

CHAPTER TWO

SENSATION AND PERCEPTION

Chapter Overview

Before anything else, psychological life begins with the activity of knowing what is happening around. Sensation and perception are the first important dimensions of this intelligent life. That is, they are starting points for all of your other psychological processes. They supply the data you use for learning and remembering, thinking and problem solving, communicating with others, and experiencing emotions and for being aware of yourself. Without access to the environment through sensation and perception, you would be like a person in a coma devoid of any thoughts or feelings.

This chapter discusses the nature of sensation and perception as the first forms of human's intelligent life. It attempts to discuss the meaning and relationship of sensation and perception, the principles explaining how they work, and other related topics.

Learner Appetizer Once upon a time, there were couples in a village. They had a horse. One day they started a journey both of them sitting on the horse. When people see that, they get upset and criticized the couples as unkind to animals. Then, the husband sat on the horse leaving his wife walking on foot. Looking at this, people started to criticize the husband as selfish and disrespectful of his wife. Following the critics, the husband left the horse for his wife and walked on foot. People started laughing at the husband and labeled him as foolish. Finally, both the husband and his wife started walking on foot leaving the horse free. As usual, people started joking at the couples and considered them as stupid guys because they left the horse free.

Dear student, what do you understand from this short story? □ Do people have same perception about what is right and wrong? In which scenario of the above story people's critics is right? How?

Learning Outcomes

At the end of this chapter, you are expected to understand the:

- ψ meaning of sensation and perception
- ψ difference and similarities of sensation and perception
- ψ factors affecting sensation and perception
- ψ principles of sensation and perception, and

ψ reasons for sensory and perceptual differences among individuals.

2.1. The meanings of sensation and perception

Psychologists have traditionally differentiated between sensation and perception

Brainstorming questions

Have you heard of sayings like „you watch but you don“t see“; „you hear but you don“t listen“, „you touch but you don“t grasp...“ What do these statements suggest to you? Which one do you think refers to sensation and which one refers to perception?

What are the elements of learning?

Sensation is the process whereby stimulation of receptor cells in the eyes, ears, nose, mouth, and surface of the skin sends nerve impulses to the brain. Sensations are closely tied to what is happening in the sensory systems themselves. Color, brightness, the pitch of tone or a bitter taste are examples of sensations. The starting point of sensations is a stimulus. A form of energy (such as light waves or sound waves) that can affect sensory organs (such as the eye or the ear). Sensation is therefore the process that detects the stimulus from one's body or from the environment.

How different is sensation from perception?

In real life, you seldom experience simple sensations. Instead of simple sensations, perceptual processes are constantly at work to modify sensory input into what are actually experiences. Perception is the process that organizes sensations into meaningful patterns. It is the process whereby the brain interprets sensations, giving them order and meaning. Thus, hearing sounds and seeing colors is largely a sensory process, but forming a melody and detecting patterns and shapes is largely a perceptual process.

Why do we say “largely” in the above expression?

We say largely because in everyday life, it is almost impossible to separate sensation from perception. As soon as the brain receives sensations, it automatically interprets or perceives them, and without sensations of some kind perception could not occur.

Can you mention examples showing the difference between sensation and perception?

Consider, for example, the black marks and letters in this page. Visual sensation lets you detect the black marks. Visual perception lets you organize the black marks into letters and words.

For a real life example of the difference between sensation and perception consider a case study presented by neurologist Oliver Sacks (1985) one of his patients suffered from brain damage that caused him to develop prosopagnosia, the inability to recognize human faces. The patient could recognize people by sound of their voices, but he could not recognize them by light. His disorder was so severe that he sometimes patted tire hydrants, thinking they were children's heads. He would even grab his wife's head mistaking it for a hat yet he was not nearsighted; he could easily see a pin on the floor. Thus he had people's facial features, but he could not organize them into recognizable face (visual perceptions).

Reflection Dear student, now show with examples how sensation is similar and different from perception.

2.2. The sensory laws: Sensory thresholds and sensory adaption.

There are certain sensory laws that explain how sensation works. Sensory threshold and sensory adaptation are the two general laws of sensation.

Brainstorming questions How much intense must a sound be for you to detect it? How much changes in light intensity must occur for you to notice it? □ perception?

□ What are the elements of learning?

