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SENSORY PROCESSES: ATTENTION AND PERCEPTION

The purpose of describing sensory receptors, attention and perception is to familiarize you with the way our sense organs collect information and how it is processed by our brain. We have five sense organs through which we acquire information. These include eye, ear, skin, nose and tongue. We have mainly two functions of our senses: survival and sensuality. If we could not see any colors or the beauty of flowers or the pictures on our television or the traffic lights, our life would become dull and risky. Colors do not really exist “out there” in objects rather our world of colour is a product of sensory and perceptual processes of brain. We derive sensual pleasure in breathing fresh air enjoying tasty food, good music or feeling relaxed by gently touching a cat or dog. Our senses do more than just making contact with our external world. They add to happiness, variety and satisfaction in life. Sensation is a process by which neutral impulses are created by stimulation of sensory neurons that results in awareness of conditions inside or outside the body. Perception refers to the elaboration and interpretation of these sensory experiences. It is governed with our past and present experiences. With the help of this lesson you will learn how we derive a world of reality from the information that we receive from our sense organs.



OBJECTIVES

After studying this lesson, you will be able to:

- understand various senses and the sense organs;
- know the qualities that are common to all senses;
- understand the factors in attention; and
- identify some other senses beyond these five senses.



5.1 SENSATION

Sensation can be explained as the process by which one form of energy is converted into another form. For example light is converted into neural impulses by which we code sensory events in our system that can be processed by our brain. The sensory systems process information reaching to the brain. The motor systems process information going out of the brain to muscles and glands. Sometimes your parents switch on the T.V. and adjust the volume of sound that they can hear. Suppose you adjust it to a volume which you are able to detect but your mother says that she is unable to hear and asks you to increase the volume. If your mother asks you to stop after some point that means that difference of adjustment has been noticed by your mother. This minimal amount of change of volume between two stimuli that is being recognized by your mother is called a “difference threshold”. Background of a stimulus also affects our sensation. For example stars are present in the sky in day time and at night but are visible only after sunset or at nighttime because they can not be detected due to intense background of the daylight sun.

We all are also guided by factors of expectations and experiences. Experience of sensation is not simply a yes/no, present/absent mechanism. For example you are expecting a very close friend of yours to visit your home at 4 p.m. At 4 p.m. that friend reaches your house and pushes the doorbell button. Other members of your house do not notice it but you are able to notice that sound. It is primarily because of your expectation that you notice this second clearly while others do not notice it. The minimum amount of physical energy needed to produce a sensory experience is called “absolute threshold”.

We have several sense organs. The table below describes them

Table 5.1: Fundamental human senses

Sense	Stimulus	Sense organ	Sensation
sight	light waves	eye	colors, patterns, textures
hearing	sound waves	ear	noise, tones, music
skin sensations	external touch	skin	touch, cold, warmth, pain
smell	volatile materials	nose	odors
taste	soluble materials	tongue	sweet, salty, bitter

Let us look briefly at each of the senses.

- **Vision:** Vision is extremely important for all of us. Humans and animals with good vision have advantage in each and everything in life. We experience vision with the help of our eyes which function like a camera. The eye gathers and focuses light like a camera. Sir Isaac Newton, who in the seventeenth century discovered the laws of



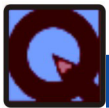
motion and gravity, also discovered that when white light passes through a prism it separates into a rainbow of color – the visible spectrum.

- **Color blindness:** Not everyone sees colors in the same way. Some people are born with a color deficiency. Color blindness is the partial or total inability to distinguish colors. Most color blind people have trouble in distinguishing red from green.
- **Hearing:** Hearing is equally important for our daily life. It is a principal sensory modality for human communication. Sounds are created when actions cause objects to vibrate. When vibrating objects push the molecules of medium back and forth we can experience sound. Frequency refers to the number of cycles a wave completes in a given amount of time. It is usually expressed in cycles per second (CPS) or hertz (Hz). Sound cannot travel in a true vacuum (such as outer-space) because there is no medium there to move or vibrate.
- **Pitch :** Pitch is the highness or lowness of a sound determined by the sound's frequency. High frequencies produce high pitch and low frequencies produce low pitch.
- **Loudness:** The loudness or physical intensity of a sound is determined by its amplitude. Sound waves with large amplitudes are experienced as loud and those with small amplitudes as soft. Loudness of sound is measured in units called decibels (dB).
- **Timbre:** The quality of a sound wave's complexity is its timbre. The sounds that we call noise contain many frequencies that are not systematically related to each other.
- **Sense of bodily orientation (vestibular sense)**
It is the sense of bodily orientation with respect to gravity, especially how our heads are positioned, whether straight leaning, reclining or upside down. The vestibular sense also tells us when we are moving or how our motion is changing.
- **Sense of bodily position and the movement of body parts (Kinesthetic sense)**
Kinesthetic sense is the sense of body position and the movement of body parts relative to each other. It is a sense that provides sensory feedback about motor activities of our body, for example how the hand moves to pick up the telephone when it rings.
- **Sense of smell (olfaction)**
The sense of smell involves a sequence of bio-chemical activities that triggers neural impulses. Once activated these neural impulses convey odor information to the brain.
- **Sense of taste (gustation)**
The taste receptor cells are gathered in the taste buds on the upper side of the tongue. The experience of sweetness or saltiness is affected by these taste buds. There are only four true or primary taste qualities: sweet, sour, bitter and saline. Taste sensitivity develops in infancy but decreases in old age. Taste receptors can be damaged by

