positions within the pattern. As illustrated, more of the inhibitory surround of the unit is illuminated at the intersection of the white strips than at a region located to the right of the intersection. Accordingly, there is a greater inhibitory effect or weakened brightness response from stimulation at the intersection.

Figure- Background Differentiation :

In the figure-ground rule, Gestalt psychologists found that when looking at unfamiliar scenes, familiar or consistent shapes tend to stand out as figures, and unfamiliar or undifferentiated shapes are perceived as the background. So, when looking at an abstract painting in which there are very few clearly defined forms, those forms that appear familiar, or that are repeated, will tend to be perceived as standing out from the rest of the painting which is then perceived as the background for those forms. The pictures, words and melody are perceived as the **figure**, while the wall, page and chords are the **ground**. This distinction was brought out by the Danish Psychologist, Edger Rubin in 11115. Some of the examples of the figure and

background are seen in figures 11.5, 11.6, 11.7 and 11.10. Rubin has identified the main differences between figure and ground as follows:

1. The figure has a "thing" quality and the contour appears at the edge of the figure's shape. In Contrast, the ground has a characteristic more like a "substance" and appears relatively formless.
2. The figure appears closer to the viewer and in front of the ground, whereas the ground appears less clearly localized than the figure, extending continuously behind the figure.
3. In relation to the ground, the figure appears more impressive, dominant better remembered and the figure suggests more associations of meaningful shapes than does the ground.

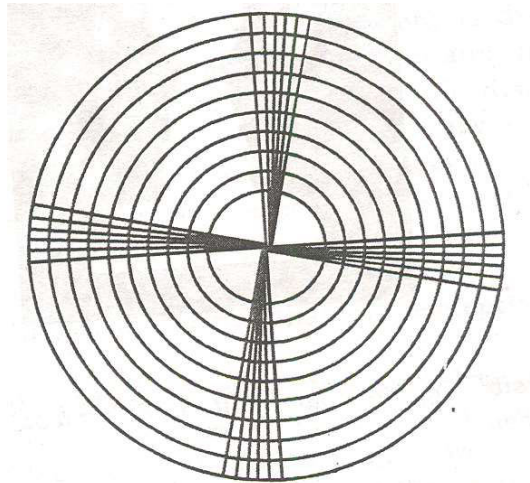


Fig. 11.5 Figures Ground Reversal. Either a radical by or concentrically marked as cross is seen.

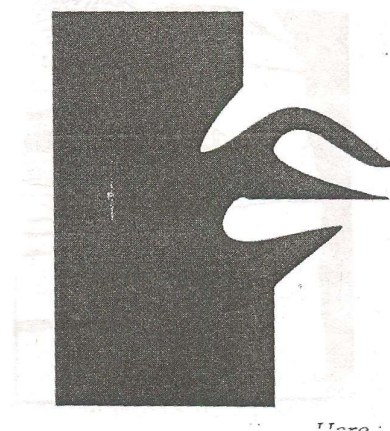


Fig. 11.6 Reversible Figures Ground Pattern. Hence the two fields has an equal chance of being the figure, though the white field, being the same in colour as the page, is more likely to be seen as ground.



Fig. 11.7 Reversible Figure-Grounds pattern. Either a goblet or a pair of silhouetted faces in profile is seen

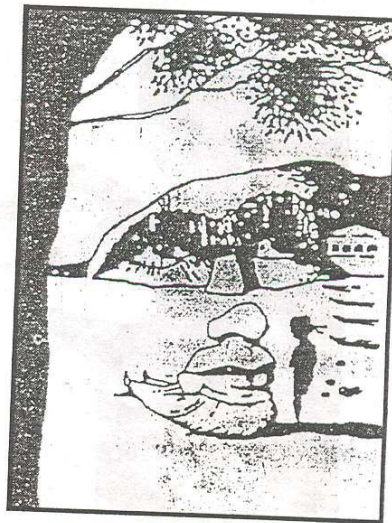


Fig. 11.10 Reversible Figures Ground pattern based on detail Salvadore Dali's painting "The Three Ages".