Sensory threshold is the minimum point of intensity a sound can be detected. There are two laws of sensory threshold: The law of absolute threshold and the law of difference threshold.

The absolute threshold

The minimum amount of stimulation a person can detect is called the absolute threshold, or Limen, for example, a cup of coffee would require a certain amount of sugar before you

could detect a sweet taste. Because the absolute threshold for a particular sensory experience varies, psychologists operationally define the absolute threshold as the minimum level of stimulation that can be detected 50 percent of the time when a stimulus is presented over and over again. Thus, if you were presented with a low intensity sound 30 times and detected it 15 times, that level of intensity would be your absolute threshold for that stimulus.

The absolute threshold is also affected by factors other than the intensity of the stimulus; Researchers assume that the detection of a stimulus depends on both its intensity and the physical and psychological state of the individual. One of the most important psychological factors is the response bias-how ready the person is to report the presence of a particular stimulus. Imagine that you are walking down a street at night. Your predisposition to detect a sound depends, in part, on your estimate of the probability of being mugged, so you would be more likely to perceive the sound of footsteps on a neighborhood you believe to be dangerous than in a neighborhood you believe to be safe.

The difference threshold

In addition to detecting the presence of a stimulus, you also detect changes in the intensity of a stimulus. The minimum amount of change that can be detected is called difference threshold. For example, a cup of coffee would require a certain amount of additional sugar before you could detect an increase in its sweetness. Similarly, you would have to increase the intensity of the sound from your tape recorder a certain amount before you could detect a change in its volume.

Like the absolute threshold, the difference threshold for a particular sensory experience varies from person to person and from occasion to occasion. Therefore, psychologists formally define the difference threshold as the minimum change in stimulation that can be detected 50 percent of the time by a given person. This difference in threshold is called the just noticeable difference (jnd). The amount of change in intensity of stimulation needed to produce a jnd is

a constant fraction of the original stimulus. This became known as Weber's law. For example, because the jnd for weight is about 2% and you held a 50 ounce for weight you would notice a change only if there was at least one ounce change in it. But a person holding a 100 ounce weight would require the addition or subtraction of at least 2 ounce to notice a change. Research findings indicate the weber's law holds better for stimuli of moderate intensity than stimuli of extremely low or high intensity.

Sensory Adaptation

Brainstorming questions Given that each of your senses is constantly bombarded by stimulation, why do you notice only certain stimuli?

One possible reason is that if a stimulus remains constant in intensity, you will gradually stop noticing it. For example, after diving into a swimming pool, you might shiver. Yet a few minutes later you might invite someone to join you saying, —The water is fine! On entering a friend's dormitory room, you might be struck by the repugnant stench of month-old garbage. Yet a few minutes later you might not notice the odor at all, this tendency of our sensory receptors to have decreasing responsiveness to unchanging stimulus is called sensory adaptation.

Sensory adaptation lets you detect potentially important change in your environment while ignoring unchanging aspects of it. For example, when vibrations repeatedly stimulate your skin, you stop noticing them. Thus, if you were having a bumpy train ride that made your seat vibrate against your bottom, you would initially notice the vibrations, but it would serve little purpose for you to continue noticing them. Likewise, once you have determined that the swimming pool water is cold or that your friend's room smells, it would serve little purpose to continue noticing those stimuli-especially when more important change might be taking place elsewhere in your surroundings. Of course, you will not adapt completely to extremely intense sensations, such as severe pain or freezing cold.

This is adaptive, because to ignore such stimuli might be harmful or even fatal.

2.3.Perception

You have seen earlier that perception is a meaning making process. Now you study more about this meaning making process of the human intelligent life. It helps you understand the major characteristics of the perceptual process: selectivity of perception, from perception, depth perception, perceptual constancy, and perceptual illusion.

2.3.1.Selectivity of perception: Attention

Note that at any given time, your sense organ is bombarded by many stimuli. Yet you perceive a few of them. Were you aware of, for example, the noise in your room until you read this sentence? You may not. Yet input from the environment was coming into your ears all the time. In fact you may be attending to one of such incoming input ignoring the other noises. Such selective perception is called attention.

Attention is therefore the term given to the perceptual process that selects certain inputs for inclusion in your conscious experience, or awareness, at any given time, ignoring others.

