Sensation and Perception

Scenario

As Isabel sat down to Thanksgiving dinner, her father carried the turkey in on a tray and placed it squarely in the center of the table. The noise level, already high from the talking and laughter of family members, grew louder still. As Isabel picked up her fork, the smell of the turkey reached her and she felt her stomach growl hungrily. The sight and sound of her family around the table, along with the smells and tastes of the holiday meal, made Isabel feel more relaxed than she had since starting school in the fall.

Sensation vs. Perception

Sensation encompasses the processes by which our sense organs receive information from the environment. **Perception** is the brain's and the sense organs' sorting out, interpretation, analysis, and integration of stimuli.

The primary difference is that sensation can be thought of as an organism's first encounter with a raw sensory stimulus, whereas perception is the process by which it interprets, analyzes, and integrates that stimulus with other sensory information.

Sensation vs. Perception

In formal terms, **sensation** is the activation of the sense organs by a source of physical energy. **Perception** is the sorting out, interpretation, analysis, and integration of stimuli carried out by the sense organs and brain. A **stimulus** is any passing source of physical energy that produces a response in a sense organ.

Absolute Thresholds: Detecting What's Out There

Just when does a stimulus become strong enough to be detected by our sense organs? An absolute threshold is the smallest intensity of a stimulus that must be present for it to be detected. As the strength of a stimulus increases, the likelihood that it will be detected increases gradually. Technically, then, an absolute threshold is the stimulus intensity that is detected 50% of the time.

It often takes a very small stimulus to produce a response in our senses. For example, the sense of touch is so sensitive that we can feel a bee's wing falling on our cheeks when it is dropped from a distance of 1 centimeter.

Absolute Thresholds: Detecting What's Out There

Of course, the absolute thresholds are measured under ideal conditions. Normally our senses cannot detect stimulation quite as well because of the presence of noise. **Noise**, as defined by psychophysicists, is background stimulation that interferes with the perception of other stimuli. Hence, noise refers not just to auditory stimuli, as the word suggests, but also to unwanted stimuli that interfere with other senses.

For example, picture a talkative group of people crammed into a small, crowded room at a party. The din of the crowd makes it hard to hear individual voices. In this case, the crowded conditions would be considered "noise," because it is preventing sensation at more discriminating levels. Similarly, we have limited ability to concentrate on several stimuli simultaneously.

Difference Thresholds: Noticing Distinctions Between Stimuli

Suppose you wanted to choose the six best apples from a supermarket display—the biggest, reddest, and sweetest apples. One approach would be to compare one apple with another systematically until you were left with a few so similar that you could not tell the difference between them.

The smallest level of added or reduced stimulation required to sense that a change in stimulation has occurred. Thus, the difference threshold is the minimum change in stimulation required to detect the difference between two stimuli, and so it also is called a **just noticeable difference**

Difference Thresholds: Noticing Distinctions Between Stimuli

The relationship between changes in the original size of a stimulus and the degree to which a change will be noticed forms one of the basic laws of psychophysics: Weber's law. Weber's law (Weber is pronounced "VAY-ber") states that a just noticeable difference is a constant proportion of the intensity of an initial stimulus (rather than a constant amount).

Weber's law helps explain why a person in a quiet room is more startled by the ringing of a cellphone than is a person in an already noisy room. To produce the same amount of reaction in a noisy room, a cellphone ring would have to be set to a much higher level. Similarly, when the moon is visible during the late afternoon, it appears relatively dim. On the other hand, the moon appears much brighter when it is in the dark night sky.

Sensory Adaptation: Turning Down Our Responses

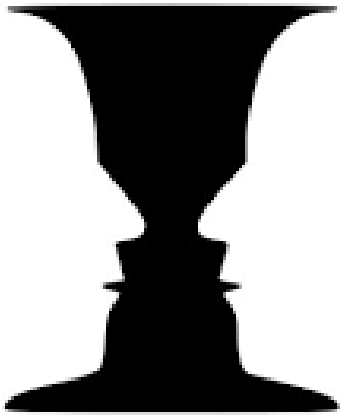
You enter a movie theater, and the smell of popcorn is everywhere. A few minutes later, though, you barely notice the smell. The reason you become accustomed to the odor is sensory adaptation. **Adaptation** is an adjustment in sensory capacity after prolonged exposure to unchanging stimuli.

