1. Details of Module and its structure

Module Detail	
Subject Name	Psychology
Course Name	Psychology 02 (Class XI, Semester - 2)
Module Name/Title	Sensation and Attention – Part 3
Module Id	kepy_20503
Pre-requisites	Knowledge about functioning of sensory organs.
Objectives	1. To understand what perception is. 2. To explain the processes of perceptual organization. 3. Explain perceptual constancies. 4. To understand impact of culture in perception. 5. Perception of distance, depth and movement. 6. Understanding visual illusions.
Keywords	Perception, top-down processing, bottom up processing, Depth Perception, Monocular cues, Binocular cues, Retinal disparity

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Perceptual Processes

In the previous section we had learnt that stimulation of sensory organs leads us to experience something such as, a flash of light or a sound, or a smell. This elementary experience, called sensation, does not provide us with any understanding of the stimulus that stimulated the sense organ. For example- as you watch a scenery or a picture you just see it you do not decipher it in terms of pleasant or unpleasant. In order to make sense out of the raw material provided by the sensory system, we process it further.

The process by which we recognise, interpret or give meaning to the information provided by sense organs is called perception.

In interpreting stimuli or events, individuals often construct them in their own ways. Thus, perception is not merely an interpretation of objects or events of the external or internal world as they exist, instead it is also a construction of those objects and events from one's own point of view. The process of meaning-making involves certain **sub-processes**.

Processing Approaches in Perception How do we identify an object? Do we identify a cat because we recognised its furry coat, its four legs, its eyes, ears, and so on, or do we recognise these different parts because we have first identified a cat? The idea that recognition process begins from the parts, which serve as the basis for the recognition of the whole is known as **bottom-up processing.**

The notion that recognition process begins from the whole, which leads to identification of its various components is known as **top down processing**.

The **bottom-up approach** lays emphasis on the features of stimuli in perception and considers perception as a process of mental construction.

The **top-down approach** lays emphasis on the perceiver and considers perception as a process of recognition or identification of stimuli.

Studies show that in perception both the processes interact with each other to provide us with an understanding of the world.

Role of the Perceiver

Human beings are not just mechanical and passive recipients of stimuli from the external world. They are creative beings and try to understand the external world in their own ways. In this process their motivations and expectations, cultural knowledge, past experiences, and memories as well as values, beliefs, and attitudes play an important role in giving meaning to the external world.

Some of these **factors are** described here.

a) Motivation The needs and desires of a perceiver strongly influence her/his perception. People want to fulfil their needs and desires through various means. One way to do this is to perceive objects in a picture as something that will satisfy their need. Experiments were conducted to examine the influence of hunger on perception. When hungry persons were shown ambiguous pictures, they were found to perceive them as pictures of food objects more often than those who were not hungry.

b) Expectations or Perceptual Sets The expectations about what we might perceive in each situation also influences perception. This phenomenon of perceptual familiarisation or perceptual generalisation reflects a strong tendency to see what we expect to see even when the results do not accurately reflect external reality. For example, if a delivery man delivers your grocery daily at about 7.30 A.M., then the doorbell at that time is likely to be perceived as the presence of the delivery boy even if it is someone else.

ACTIVITY: To demonstrate expectancy, tell your friend to close her/him eyes. Write 12, 13, 14, 15 on the board. Ask her/him to open her eyes for 5 seconds, look at the board, and note down what she/he saw. Repeat replacing only the 12, 14, 15 with A, C, D viz. 'A 13 C D'. Ask her/him again to note down what she saw. Most people write down B in place of 13. Those who can do it quickly will be called **"field independent**"; those who take long time will be called "**field dependent**".

c) Cultural Background and Experiences Different experiences and learning opportunities available to people in different cultural settings also influence their perception. People coming from a pictureless environment fail to recognise objects in pictures. Hudson studied the perception of pictures by African subjects and noted several difficulties. Many of them were unable to identify objects depicted in pictures (e.g., antelope, spear). They also failed to perceive distance in pictures, and interpreted pictures incorrectly. Eskimos have been found to make fine distinction among a variety of snow that we may be unable to notice. These studies indicate that the perceiver plays a key role in the process of perception. People process and interpret stimuli in their own ways depending on their personal, social and cultural conditions. Due to this, our perceptions may get modified.

d) Cognitive Styles Cognitive style refers to a consistent way of dealing with our environment. It significantly affects the way we perceive the environment. There are several cognitive styles that people use in perceiving their environment. One most extensively used in studies is the "field dependent and field independent" cognitive style**.**

Field dependent people perceive the external world in its totality, i.e. in a global or holistic manner. On the other hand, field independent people perceive the external world by breaking it into smaller units, i.e. in an analytic or differentiated manner.