What does this selectivity of perception imply?

Brainstorming questions What does this selectivity of perception imply?

The selectivity of perception implies, among other things, that our field of experience is divided into what is known as —Focus‖ and —Margin.‖ Events or stimuli that you perceive clearly are the focus of your experience and other items or stimuli that you perceive dimly or vaguely are in the margin of your attention. You may be aware of items in the marginal field but only vaguely or partially

To illustrate focus and margin consider that your perceptual field is a football game. While you are dimly aware of the tangle of players and the activity of the blockers during the play, it is the ball carrier and his movement that stands out clearly to you your attention is mainly focused on him. But at the same time, sensory inputs are coming in from your cold feet, from

your stomach as a result of the last uncomfortable food you ate, and from the fellow behind you who is smoking a cigar. The crowd is also shouting. While the play is going on, you are probably not aware of any of these sensory inputs. Only when the play is finished or time is called that you perceive how cold your feet are, and how noisy the crowd is.

The fact that you perceive how cold your feet are, and how noisy the crowd is when the play is finished or time is called illustrates another characteristic of attention, that it is constantly shifting. Attention shifts constantly. What is in the focus of your attention one moment may be in the margin; and what is in the margin may become in your focus.

Brainstorming questions What factors do you think determine your attention? Why do you pay, in the above example, attention to the ball carrier ignoring others and why, at the end of the game, your attention shifted to the cold feeling you are experiencing in your feet? What aspects of the environment get your attention at a given time?

Paying attention is in general a function of two factors: factors external to the perceiver and factors internal to the perceiver. External factors refer to factors that are generally found in the objects or stimuli to be perceived. Some of the external characteristics of objects that determine whether you are going to attend them or not are size and intensity, repetition, novelty (or newness), and movement. Other things being constant, bigger and brighter stimuli are more likely to capture your attention than smaller and dimmer objects. That is why announcements and notices are written in big and block letters. In the same way, people who dress bright colored clothes tend to capture your attention.

Repetition is the second factor. You are more likely to attend to stimuli that repeatedly or frequently occur in your perceptual field. A misspelled word is more likely to be detected if it occurs many times in a paragraph than when it occurs only once or twice. You are going to notice a person if he continuously follows you as compared to a person you meet only once or twice. That is, by the way, why slogans, advertisements, and announcements are repeated

continuously to audiences and spectators. In a word, repetition is attention getting. However, no matter how big or bright a stimulus is, or else no matter how frequently it may occur, you may not give it attention as if it occurs in the same way all the time. This is basically because you are likely to adapt to it and then stop responding to it. This is called sensory adaptation or habituation. It is the tendency to ignore a stimulus that occurs continuously in the same way. Hence, the third factor of attention is novelty-the extent to which a stimulus creates a contrast with the rest objects in the environment. Novel or new objects create a sharp contrast with the environment and hence tend to capture your attention. Remember here why you are given a special attention as a guest, why first-born children get more attention from parents etc.

The last but not the least external factor in attention getting is movement. Moving objects tend to get your attention more than non-moving or stagnant objects. Your eyes are involuntarily attracted to movement the way butterflies are attracted to light. This is because moving objects are instinctually felt dangerous or threatening and you are reflexively responding to them to defend yourself. Moreover, moving objects bring with them changes in stimulation or newness in their presentation.

In general, stimuli in the environment that, are bigger and brighter, or more frequently occurring. Or newer or moving are likely to get your attention. Paying attention is not, however, determined only by these characteristics of objects. Even when a stimulus is bigger, brighter, new frequent, or moving, you may not give it attention if you are not psychologically ready to attend to it. Hence, attention giving also depends on your psychological states as an observer.

What are some of the internal psychological states of the observer that affect as to which stimulus one pays attention to or ignore?

Psychologists have identified two important psychological factors: Set or expectancy and motives or needs. Set refers to the idea that you may be —ready‖ and —Primed for‖ certain

kinds of sensory input. Set, or expectancy, therefore, varies from person to person. It is important not only in the selection of sensory input for inclusion in the focus of your attention. It is also important in organizing the selected sensory input. To illustrate the role of set in attention, consider the husband who is expecting an important phone call. He will hear the telephone ring in the night while his wife does not. The wife, on the other hand, may more likely to hear the baby crying than the telephone ringing. Of course, if the wife is expecting an important call, the reverse may be true.