2.3.3 PERCEPTUAL SET :

Perception involves more than the operation of a class of mechanisms concerned with the reception of stimulation at a retina. Indeed, the optical array reflected from the environment that is, patterns of discrete stimuli composed of line, dots and various luminance discontinuities-is insufficient to account for the meaningful structured visual world we experience. The perception of many aspects of the environment is

due to not only to the biophysical character of the incoming stimulation and the appropriate sensory receptor mechanisms, but it is also due to certain dispositions and existing intensions within the perceiver. There are very specific psychological processes that play a role in organizing the incoming stimulation towards a meaningful percept. The perceiver expects to perceive or is set to perceive a particular thing. For example, if a poor man is shown in figure "2" and asked to identify the figure he would immediately say "Rs.2" This is because of his mental set or readiness, or we can say that his perception is influenced by his need.

Bruner and Minturn (1955) found that, when briefly flashed, an ambiguous figure as shown in fig. 11.11 was perceived as a "B" by subjects previously shown four different capital letters and a "13" by subjects who were "set" for a letter. They saw the broken "B" of fig 11.11 as closed, and when they were set for a number, it was seen as open.

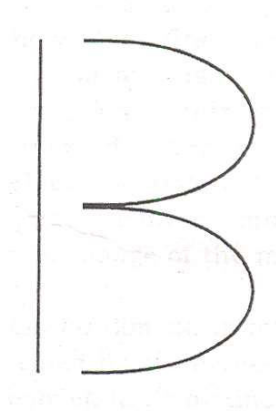


Fig. 2.3.11 The Broken "B" stimulus figure used by Bruner and Minturn (1955).

Subjects who previously saw letters or digits, first identified the test figure as the letter "B" or the number "13" respectively (in the experiment the stimulus test figure was 7 mm in height and the curved part of the figure was separated from the vertical line by a distance of 1 mm).

2.3.4 Summary

The perception of form can be said to result, in part, from characteristics of the **nervous system**, as well as **learning** and experience. Yet there is no single theory of form perception that can fully account for the ability to perceive form. Nor is there a general principle that can put together the many different types of form perception

EXERCISE

Q:1 Write short notes on the following

- (a) Law of contour
- (b) Law of closure
- (c) Law of figure and background
- (d) Perceptual set

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LESSON NO. 2.4

PERCEPTION OF SPACE AND DEPTH

LESSON STRUCTURE

2.4.0 OBJECTIVE

2.4.1 INTRODUCTION

2.4.2 PRINCIPLES OF SPACE PERCEPTION

2.4.3 VISUAL SPACE PERCEPTION

2.4.3.1 VISUAL PERCEPTION OF THE THIRD DIMENSION

2.4.3.2 VISUAL PERCEPTION OF SIZE

2.4.3.3 Perceived Size and Surrounding Objects

2.4.4 CUES OF SPACE PERCEPTION

2.4.4.1 MONOCULAR CUES

12.4.1.1 SIZE OF THE IMAGE

12.4.1.2 INTERPOSITION

12.4.1.3 AERIAL PERSPECTIVE

12.4.1.4 LINEAR PERSPECTIVE

12.4.1.5 LIGHT AND SHADOW

12.4.1.6 MOVEMENT CUES

12.4.1.7 FIXATION

12.4.1.10 GRADIENTS

12.4.1.11 ACCOMODATION OR FOCUSING

12.4.2 BINOCULAR CUES

12.4.2.1 CONVERGENCE

12.4.2.2 RETINAL DISPARITY

12.5 SUMMARY

EXERCISE

REFERANCES

12.0 OBJECTIVE

This lesson explains the concept of space perception. After reading this lesson the students will be able to answer:

The principles of space perception

The phenomenon of perceiving the objects as tridimensional

Function of monocular and binocular cues in space perception

12.1 INTRODUCTION

All perceptual processes begin with a stimulus, and sensory systems respond to many types of stimuli. For example, you can stimulate the visual system by applying pressure at an eye. However, the appropriate stimulus for vision is light which give the perception of objects. The objects may be short, long wide or thin, but in addition they may be located to the right, left, behind, above around other objects in the field. Distance between two objects is just as real as the distance on the surface of an object. Space is a dimension of experience, a characteristic about which we have to ask the questions-how far? What direction? Where does it start or stop?

Space does not belong to one sense alone. It is common to several senses. Distance felt on the skin is related to the distance through which you feel your finger moving, and the size you see with your eyes. The space perceived is the joint creation of several senses, and is richer for contribution of each.

The dimensions of perceived space must be chosen with reference to the problems to be studied. The real world of objects is fitted into three dimensions: up-down, north-south, east-west, or else some other system of three co-ordinates. The world of visual perception similarly has three dimensions: up-down, right-left and near-far. Perceived up and down may approximate the geographical vertical or it may differ from it. Near-far is not perceived so precisely as up-down and right-left, its mechanism is more complex, its correspondence with reality is not so sure.