Principles of Perceptual Organisation:

Our visual field is a collection of different elements, such as points, lines, and colours. However, we perceive these elements as organised wholes or complete objects. The process of organising visual field into meaningful wholes is known as **form perception**. Several researchers tried to answer this but the most widely accepted answer has been given by a group of psychologists, called Gestalt psychologists. Prominent among them are Wolfgang Köhler, Kurt Koffka, and Max Wertheimer. **Gestalt means a regular figure, pattern or a form**. According to Gestalt psychologists, we perceive different stimuli not as discrete elements, but as an organised "whole". They believe that the form of an object lies in its totality, which is different from the sum of their parts. Eg a bicycle.They believed that the brain creates a complete coherent perceptual experience which is more than the available sensory experience.

The Gestalt psychologists indicate that our **cerebral processes are always oriented towards the perception of a good figure or pragnanz. That is the reason why we perceive everything in an organised form.**

Source:
https://upload.wikimedia.org/wikipedia/commons/thumb/0/06/Aros_ol%C3%ADmpicos_01.jpg/220px-Aros_ol%C3%ADmpicos_01.jpg

The most primitive organisation takes place in the form **of figure-ground segregation.** When we look at a surface, certain aspects of the surface clearly stand out as separate entities, whereas others do not. For example, when we see words on a page, or a painting on a wall, or birds flying in the sky, the words, the painting, and the birds stand out from the background, and are perceived as figures, while the page, wall, and sky stay behind the figure and are perceived as background. To experience this look at the given figure:

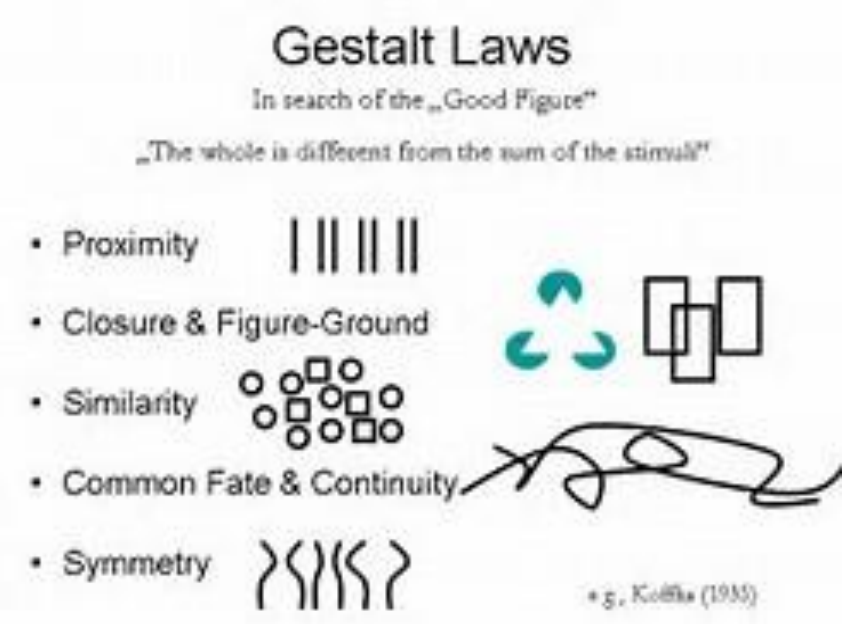
Source: https://tse3.mm.bing.net/th/id/OIP.63Qs1YEZ3NwqGL9tSLSTcwHaFp?w=242&h=183&c=7&o=5&dpr=1.1&pid=1.7

You see either the white part of the figure, which looks like a flowerpot, or the black part of the figure, which looks like two faces.

We distinguish figure from the ground based on the following characteristics:

1. Figure has a definite form, while the background is relatively formless.
2. Figure is more organised as compared to its background.
3. Figure stands out from the background, while the background stays behind the figure.
4. Figure appears clearer, limited, and relatively nearer, while the background appears relatively unclear, unlimited, and away from us.