What other examples, do you think, illustrate the role of set or expectancy in perception?

Motives and needs are the second psychological factors influencing you as an observer. There are differences between you and your friend in what you select to perceive as a result of differences in your motives and needs. You and your friend attend to and organize the sensory input in ways that match your respective needs. People who are hungry, thirsty, or sexually aroused are likely to pay attention to events in the environment, which will satisfy these needs.

2.3.2. From perception

Visual sensations, as discussed under sensation, provide the raw materials that are to be organized into meaningful patterns, shapes, forms, and concepts or ideas or form perception. The meaningful shapes or patterns or ideas that are made perhaps out of meaningless and discrete or pieces and bites of sensations refer to form perception. To perceive forms (meaningful shapes or patterns), you need to distinguish a figure (an object) from its ground (or its surrounding). Let us look at this idea further.

Figure-Ground Perception

Figure-ground perception is the perception of objects and forms of everyday experience as standing out from a background. Pictures (figure) hang on a wall (ground), words (figure) are seen on a page (ground), and melody (figure) stands out from the repetitive chords in the

musical background (ground), the pictures, words, and the melody are perceived as the figure, while the wall, the page, and the chords are the ground.

The ability to distinguish an object from its general background is basic to all form perception. And gestalt psychologists stress that form perception is an active, rather than a passive, process like selectivity of perception. Hence, there can be a shift in your perception of figure and ground such that the figure may become the ground and vice versa. Factors that determine your attention equally determine what should become the figure and what should become the ground.

By the way, what helps you in general to separate the figure from the general around in your visual perception?

This will take you to the second feature of form perception called contours.

Contours in Form Perception

You are able to separate forms from the general ground only because you can perceive contours. Contours are formed whenever a marked difference occurs in the brightness or color of the background. If you, for instance, look at a piece of paper that varies continuously in brightness from white at one border to black at the opposite border, you will perceive no contour. The paper will appear uniform, and if you are asked to say where the sheet stops being light and starts to become dark, you can only guess. On the other hand, if the change is marked rather than gradual-suppose several shades are skipped-you will see the paper as divided into two parts. In perceiving the division at the place where the brightness gradient changes abruptly, you have perceived a contour. In general, 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. When contours are disrupted visually, as in camouflage, objects are difficult to distinguish from the background.

Organization in form Perception

When several objects are present in the visual field, we tend to perceive them as organized into patterns or groupings. The Gestalt psychologists studied such organization intensively in the early part of this century. They emphasized that organized perceptual experience has properties, which cannot be predicated from a simple analysis of the components. In other words, Gestalt psychologist said —the whole is more than the sum of its parts.‖ This simply means that what is perceived has its own new properties, properties that emerge from the organization, which takes place.

Organization in perception partially explains our perception of complex patterns as unitary forms, or objects. We see objects as objects only because grouping processes operate in perception. Without them, the various objects and patterns we perceive—a face on a television screen, a car a tree, a book—would not —hang together‖ as objects or patterns., they would merely be so many disconnected sensations—dots, lines or blotches, for example.

What are some of the laws of perceptual organization?

One organizing principle is proximity, or nearness. The laws of proximity says that items which are close together in space or time tend to be perceived as belonging together or forming an organized group.

Another organizing principle of perception is similarity. Most people see one triangle formed by the dots with its apex at the top and another triangle formed by the rings with its apex at the bottom. They perceive triangle because similar items such as, the rings and the dots, tend to be organized together. Otherwise, they would see a hexagon or a six-pointed star, where all the dots are the same.

Grouping according to similarity, however, does not always occur. A figure is more easily seen as a six-pointed star than as one figure composed of dots and another figure made up of rings. In this case, similarity is competing with the organizing principle of symmetry, or good figure. Neither the circle nor the dots by themselves form a symmetrical pattern. The law of

good figure says that there is a tendency to organize things to make a balanced or symmetrical figure that includes all the parts. In this case, such a balanced figure can be achieved only by using all the dots and rings to perceive a six pointed star the law of good figure wins out over the law of similarity because the rings by themselves or the dots by themselves do not form symmetrical goods figures.