In the field of auditory space perception, the primary dimension is right-left, determined by the spatial relation of the two ears. Direction up and down is less accurately perceived, and near-far is so uncertain is heard space as sometimes not to figure at all in the localization of sound.

Because there is a fair degree of correspondence between the geometry of physical space and the dimensions of visually perceived space, it is tempting to believe that there is some necessary relationship between them. When you look at the stars, for example, you see them all roughly the same distance away. Actually, one star may be thousands of times as far away as another which look to you equally distant. On the other hand, you may perceive depth where there is none. Two flat photographs when viewed properly in a stereoscope produce an impression of depth which cannot be overcome. There is no escape from the conclusion that perceived space, like other perceived qualities, is something which exists within each of us.

We are now in position to understand how an individual perceives the location of objects in space. First, there must be a reference point which may be body. In terms of this system, objects are localized with the aid of the spatial aspects of vision and touch, movement is an important element in both. But once a number of objects are localized, the system of co-ordinates is externalized into "objective " space. Then, we complete the circle; the body is also localized in this objective space, and we say it is oriented in space.

12.2 Principles of Space Perception :

How can we account for perceived space? What takes place in the eye, in the brain, in order that the perceiving organism can usually respond so neatly to actual places and things? The answer of these questions is given by the following principles :

1. The organism must have sense organs which are able to respond to the appropriate physical stimulus that is received from the object. The eye must be sensitive to light, the skin to contact, the ear to sound.
2. Each of these sense organs must be able to give a different response when a different space is occupied by the stimulus object. Thus , the eye must respond differently to a large object than it does to small one; the ear must act differently when a sound come from the right or from the left. Patterns of stimulation are set up in the sense organs which corresponds to some degree with the properties of the world we are perceiving.
3. The brain and the nerve pathways leading from the sense organs to the brain must be constructed so that the information from the sense organs is properly transmitted and registered in the brain.
4. Once the information received by the sense organs has been relayed to the brain, the brain takes charge of the job of interpreting this material. Each item must be located with reference to other items being perceived at that movement or to points supplied by memory. Each item must be located with respect to a total frame of reference.
5. Perceived space depends on the joint contribution of several senses to a much greater than we ordinarily realize. Many of the good things which seem to be so natural and fundamental about pace actually take form only when what we see brought into line with what we hear, and with our feelings of movement.

12.3 Visual space Perception :

The human organism like three dimensional space, orients itself in it, reacts to stimulus objects in it, and is fully aware of it in all its tridimensionality. It has equipment for perceiving space, equipment with which heredity provides it-eyes with retinas on which a two-dimensional image of the visual field can be focused, eyes which can do the focusing, which can comouflage more or less toward each other, which being separate, get dissimilar views of the world, which move in the head, thus changed the visual field. It has a head to hold the eyes and to move them around. It has also mobile arms and hand to explore the immediate universe, and to respond within this universe to visual stimulation as well as a mobile body to explore the remote world and to make more responses to stimulation. The organism uses this equipment during its early lifetime to build up its knowledge and awareness of tridimensional space, to learn how to react with discrimination to objects in a three way visual field. The retinas could not do this job alone . They depend on movements

of the body and limbs to give spatial meaning to the core of the visual perception, a core which in itself consists only of a bidimensional pattern of colours.

12.3.1 Visual Perception of the Third Dimension :

You can think of the perceiving organism as instantly knowing how to build up its picture of the stimulus world from clues which the senses furnish it. The organism is an instantaneous detective in these perceptual matter. It does not reason its perception out and sometimes it makes errors. A standard habitual error we call an illusion. Nevertheless, the organism does well with its clues. It has to have some basis for discriminative reaction end for accurate knowledge.

The stimulation clues for up-down and right-left perception lie, obviously, in the stimulation pattern itself. The clues to adequate knowledge of the third dimension are less direct. some of them from eye movements and some from the disparity of images in the two eyes due to their spatial separation, but the simplest are the clues implicit in the pattern of the projected retina image, the clues to depth and solidarity that you can with one eye or in a photograph.