This apparent decline in sensitivity to sensory stimuli is due to the inability of the sensory nerve receptors to fire off messages to the brain indefinitely. Because these receptor cells are most responsive to changes in stimulation, constant stimulation is not effective in producing a sustained reaction.

Perceptual Organization: Constructing Our View of the World

The fact that we can look at the same figure in more than one way illustrates an important point. We do not just passively respond to visual stimuli that happen to fall on our retinas. Rather, we actively try to organize and make sense of what we see.

We turn now from a focus on the initial response to a stimulus (ion) to what our minds make of that stimulus (perception). Perception is a constructive process by which we go beyond the stimuli that are presented to us and attempt to construct a meaningful situation.

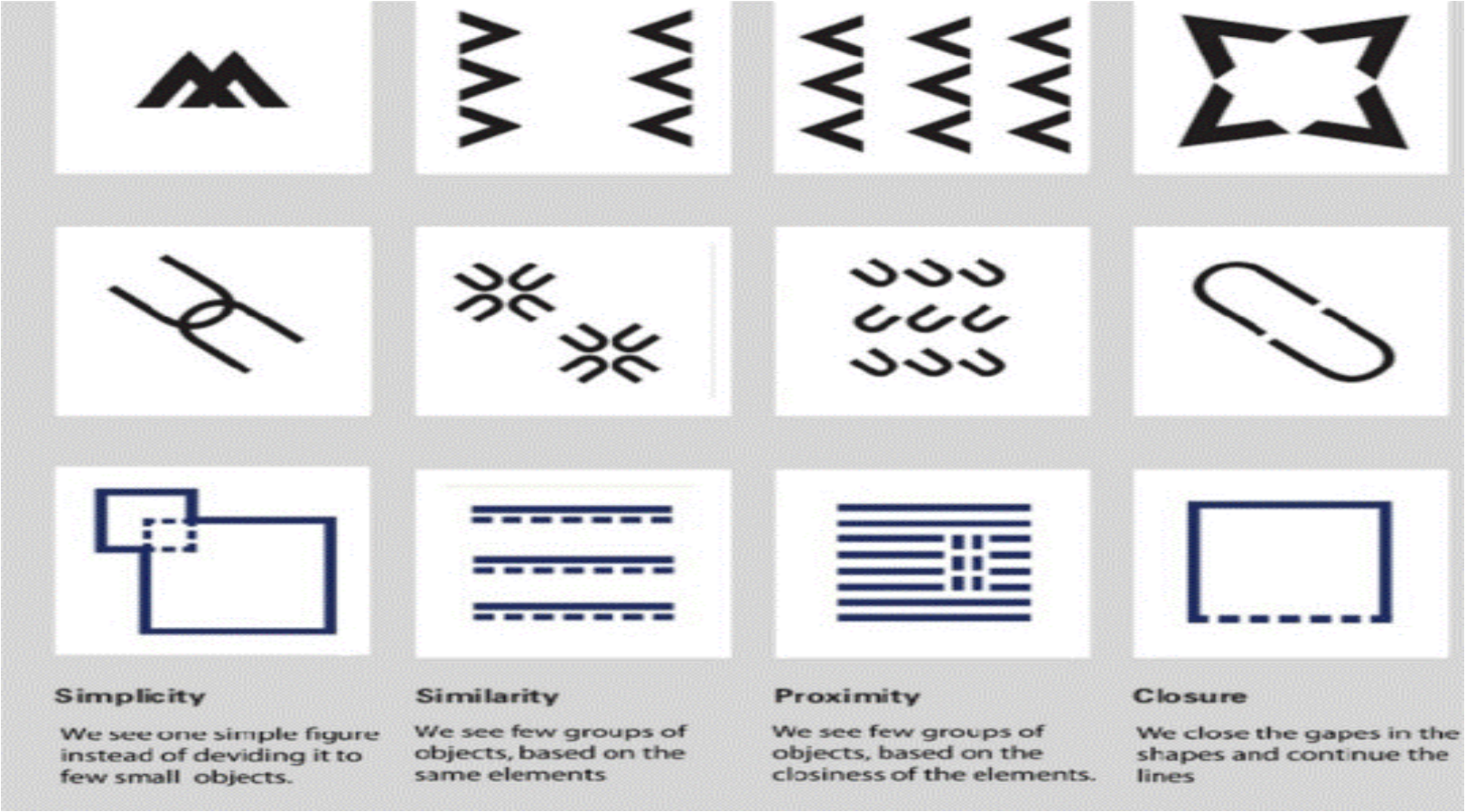


The Gestalt Laws of Organization

The most basic perceptual processes can be described by a series of principles that focusing on ways we organize pieces of information into meaningful wholes.

- **Closure**: We group elements to form enclosed or complete figures rather than open ones and tend to ignore breaks and concentrate on the overall form.
- **Proximity**: We perceive elements that are closer together as grouped together. As a result, we tend to see pairs of dots.
- **Similar:** Elements that are similar in appearance we perceive as grouped together.
- **Simplicity**: When we observe a pattern, we perceive it in most basic, straightforward manner that we can.

Image


Simplicity
We see one simple figure instead of deviding it to few small objects.
Similarity
We see few groups of objects, based on the same elements
Proximity
We see few groups of objects, based on the closiness of the elements.
Closure
We close the gapes in the shapes and continue the lines

Top-Down and Bottom-Up Processing

Ca- yo- re-d t-is -en-en-e, w-ic- ha- ev-ry -hi-d l-tt-r m-ss-ng? It probably won't take you too long to figure out that it says: "Can you read this sentence, which has every third letter missing?"

In **top-down processing**, perception is guided by higher-level knowledge, experience, expectations, and motivations. You were able to figure out the meaning of the sentence with the missing letters because of your prior reading experience and because written English contains redundancies. Not every letter of each word is necessary to decode its meaning. Moreover, your expectations played a role in your being able to read the sentence.