Still another principle or organization is continuation, the tendency to perceive a line that starts in one way as continuing in the same way. For example, a line that starts out as a curve is seen as continuing on smoothly curved course. A straight line is seen as continuing on a straight course or, if it does change direction as forming an angle rather than a curve. We see the dots as several curved and straight lines. Even though the curved and straight lines cross and have dots in common, it is only with an effort that we can perceive a straight line suddenly becoming a curved line at one of these functions.

Finally, the law of closure makes our perceived world or form more complete than the sensory stimulation that is presented. The law of closure refers to perceptual processes that organize the perceived world by filling in gaps in stimulation

2.3.3.Depth perception

If we live in a two-dimensional world, form perception would be sufficient. But because we live in a three-dimensional world, we have evolved depth perception-the ability to judge the distance of objects. Given that images on the retina are two dimensional, how can we perceive depth? That is, how can we determine the distance of objects (the distal stimulus) from the pattern of stimulation on our retinas (the proximal stimulus)?

Depth perception depends on the use binocular cues and monocular cues there are two kinds of binocular cues: retinal disparity and convergence. The two kinds of binocular cues require the interaction of both eyes. Retinal disparity is, the degree of difference between the image of an object that are focused on the two retinas. The closer the object, the greater is the retinal

disparity. To demonstrate retinal disparity for yourself, point a forefinger vertically between your eyes. Look at the finger with one eye closed. Then look at it with the other closed. You will notice that the background shifts as you view the scene with different views of the same stimulus. The —view master device you might have used as a child creates the impression of visual depth by presenting slightly different image to the eyes at the same time mimicking retinal disparity. Retinal disparity is greater when an object is near you than when it is farther away from you. Certain cells in visual cortex detect the degree of retinal disparity, which the brain uses to estimate the distance of an object focused on the retinas.

The second binocular cue to depth is convergence, the degree to which the eyes turn inward to focus on an object. As you can confirm for yourself, the closer the objects are the greater the convergence of the eyes. Hold a forefinger vertically in front of your face and move it toward your nose. You should notice an increase in ocular muscle tension as your finger approaches your nose. Neurons in the cerebral cortex translate the amount of muscle tension into an estimate of the distance of your finger. Not that convergence is associated with important everyday activities. For example, drinking alcohol impairs depth perception by disrupting the normal convergence of the eyes and using a computer terminal for hours induce eye fatigue caused by continues convergence.

Binocular cues require two eyes, whereas monocular cues require only one. This means that even people who have lost sight in one eye may still have good depth perception. One monocular is accommodation, which is the change in the shape of the lens that lets you focus the image of an object on the retina. Neuron in the rectum assume that the greater the accommodation of the lens, the closer the object. But prolonged accommodation can alter your depth perception. For example, if you stare at a near object for a long time and then look at a more distant object, the more distant object will look farther away than it is. This is

attributable to the brain's overcompensation for the continuous accommodation of the lens while it was focused on the near object.

A second monocular cue is motion parallax, the tendency to perceive ourselves as passing objects faster when they are closer to us than when they are farther away. You will notice this when you drive on a rural road. You perceive yourself passing nearby telephone poles faster than you are passing a farmhouse.

The remaining monocular cues are called pictorial cues because artists use them to create depth in their drawings and paintings. Leonardo da Vinci formalized pictorial cues 500 years ago in teaching his art students how to use them to make their paintings look more realistic. He noted that an object that overlaps another object will appear closer, a cue called interposition. Because your psychology professor overlaps the blackboard, you know that she or he is closer to you than the blackboard is. Comparing the relative size of objects also provides a cue to their distance. If two people are about the same height and one casts a smaller image on your retina. You will perceive that person as farther away.

You probably have noticed that parallel objects, such as railroad tracks, seem to get closer as they get further away (and farther apart as they get closer). The pictorial cue, linear perspective, may even have practical application. During World War II, naval aviation cadets flying at night sometimes crashed into airplanes ahead of them, apparently because of failure to judge the distance of those planes. Taking advantage of linear perspective solved this problem. Two taillights set a standard distance apart replaced the traditional single taillight. As a result, when pilots noticed that the taillights of an airplane appeared to move farther apart, they realized that they were getting closer to it.