The Gestalt psychologists have given us several laws to explain how and why different stimuli in our visual field are organised into meaningful whole objects. Apart from Figure and Ground several other principles are valid for visual as well as auditory stimuli, which may be seen in the figure below, namely: closure, proximity, similarity, continuity and symmetry. We will learn more about these principles called the principles of perceptual organization.



Principles of perceptual organisation

Proximity: as you can see in the above figure, objects that are close together in space or time are perceived as belonging together or as a group.

Similarity: Objects which are similar to one another and have characteristics that are alike are perceived as a group. The little circles and squares are spaced such that the proximity does not come into play. So can perceive thus that objects that are close together in space or time are perceived as belonging together or as a group. In the given figure the little circles and squares are placed close together, yet we tend to perceive squares and circles independently.

Continuity: This principle states that we tend to perceive objects as belonging together if they appear to form a continuous pattern. For instance, we are more likely to view the lines as two lines crossing over and extending behind the other line. We tend to perceive objects as belonging together if they appear to form a continuous pattern.

Symmetry This principle suggests that symmetrical areas tend to be seen as figures against asymmetrical backgrounds.

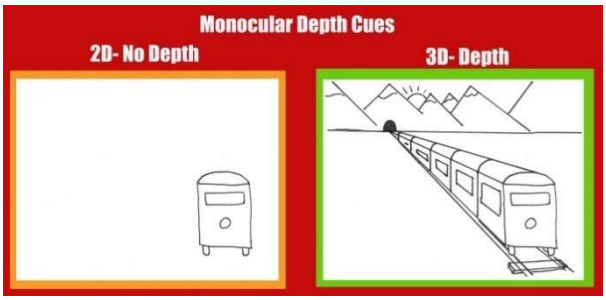
Closure: We tend to fill the gaps and perceive the objects as whole rather than their separate parts. The small angles are seen as a triangle due to our tendency to fill the gaps in the object provided.

Law of simplicity: This law states that our mind perceives everything in its simplest form.

Depth Perception

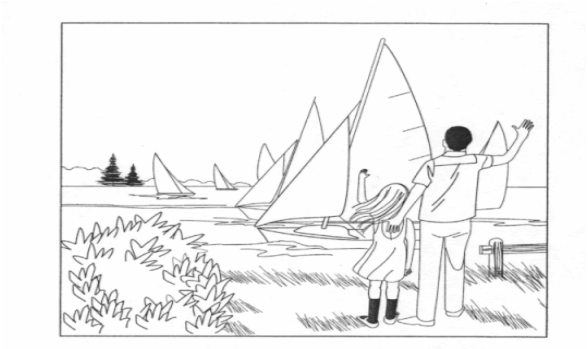
The visual field or surface in which things exist is called space. The space in which we live is organised in three dimensions. We perceive not only the spatial attributes (e.g., size, shape, direction) of various objects, but also the distance between the objects found in this space. While the images of objects projected on to our retina are flat and two dimensional (left, right, up, down), we still perceive three dimensions in the space. Why does it happen so? It occurs due to our ability to transfer a two-dimensional retinal vision into a three-dimensional perception. The process of viewing the world in three dimensions is called distance or depth perception. Depth perception is important in our daily life.

The process of viewing the world in three dimensions is called **distance or depth perception**. Depth perception is important in our daily life. In perceiving depth, we depend on two main sources of information, called cues. One is called ***binocular cues*** because they require both eyes. Another is called ***monocular cues***, because they allow us to perceive depth with just one eye.



Monocular Cues (Psychological Cues)

Monocular cues of depth perception are effective when the objects are viewed with only one eye. These cues are often used by artists to induce depth in two dimensional paintings. Hence, they are also known as pictorial cues.



Relative Size: The size of retinal image allows us to judge distance based on our past and present experience with similar objects. As the objects get away, the retinal image becomes smaller and smaller. We tend to perceive an object farther away when it appears small, and closer when it appears bigger.

Interposition or Overlapping: These cues occur when some portion of the object is covered by another object. The overlapped object is considered farther away, while the object that covers it appears closer.