12.3.2 Visual Perception of Size :

The most obvious determinant of visually perceived size is, of course the size of the retinal image, which stands in a fixed relation to the size and distance of the object. To maintain a constant visual angles, and this constant size of retinal image, the size (width, diameter) of objects must vary directly as the distance of objects from the eyes. With an object of constant size. The size of visual angle varies inversely as the distance of object. Thus from the knowledge of the physical size of an object and of its distance from the eye, we can calculate the approximate size of the image which is produced on the retina and on the basis of this rule, we can predict how large the object ought to look at any given distance of its size were determined solely by visual angle.

12.3.3 Perceived Size and Surrounding Objects :

The relationship between size and distance is one of many instances in which the specific perception of things is determined by their situation. If an object appears at a great distance, its size corresponds approximately to that distance.

This principle holds also for bidimensional situations. In the following figure, the line AX in fig. I appears longer than the line AY, the former is apprehended as the diagonal of a large and the latter as the diagonal of a smaller prallelogram.

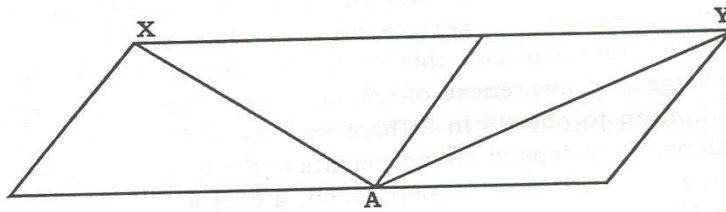
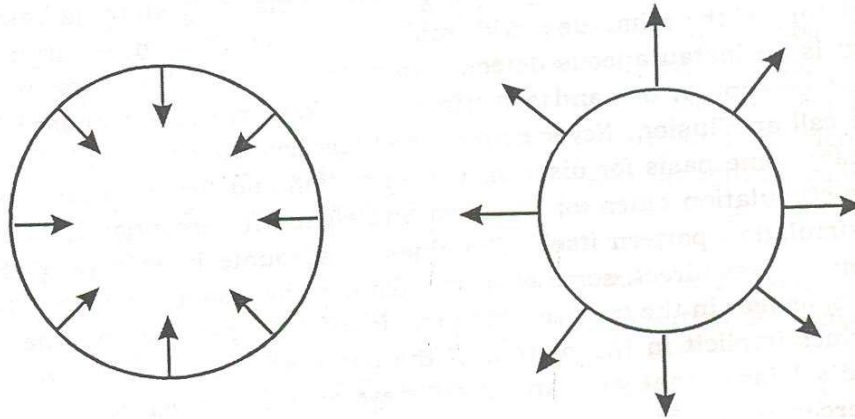


Fig. 1: Influence of linear figure taken as a whole upon the size of one of its parts.



Similarly in Fig.2, the difference in size between the two circles must be referred to the influence of the included and excluded line. In the familiar arrowhead illusion (Fig.3) the line C appear than because it is a part of the larger area suggested by the direction of the arrowheads.

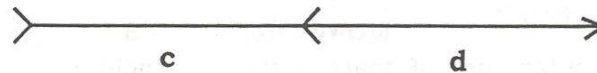


Fig. 3: Effect of a Total Figure upon an Isolated Linear Distance.



Fig. 4

Similarly, in Fig.4, it is almost impossible to see the distance between the outer limits of circles A and B as equal to the distance between the right extreme of B and the left

extreme of C. The perception of the circles as objects constraints us to perceive the distance as between circle and circle rather than as between point to point.

Within limits, even such factors as whiteness may function as determinants of size. If two equal squares, one black and one white are placed side by side against a grey ground, the white will usually appear larger than the black. Differences in two may also have an effect on apparent size. To most people, a red object will appear slightly larger and nearer than an equally bright blue object and in some pathological cases, such differences become pronounced. The apparent distance of colour is sometimes used by artists on obtaining depth in their pictures.

Apparent shape and direction of lines are similarly modified by surrounding objects that set up implicit perceptual attitudes. Because of the tendency to perceive all objects as tridimensional, lines in a drawing that cross each other at oblique angles are taken implicitly to represent right angles extending into space. For example, a vertical line with sensual oblique cross lines is perceived as if set at an angle at the frontal plane like a telegraph pole with cross arms. Similarly, all acute angles tend to be over estimated and all obtuse angles tend to be under estimated, making them approach right angles. Even in drawing to which perspective perception does not apply, distortion in direction of the line takes place. Many of the so-called visual illusions are of this sort.