An object's elevation provides another cue to its distance. Objects that are higher in your visual field seem to be farther away. If you paint a picture, you create depth by placing more distant objects higher on the canvas. Shading patterns provide cues to distance because areas

that are in shadow tend to recede, while areas that are in light tend to stand out. Painters use shading to make balls, balloons, and organs appear round. Aerial perspective depends on the clarity of objects. Closer objects seem clearer than more distant ones. A distant mountain will look hazier than a near one.

The final monocular cue, the texture gradient, affects depth perception because the nearer an object, the more details we can make out and the farther an object, the more details we can make out, and the farther an object, the fewer details we can make out. When you look across a field, you can see every blade of grass near you, but only an expanse of green far away from you. Even 7 month old infants respond to the texture gradient cue. When presented with drawings that use the texture gradient to make some objects appear to be in the foreground and others in the background, infants will reach for an object in the foreground.

2.3.4.Perceptual Constancies

The image of a given object focused on your retina may vary in size, shape, and brightness. Yet you will continue to perceive the object as stable in size, shape, and brightness because of perceptual constancy. This is adaptive, because it provides you with a more visually stable world, making it easier for you to function in it, as an object gets farther away from you, it produces a smaller image on your retina. If you know the actual size of an object, size constancy makes you interpret a change in its retinal size as a change in its distance rather than a change in its size. When you see a car a block away, it does not seem smaller than one that is half a block away, even though the more distant car produces a smaller image on your retina. Size constancy can be disrupted by alcohol. In one study, young adults drank alcohol and were then asked to estimate the size of an object. They tended to underestimate its size. Disruption of size constancy might be one way that alcohol intoxication promotes automobile accidents.

Shape constancy assures that an object of known shape will appear to maintain its normal shape regardless of the angle from which you view it. Close this book and hold it at various orientations relative to your line of sight. Unless you look directly at the cover when it is on a plane perpendicular to your line of vision, it will never cast a rectangular image on your retinas, yet you will continue to perceive it as rectangular. Shape constancy occurs because your brain compensates for the slant of an object relative to your line of sight.

Though the amount of light reflected from a given object can vary, we perceive the object as having a constant brightness, this is called brightness constancy. A white shirt appears equally bright in dim light or bright light. But brightness constancy is relative to other objects. If you look at a white shirt in dim light in the presence of nonwhite objects in the same light, it will maintain its brightness. But if you look at the white shirt by itself, perhaps by viewing a large area of it through a hollow tube, it will appear dull in dim light and brighter in sunlight.

2.3.5. Perceptual Illusion

In Edgar Allan Poe's "The sphinx,"¹ a man looks out of his window and is horrified by what he perceives to be a monstrous animal on a distant mountain. He learns only later that the "monster"¹ was actually an insect on his window. Because he perceived the animal as far away, he assumed it was relatively large. And because he never had seen such a creature, he assumed that it was a monster. This shows how the misapplication of a visual cue, in this case perceived size constancy, can produce a visual illusion. Visual illusions provide clues to the processes involved in normal visual perception. For example, from ancient times to modern times, people have been mystified by the moon illusion illustrated in Figure in which the moon appears larger when it is at the horizon than when it is overhead. This is an illusion because the moon is the same distance from us at the horizon as when it is overhead. Thus, the retinal image it produces is the same size when it is at the horizon as when it is overhead.

Perhaps Franz Muller-Lyer, developed the most widely studied illusion. Note in Fig 2/5 (A) that the vertical line at the bottom appears longer than the one at the top. But if you take a ruler and measure the lines, you will find that they are equal in length. Figs 5.33 (B to D) are variants of the Muller-Lyer illusion.

Though no explanation has achieved universal acceptance, a favored one relies on size constancy and the resemblance of the figure on the right to the inside corner of a room and the resemblance of the figure on the left to the outside corner of a building. Given that the lines project images of equal length on the retina, the lines that appear farther away will be perceived as longer. Because an inside corner of a room appears farther away than an outside corner of a building, the line on the right appears farther and, therefore, longer than the line on the left.

In general, perception is the act of knowing through sensation. But, some people appear to have an ability to know other people, objects, and events without any sensory contact an experience called extra sensory perception (ESP) or paranormal ability. Have you ever heard or experienced such phenomena? What specific type? Do you believe it is true? Do you think psychologists and scientists believe in ESP? Why?