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excessive use of alcohol, smoking, acids or hot foods but they are also replaced every few days and a permanent loss of taste is extremely rare.

- **Skin senses:** Our skin contains nerve endings that are stimulated by contact with external objects and it produces sensations of cold, warmth or pressure. The sensitivity to pressure is maximum on face, tongue and hands and it is less on our backs. Touch plays an important role in human relations and emotions.
- **Sense of pain:** Pain is the body's response to stimulation from noxious stimuli. Acute pain is reaction to sharp or sudden stimulation. The pain one feels in everyday life is also related to psycho-social and cultural habits. What "pain" a person experiences depend upon the meaning one attaches to pain and also on attention one receives from near and dear ones.



INTEXT QUESTIONS 5.1

1. Discuss the role of vision and hearing in our lives.

2. Briefly explain the concept of 'threshold'.

5.2 PERCEPTION

In the last section we dealt with sensation, the process of bringing information into the brain. This section is about perception, or how we use sensations into meaningful patterns. As we encounter a variety of events in our daily lives, the brain actively selects, organizes and integrates sensory information to create a picture of the world. Some of our perceptions are native or inborn and many other perceptions are a result of our past experiences.

Sensation is the stage where neural activity codes the information about nature of stimulation. Perception is the next stage in which an internal representation of an object is formed. This representation provides a working description of perceiver's external environment. Perception involves synthesis of simple sensory features into percept of an object that can be recognized.

This helps in identification and recognition, and meaning is assigned to the percepts. Perception and recognition are combined processes that do not act separately. For example a circular object may be a cricket ball or orange.

Stages of perception: The physical object in the world is called the distal stimulus (distant from the observer) and the optical image on the retina is called the proximal stimulus

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(proximate or near to observer). The major task of perception is to determine the distal stimulus based on information of proximal stimulus – to know what the world out there is “really like” using one’s imagination of mind.

There is more to perceiving which includes physical properties such as shape or size and past experiences.

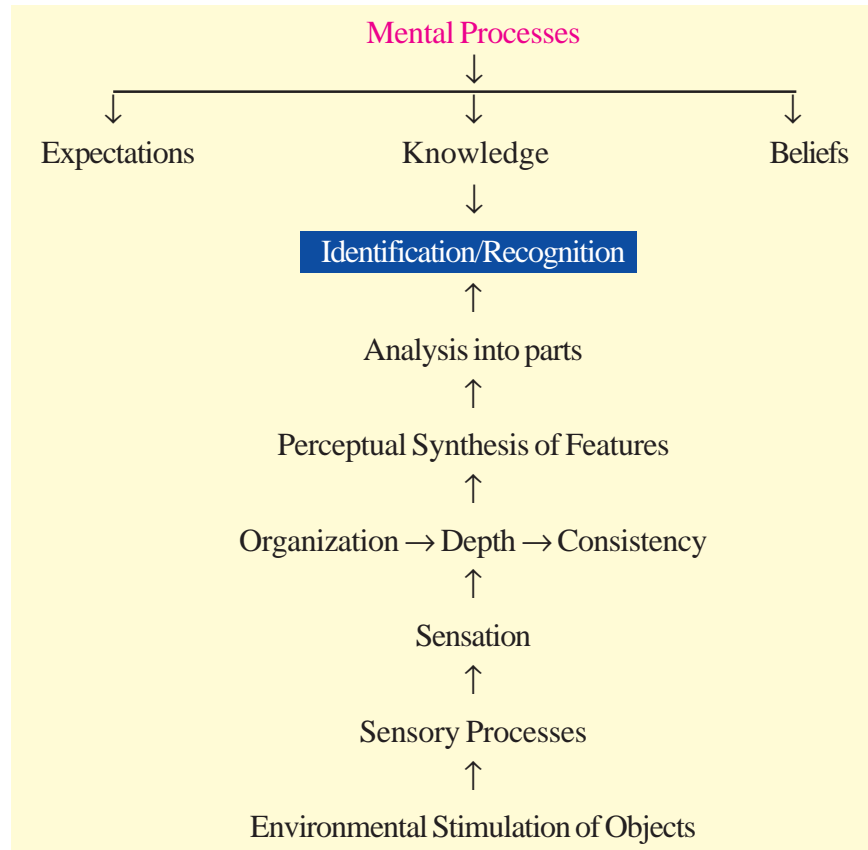
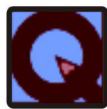