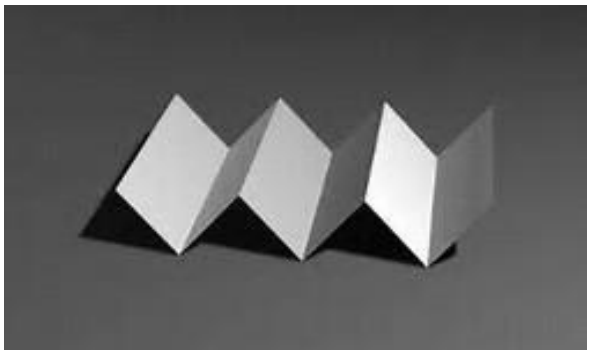
Linear Perspective: This reflects a phenomenon by which distant objects appear to be closer together than the nearer objects. For example, parallel lines, such as rail tracks, appear to

converge with increasing distance with a vanishing point at the horizon. The more the lines converge, the farther away they appear.

Aerial Perspective: The air contains microscopic particles of dust and moisture that make distant objects look hazy or blurry. This effect is called aerial perspective. For example, distant mountains appear blue due to the scattering of blue light in the atmosphere, whereas the same mountains are perceived to be closer when the atmosphere is clear.

Source: http://resumbrae.com/ub/dms423_f09/12/Mount_Ellinor.jpg

Light and Shade: In the light some parts of the object get highlighted, whereas some parts become darker. Highlights and shadows provide us with information about an object's distance and depth.



Relative Height: Larger objects are perceived as being closer to the viewer and smaller objects as being farther away. When we expect two objects to be the same size and they are not, the larger of the two will appear closer and the smaller will appear farther away.

Texture Gradient: It represents a phenomenon by which the visual field having more density of elements is seen farther away.

Source: https://c2.staticflickr.com/4/3163/2297308960_f935e675d6_b.jpg

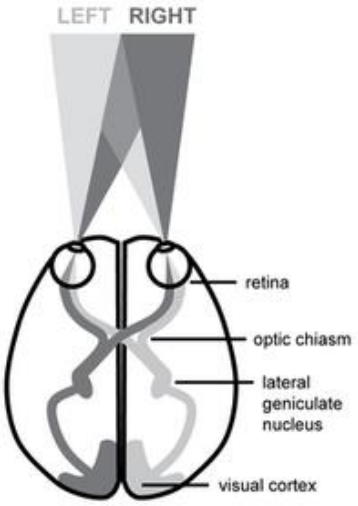
Motion Parallax: It is a kinetic monocular cue, and hence not considered as a pictorial cue. It occurs when objects at different distances move at a different relative speed. The distant objects appear to move slowly than the objects nearby. The rate of an object's movement provides a cue to its distance. For example-while traveling in a bus, objects that are closer move "against" the direction of the bus, whereas objects that are further away move in the same direction as the bus.

Source:
https://tse4.mm.bing.net/th?q=Motion+Parallax+Monocular+Cues&w=120&h=120&c=1&rs=1&qlt=90&dpr=1.1&pid=InlineBlock&mkt=en-IN&adlt=strict&t=1&mw=247

Binocular Cues (Physiological Cues)

Some important cues to depth perception in three dimensional spaces are provided by both the eyes. Three of these are:

Retinal or Binocular Disparity: Retinal disparity occurs because the two eyes have different locations in our head. They are separated from each other horizontally by a distance of about 6.5 centimeters. Because of this distance, the image formed on the retina of each eye of the same object is slightly different. This difference between the two images is called retinal disparity. The brain interprets a large retinal disparity to mean a close object and a small retinal disparity to mean a distant object, as the disparity is less for distant objects and more for the near objects.



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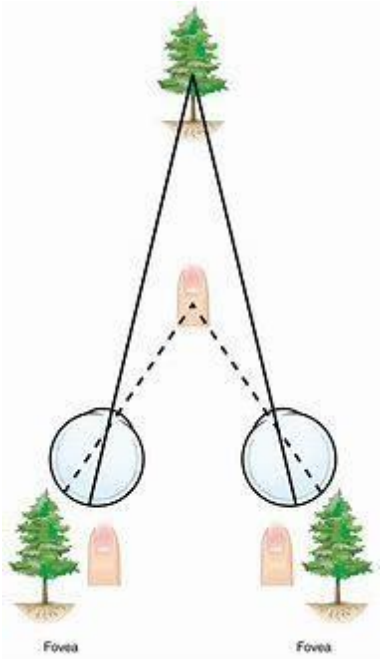
https://upload.wikimedia.org/wikipedia/en/thumb/1/15/Diagram_of_lateralized_visual_pathways_of_the_human_brain.png/220px-Diagram_of_lateralized_visual_pathways_of_the_human_brain.png

Convergence: When we see a nearby object our eyes converge inward in order to bring the image on the fovea of each eye. A group of muscles send messages to the brain regarding the degree to which eyes are turning inward, and these messages are interpreted as cues to the perception of depth. The degree of convergence decreases as the object moves further away from the observer. You can experience convergence by holding a finger in front of your nose and slowly bringing it closer. The more your eyes turn inward or converge, the nearer the object appears in space.