12.4 CUES OF SPACE PERCEPTION

A distinction is made between **Monocular** and **Binocular Cues** of space perception. Monocular cues are those which can operate even with one eye and binocular cues are those which can operate with both the eyes.

12.4.1 MONOCULAR CUES

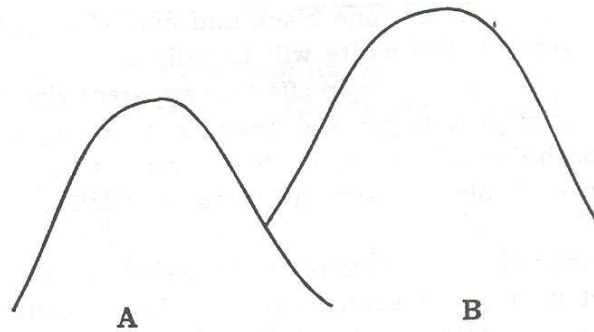
The monocular cues of space perception include:

12.4.1.1. Size of the Image:

The retinal image is larger for the near by objects than the distant ones. Bigger objects are seen to be nearer than the smaller ones. But we must be acquainted with the actual size of the object. Clouds, for example, might be of almost any size. Hence , it is difficult to know whether we are seeing a large cloud high up or a small cloud near the earth. Similarly, when we fly a kite, it appears smaller and smaller as it soars higher and higher in the sky

12.4.1.2. Interposition :

When one object partially obscures another object, the partially obscured object is judged to be more distant. The essential cue is related to the contour lines of the overlapping objects (Ratoosh,111411). For e.g., the object whose outline is continuous looks nearer than the object whole line is lost at the point of overlapping as in the case of hills. In the figure, A is perceived nearer than B.

**12.4.1.3. Aerial Perspective or Clearness :**

When we do not know the actual distance of objects, an important cue is provided by the clearness of perceived detail. If the outlines of an object are clear and distinct, it appears to be near. But if the outlines are vague and hazy, it appears to be distant. But if the atmosphere is foggy, even a near object appears to be faint and indistinct. For e.g., a mountain, building or any other object which stands out from its surroundings seems closer on a clear day than on a foggy one.

12.4.1.4. Linear Perspective :

The decrease in size and in the separation of objects as they become more distant is known as linear perspective. For e.g. if you stand in the middle of the railway track and look ahead, the track seems to be getting closer and closer to each other as the distance increases.

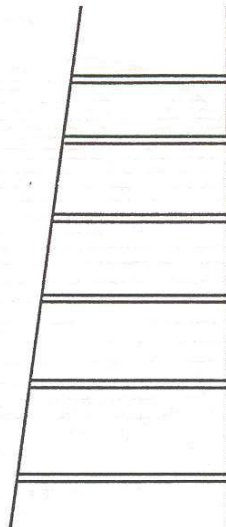


Figure: Railway Track

12.4.1.5. Light and Shadow :

The relation between light and shade on a surface also helps us to know the third dimension. The only thing required is that the source or distinction of light should be directly indicated. The lighted portion of a picture appears nearer and the shaded portion appear further. If a picture is lighted and shaded properly, we actually see the objects at different distances.

12.4.1.6. Movement Cues :

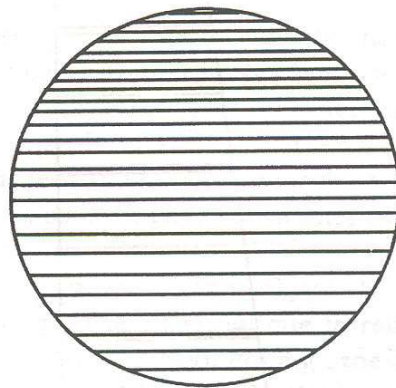
The relative movement of the object is sometimes important in judging distance. Other things being equal, the object which seems to move by us rapidly is judged to be closer than that which moves by slowly. For e.g. if the perceiver is in the bus, the objects like the trees, houses seem to move in the opposite direction and the distant objects seem to be moving in the same direction. The nearer, the object, the more rapid its backward movement and the more distant the object, the more rapid is its forward movement.

12.4.1.7. Fixation :

Objects-tend to be nearer which are fixated or which come into our field of focusing; than the objects which lie outside the field of focussing

12.4.1.8. Gradients :

GIBSON has pointed out the importance of surface like the floor or the ground on which we walk, fly or drive. Gradiance is a cue similar to linear perspective. A gradient is a continuous change in something; a change without abrupt change. If there is a regular marking on the floor or the surface in front of us, the marking seems to be getting closer to each other as the distance from the perceiver increases.