Fig. 5.1: *The Process of Perception*



INTEXT QUESTIONS 5.2

1. Explain the concept of perception.

2. Describe the process of perception.

5.3 PERCEPTUAL ORGANIZATION

Perception is an organized process. The most common form of perceptual organization is called figure ground organization in which sensations are grouped into objects or figures



that stand out on a plainer background. Look at Figure 5.2. Do you see a nose or two faces?

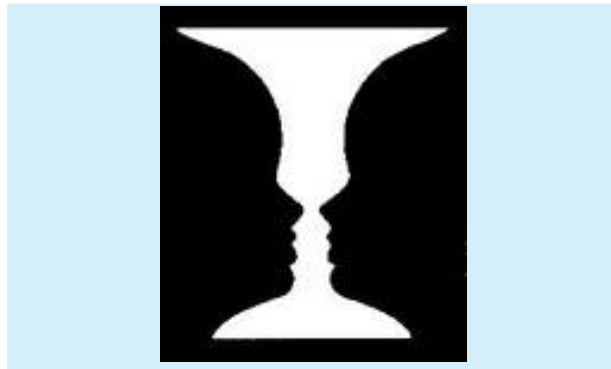


Fig. 5.2: Reversible Figure and Ground Organisation

Reversible goblet is a favourite demonstration of a figure-ground reversal. Note that either the light portion or the dark portion can be perceived as a figure against a background.

A. Laws of Perceptual Grouping

The factors which determine perceptual grouping are:-

- (a) **Proximity:** All other factors being equal, stimuli that are near one another tend to be grouped together. For example, if four stand near one another and a fifth 10 feet away, the adjacent four will be seen as a group and the distant fifth as an outsider. Events that are close in time and space are also perceived together.
- (b) **Similarity:** Stimuli that are similar in size, shape or color tend to be grouped together.
- (c) **Continuity:** Perception tends toward simplicity and continuity. Even if there are dots in a circular fashion, the person will see them as a complete circle.
- (d) **Closure:** It is the tendency to complete a figure that is incomplete but has a consistent overall form.
- (e) **Common region:** Stimuli that are found within a common area tend to be seen as a group.

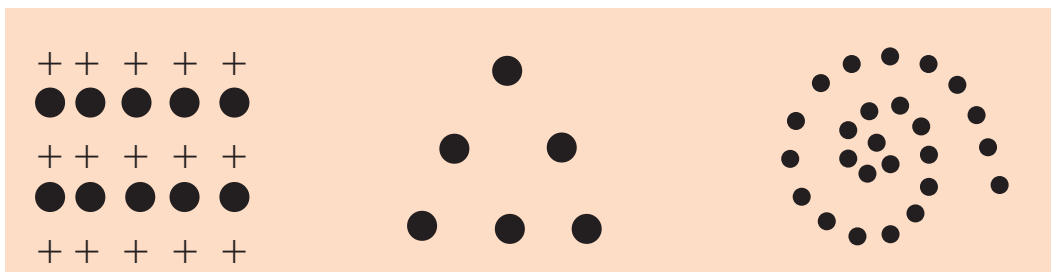


Fig. 5.3: Laws of Perceptual Grouping



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B. Perceptual Constancy

Perception of an object's shape, size or brightness remains the same even though its image on the retina has changed. This is called perceptual constancy and is found in all senses, though most examples given here are of vision.

If the perceived size of an object remains the same, even though the size of its image on the retina changes it is called size constancy.

In shape constancy the shape of an object remains stable even though the shape of its retina image changes.

Brightness constancy refers to the fact that the brightness of objects appears to stay the same as lighting conditions change.