Accommodation: Accommodation refers to a process by which we focus the image on the retina with the help of ciliary muscle. These muscles change the thickness of the lens of the eye. If the object gets away (more than 2 meters), the muscle is relaxed but as the object moves nearer, the muscle contracts and the thickness of the lens increases. The degree of contraction of the muscle is sent to the brain, which provides the cue for distance.

Perceptual Constancies

The sensory information that we receive from our environment constantly changes as we move around. Yet we form a stable perception of an object seen from any position and in any intensity of light. Perception of the objects as relatively stable despite changes in the stimulation of sensory receptors is **called perceptual constancy**. Here we will examine three types of perceptual constancies that we commonly experience in our visual domain.

Size Constancy: The size of an image on our retina changes with the change in the distance of the object from the eye. The further away it is, the smaller is the image. On the other hand, our experience shows that within limits the object appears to be about the same size irrespective of its distance. For example, when you approach your friend from a distance, your perception of the friend's size does not change much despite the fact that the retinal image (image on retina) becomes larger. This tendency for the perceived size of objects to remain relatively unchanged with changes in their distance from the observer and the size of the retinal image is called size constancy.

Shape Constancy: In our perceptions the shapes of familiar objects remain unchanged despite changes in the pattern of retinal image resulting from differences in their orientation. For example, a dinner plate looks the same shape whether the image that it casts on the retina is a circle, or an ellipse, or roughly a short line (if the plate is viewed from the edge.

See the images of a door below to understand the phenomena.

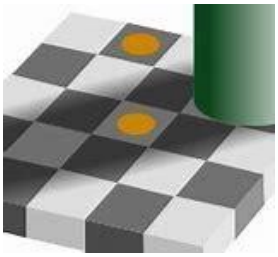
Source:

https://upload.wikimedia.org/wikipedia/commons/thumb/2/24/Shape_constancy.gif/220px-Shape_constancy.gif

It is also called form constancy.

Brightness Constancy

Visual objects not only appear constant in their shape and size, they also appear constant in their degree of whiteness, greyness, or blackness even though the amount of physical energy reflected from them changes considerably. In other words, our experience of brightness does not change in spite of the changes in the amount of reflected light reaching our eyes. The tendency to maintain apparent brightness constant under different amount of illumination is called brightness constancy. For example, surface of a paper which appears white in the sunlight, is still perceived as white in the room light. Similarly, coal that looks black in the sun also looks black in room light.



Illusions

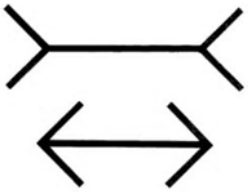
Sometimes we are unable to interpret the sensory information correctly. This results in a mismatch between the physical stimuli and its perception. **These misperceptions resulting from misinterpretation of information received by our sensory organs are generally known as illusions.** Illusions can be experienced by the stimulation of any of our senses.

Psychologists have studied visual illusions more commonly than other sense modalities. Some perceptual illusions are ***universal***and found in all individuals. For example, the rail tracks appear to be converging to all of us. These illusions are called universal illusions or permanent illusions as they do not change with experience or practice.

Some other illusions seem to vary from individual to individual; these are called ***personal illusions*.**

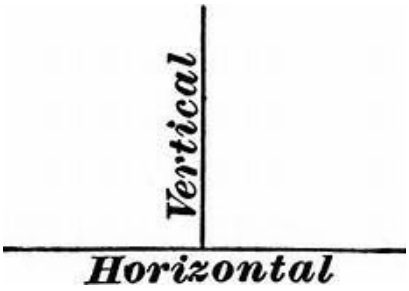
1. **The Muller-Lyer Illusion**

Line A is perceived as shorter than line B, although both the lines are equal. This illusion is experienced even by children and some studies that suggest that even animals experience this.