Observer

12.4.1.9. Accommodation or Focusing :

Accommodation or Focusing is the process of the adjustment of the lens of each eye to different distances of objects. In focussing, an object, the lens in each eye must accommodate its focus to produce the clear image of the object on the retina., This

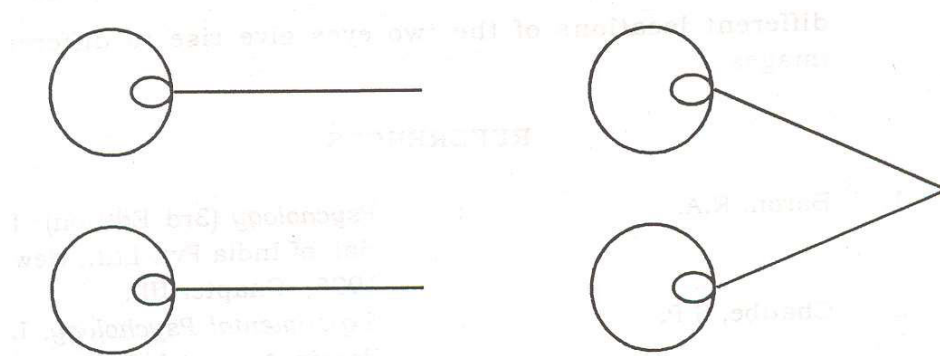
accommodation is accomplished by the ciliary muscles whose contraction and relaxation provides the cues for depth or distance. One can experiment on this by keeping the pencil in front of the eyes. As the distance between the eye and the pencil decreases, the strain increases showing that contraction of ciliary muscles has taken place. Thus the ciliary muscles allow the lens to contract or relax depending upon the distance of the objects from the perceiver to obtain a clear picture. This cue is operative only for a distance upto 20 feet . For greater distance, further accommodation of the lens of the eye is inappreciable.

12.4.2 BINOCULAR CUES

The binocular cues for space perception are as follows:

12.4.2.1 Convergence:

When the two eyes look at a distant object, their lines of vision are parallel and the muscles that move them relatively relaxed when the object comes nearer in front of the observer, his eyes must be pulled out from their parallel position so that the lines of vision converge and intersect. It mean, our eyes converge more when we fixate a near by object than the distant ones. Convergence of the eyes provide a cue for distance.



12.4.2.2. Retinal Disparity :

The fact that the eyes are set $2\frac{1}{2}$ inches apart means that the two retinal pictures of an object are never identical. The two eyes seeing the scene (or object) from different positions get some what different views. This difference in the geometry of seeing is called **BINOCULAR PARALLAX** and the resultant difference in the two retinal image is called **RETINAL DISPARITY**. In looking at an object, the right eye sees around the right side a little more than does the left eye. The left eye sees a bit further around to the left. The two image being different, we would expect double image to be seen. In actual fact, we do not see double images. The fusion of the different retinal image produces the depth effect. Retinal disparity is one of the most important determinants of perceived depth.

In sum, it can be said that both monocular and binocular cues become operative in perception of space or depth.

12.5 SUMMARY

1. Perceiving or otherwise reacting to the size, distance, or depth aspects of the environment is called space perception.
2. Perception of space is achieved through visual clues which are correlated with aspects of the external world. Space perception, rather than being only visual or only auditory, is an intersensory affair.
3. Monocular clues depends upon characteristics of the visual image. Among the monocular clues for depth are retina size, interposition, liner perspective, relative movement and accommodations of the lens.
4. Binocular clues are: convergence which is of doubtful value except at close distances, and retinal disparity, which occurs because the different locations of the two eyes give rise to different retinal images.

EXERCISE

Q. Explain the principles of Space perception.

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Questions for Practice

- Q 1. Attempt any two questions from this section**
1. What is Perception? Explain the process of perception.
 2. Discuss various laws and principles of perception.
 3. Explain the role of figure and ground in perception.
 4. Write a detailed note on monocular and binocular cues of perception.
- Q 2. This section is compulsory.**
Write Short notes on:
- (a) Law of closure
 - (b) Law of Common Fate
 - (c) Mental Set
 - (d) Illusion

Thinking :

It is a mental activity that goes in brain when a person attempts to understand and communicate information. Mental images are tools used in thought process. During most of our waking hours we are thinking. Thinking involves deep manipulation of the information, when we form concepts, engage in problem solving, reasoning and decision making. It is a higher cognitive process.