C. Depth Perception

It is the ability to see three-dimensional space and to accurately judge distances. Without depth perception you can't ride on a motorcycle, or drive a car, catch a ball, thread a needle or simply walk around a room. The world would look like a flat surface. The ability of depth perception is partly innate and partly learned.

Depth cues are features of environment and messages from the body that supply information about distance and space. The cues which work with just one eye are called monocular cues and those which require two eyes are called binocular cues. Binocular cues are the most basic source of depth perception that is caused due to retina disparity (a discrepancy in the images that reach the right and left eyes). A person with one eye will have very limited depth perception.

Pictorial cues for depth are features found in paintings, drawings and photographs that impart information about space, depth and distance. This influence causes apparent perception of things which are not there. For example, if you stand between two railway tracks, they appear to meet at the horizon, even though they actually remain parallel.

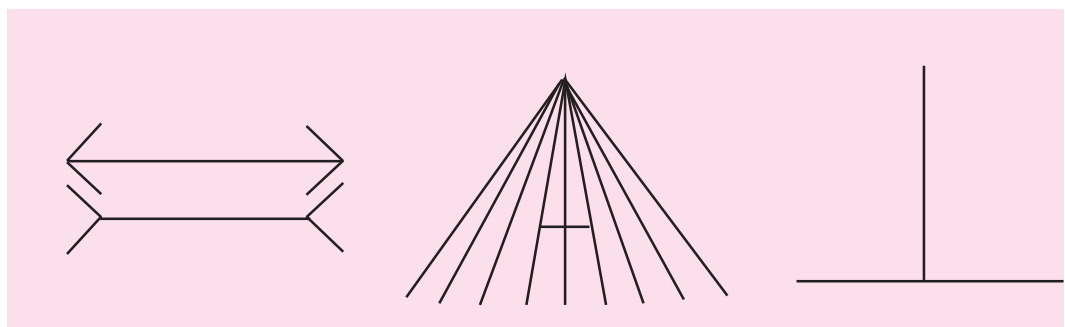


Figure 5.4: Three powerful illusions. In drawing A, known as the Muller-Lyer illusion, the bottom line looks longer than the top line. Actually, they are equal in length. In drawing B, the Ponzo illusion, the top horizontal line looks longer; again, both lines are equal. In drawing C, known as the horizontal-vertical illusion, the vertical line looks longer, check with a ruler to see that it's not!

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Illusions are distorted perception of stimuli that exist, whereas hallucination is perception of objects or events that have no external reality. An example of illusion is the Muller-Lyer illusion in which horizontal line with outgoing arrow-heads appears shorter than the line with inward arrows.



INTEXT QUESTIONS 5.3

1. Describe various determinants of perceptual organization.

2. What do you understand by the term perceptual constancy?

3. Discuss depth perception with help of an example.

5.4 ATTENTION

Attention: Have you ever noticed that while doing both, driving and talking on your mobile you may not pay attention to driving. Or when you are studying and loud music is on in the neighbourhood you lose attention on your studies. ‘Divided attention’ can lead to accidents when people are driving and watching some other objects.

‘Selective attention’ is a process in which we give priority to a particular incoming sensory message. Attention has broadly three possible functions: (a) as a sensory filter (b) as a response selection and (c) as a gateway to consciousness.

Determinants of Attention

- **Physical factors:** All other things being equal, physical factors like repetition, contrast, shape, size, brightness and contrast do affect our attention. A good packaging or bright light attracts us. That is why all big companies invest a lot on packaging their products in an attractive manner. Similarly an advertisement which is published on a regular basis in newspapers and electronic media catches the attention of customers more easily than non-advertised products.
- **Motives and attention:** Motives also play a role in shaping our perception. For example, if you are hungry food-related words are more likely to gain your attention than non-food words. Advertisers and propagandists take advantage of two motives that are very common in our society: anxiety and sex. Many products such as toothpastes, food products even automobiles highlight the health concern to catch the attention of

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customers. On the other hand items of fashionable products play on the desire to be attractive. The political parties cash on appeals to fear to make their voice heard by the public at large.



INTEST QUESTIONS 5.4

1. Discuss the concept of Attention?

2. Identify the various determinants of attention.

5.5 EXTRA SENSORY PERCEPTION

Extra sensory perception is the ability to perceive objects or events in ways that cannot be explained by known sensory capacities.

Parapsychology is the study of extra sensory perception phenomena. Events that seem to lie outside the region of accepted scientific laws are called psi-phenomena. An example of extrasensory perception when a person intuitively ‘feels’ that his brother who is in another city is not well. Another example could be when you just ‘know’ that an earthquake is going to happen in your city.