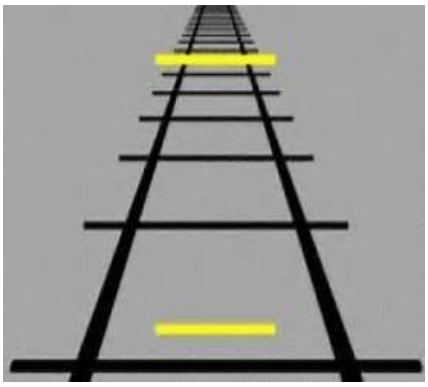
2. Illusion of vertical and horizontal lines

Although both the lines are equal, we perceive the vertical line as longer than the horizontal line.



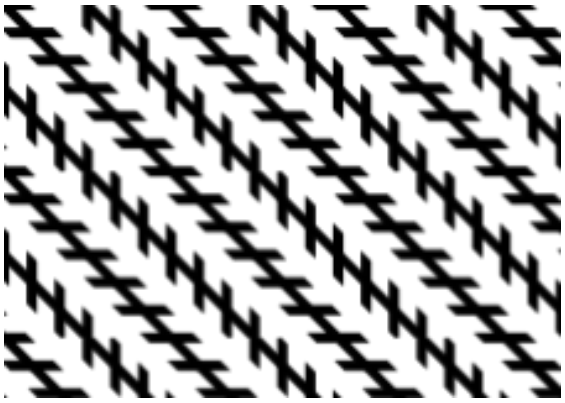
3. Ponzo Illusion

The Ponzo illusion is a geometrical-optical illusion that was first demonstrated by the Italian psychologist Mario Ponzo in 1911. He suggested that the human mind judges an object's size based on its background. He showed this by drawing two identical lines across a pair of converging lines, similar to railway tracks. The upper line looks longer because we interpret the converging sides according to linear perspective as parallel lines receding into the distance. In this context, we interpret the upper line as though it were farther away, so we see it as longer – a farther object would have to be longer than a nearer one for both to produce retinal images of the same size.



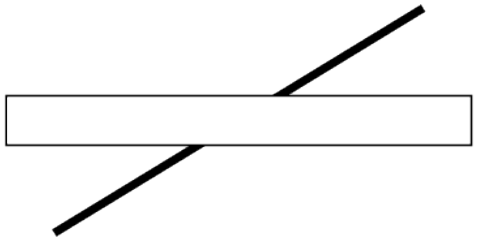
4. The Zöllner Illusion

The Zöllner Illusion was created by Johann Karl Friedrich Zöllner (1834 - 1882), a German astrophysicist with a keen interest in optical illusions. Zöllner was inspired by a cloth pattern that he observed in his father's factory, and first published the illusion in the journal *Annalen der Physik*in 1860.The Zöllner Illusion is one among a number of illusions where a central aspect of a simple line image – e.g. the length, straightness, or parallelism of lines – appears distorted in virtue of other aspects of the image – e.g. other background/foreground lines, or other intersecting shapes. These are sometimes called 'geometrical-optical illusions'



5. The Poggendorff Illusion

It is named after Johann Poggendorff (1796-1877), a German physicist who first described it in 1860. Poggendorff noted that the diagonal lines in the pattern of fabric appeared to be misaligned.



6. Apparent Movement Illusion

This illusion is experienced when some motionless pictures are projected one after another at an appropriate rate. This illusion is referred to as “phi-phenomenon”. When we see moving pictures in a cinema show, we are influenced by this kind of illusion. The succession of flickering electrical lights also generates this illusion. For the experience of this illusion, Wertheimer had reported the presence of appropriate level of brightness, size, spatial gap, and temporal contiguity of different lights.

Socio-Cultural Influences on Perception

Several psychologists have studied the processes of perception in different sociocultural settings. The questions they try to answer through these studies are: Does perceptual organisation of people living in different cultural settings take place in auniform manner? Are the perceptual processes universal, or they vary across different cultural settings? Because we know, people living in different parts of the world look different, many psychologists hold the view that their ways of perceiving the world must be different in some respects. Let us examine some studies relating to perception of illusion figures and other pictorial materials. You can see the Muller-Lyer and Vertical-Horizontal illusion figures. Psychologists have used these figures with several groups of people living in Europe, Africa, and many other places. Segall, Campbell, and Herskovits carried out the most extensive study of illusion susceptibility by comparing samples from remote African villages and Western urban settings. It was found that African subjects showed greater susceptibility to horizontal-vertical illusion, whereas Western subjects showed greater susceptibility to Muller-Lyer illusion.