Definitions

“Thinking consists of the cognitive rearrangement a manipulation of both information from the environment and symbols stored in LTM”.

(Morgan and King)

“Thinking is mental exploration for finding out the solution of a problem.”

(Woodworth)

Characteristics of Thinking

1. Thinking is a covert and invisible process. It involves manipulation of information in symbolic form.
2. Thinking involves past experiences and knowledge. This knowledge is combined into new symbols, images, patterns and combinations.
3. Thinking is determined by behavior. This means thinking can be observed from the way one behaves.
4. Thinking involves imagination, problem solving, memory, perception, reasoning etc.
5. Thinking involves mental exploration instead of motor exploration.

Tools of Thinking

1. **Images :** Thinking involves mental imagery for manipulation of information. In thinking images are manipulated instead of actual objects.
2. **Concept :** Concept is an important tool for thinking. Concepts are ideas that represent a class or category of objects, events or activities. For eg. One can think about fruit without thinking about every kind of fruit available in the world.
3. **Symbols and signs :** Thinking also involves use of symbols and signs. A symbol is a concrete particular item in thinking that stands for something in general.
4. **Language :** Language is the best medium of thinking. It serves to communicate ideas from one person to another. It is the system of symbols which makes thinking efficient. Men think in form of words.

Concept Formation

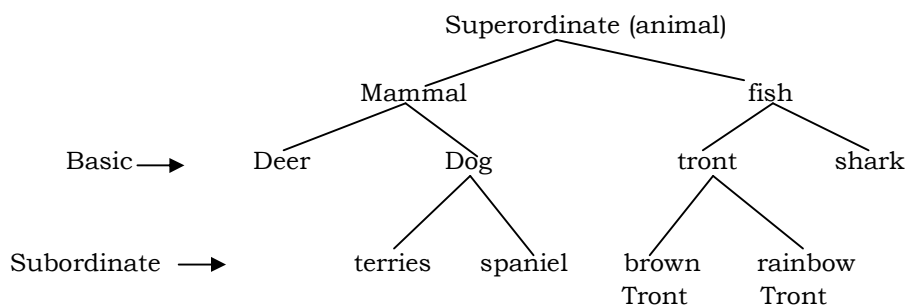
A concept is the generalized meaning that is attached to an object. It is the result of perceptual experience. These are the ideas that represent a class or category of objects, events or activities. For eg. Chair, table, sofa, bed etc. all forms one concept

of furniture. Concepts not only contain the important features of the objects but also allow the identification of new objects that may fit the concept.

Categories or Prototyper

Concepts are formed for categories of objects. It helps in responding to new object. Most concepts cannot be strictly defined but can be organized around the best category or prototype. Objects fall into many different categories. Concepts are closely related to our knowledge of the world and it is easy to learn those concepts that are consistent to our knowledge.

Hierarchy of categories



Caterories of very general form such as animal called a superordinate. The concept dog and deer are more specific kind of concept representing imperordinate category falls at basic level. At the lowest level is the subordinate category for eg. Type of dog i.e. pug, pitbull, terries etc. are the most specific example.

Prototype

Prototype refers to a concept that closely matches the defining characteristics of a concept. Prototyper develop according to the exposure a person has with objects in that category. Someone who grew up in an area where there are many coconut trees might think of coconut as more prototypical example of fruit than mangoes. What a person knows about a particular type of object does affect the person's prototype for the category.

Problem Solving

Problem can be defined as an adverse event. Everyday we caught hundred of problems. Problems range from figuring out how to cut a recipe in half to understanding complex mathematical puzzles. There are several different ways of solving problems.

Approaches to problem solving

Some of the approaches are Trial and error, Algorithms and Heuristics.

Trial and error

One method to solve problem is trial and error. It refers to trying one solution after another until finding one that works. For eg. Trying to enter forgot password one after another until the correct one feeds.

Algorithms

Algorithms are specific step by step procedure for solving certain type of problems. Mathematical problems are solved with the help of algorithms.

Heuristics

A heuristic is a simple rule that is intended to apply to many situations. A heuristic is an educated guess based on prior experiences that helps narrow down possible solutions for a problem. This rule is also known as “rule of thumb”.