Clairvoyance: It is the ability to perceive events or gain information in ways that appear unaffected by distance or normal barriers. Telepathy or perception of another person’s thoughts or the ability to read someone else’s mind.

Pre-cognition: The ability to predict or perceive accurately future events.

Psycho-kinesis: The ability to exert influence over inanimate objects by will-power (mind over matter). Some rare persons are able to move objects only through concentration but without touching them.

A few psychologists strongly believe in extrasensory perception but the majority does not subscribe to it.

5.6 APPLICATIONS OF PERCEPTION IN EVERYDAY LIFE

There are several ways in which knowledge of the process of sensation, perception and attention can be used in everyday life.

- **Eyewitness:** You may be aware that eyewitness testimony is key to decisions in the judiciary. Not only do advocates and police officers lay strong emphasis on eye witness



testimony, but they have a strong belief that it is usually correct. But psychologists in large numbers are of the opinion that eyewitness errors are very common in perception. In fact impressions formed when a person is surprised, stressed or threatened are especially prone to distortion. Therefore it would be advisable for the investigative agencies and jurors to gather more evidence instead of solely relying on eyewitness while coming to a conclusion.

- **Perceptual awareness and positive psychology:** Do some people perceive things more accurately than others? Humanistic psychologists believe that some people perceive themselves and others with unusual accuracy. Habituation is when we stop paying attention to familiar stimuli. When a stimulus is repeated without change our response to it habituates or decreases. It seems that creative people attend to stimuli, even those that are repeated.
- **The value of paying attention:** We have this general tendency to generalize without paying attention to the diversity of possibilities. Perceptual clarity requires rigorous effort of paying more and more attention. Breaking perceptual habits and interrupting habituation can lead to good results. If you begin to question your own perceptions by bringing another interpretation to the same reality you can get marvelous outcomes in your activities.



WHAT YOU HAVE LEARNT

- Sensation is the process by which neural impulses are created by stimulation or sensory neurons that results in awareness of conditions inside or outside our body.
- There are five main senses: sight, hearing, touch, smell and taste. In addition we also have vestibular sense and kinesthetic sense.
- Perception is the process through which an internal representation of an object is formed. It involves synthesis of simple sensations, and assigning meaning to the whole.
- Principles of perceptual organization include nearness, similarity, continuity and closure and help identify the figure against the background.
- Depth perception is the ability to judge distance and perceive three dimensional space. It involves monocular and binocular cues.
- Perceptual constancy refers to the fact that we interpret a familiar object as having the same size, shape or color even if the sensations point otherwise.
- Attention is the ability to focus our senses on a particular object. It involves selectivity and is influenced both by physical and psychological factors.
- Extra-sensory perception is the ability to perceive events or objects in ways that cannot be explained by known sensory capacities.



- Knowledge of perceptual psychology helps in everyday life and in learning how to improve our attention and perception.

**TERMINAL QUESTIONS**

1. Describe the importance of perception in our daily life.
2. Define perception and also discuss principles of perceptual organization.
3. Discuss the concept of depth perception and perceptual constancy.
4. What do you understand by Extra-sensory perception?
5. Describe the various applications of perception.

**ANSWERS TO INTEXT QUESTIONS****5.1**

1. Vision is extremely important. We experience vision with the help of our eyes which are like a camera.
2. The minimum amount of change between two stimuli that can be recognised is called “difference threshold”.

The minimum amount of physical energy needed to produce a sensory experience is called “absolute threshold”.

5.2

1. Perception is when an internal representation of an object that was earlier sensed is formed.
2. When we sense an object, we sensation is in the form of the organisation, depth and consistency of stimulus. Perceptual processes then analyse this into parts and mental process help us identify the stimulus.

5.3

1. Factors which determine perceptual organisation are figure ground organisation, perceptual consistency and depth perception.
2. Perception of an object’s shape, size or brightness remains the same even though its image on the retina has changed. This is called perceptual consistency.
3. Depth perception is the ability to see three dimensional space and judge distances. For example depth perception helps us drive a motorcycle or a car and helps us catch a ball.



5.4

1. Attention is the process by which we notice stimuli. Selective attention is a process in which we give priority to a particular sensory message.
2. The determinants of attention are physical factors and motives.

Hints for Terminal Questions

1. Refer to unit 5.1
2. Refer to unit 5.2
3. Refer to unit 5.3
4. Refer to unit 5.5
5. Refer to unit 5.6

Notes