Although at first it is difficult to distinguish anything in this drawing, keep looking, and eventually you may see the figure of a dog. The dog represents a gestalt, or perceptual, whole, which is something greater than the sum of the individual elements.

Top-Down and Bottom-Up Processing

Bottom-up processing consists of the progression of recognizing and processing information from individual components of a stimuli and moving to the perception of the whole. We would make no headway in our recognition of the sentence without being able to perceive the individual shapes that make up the letters. Some perception, then, occurs at the level of the patterns and features of each of the separate letters.

Top-down and bottom-up processing occur simultaneously, and interact with each other, in our perception of the world around us. Bottom-up processing permits us to process the fundamental characteristics of stimuli, whereas top-down processing allows us to bring our experience to bear on perception.

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Depth Perception: Translating 2-D to 3-D

The ability to view the world in three dimensions and to perceive distance—a skill known as **depth perception**—is due largely to the fact that we have two eyes. Because there is a certain distance between the eyes, a slightly different image reaches each retina. The brain integrates the two images into one view, but it also recognizes the difference in images and uses this difference to estimate the distance of an object from us. The difference in the images seen by the left eye and the right eye is known as **binocular disparity**

If we view two objects, and one is considerably closer to us than the other is, the retinal disparity will be relatively large. That disparity leads us to have a greater sense of depth between the two. However, if two objects are a similar distance from us, the retinal disparity will be minor

Perceptual Constancy

is the recognition that physical objects are unvarying and consistent even though our sensory input about them varies. Perceptual constancy allows us to view objects as having an unchanging size, shape, color, and brightness, even if the image on our retina changes.

For example, despite the varying size or shape of the images on the retina as an airplane approaches, flies overhead, and then disappears, we do not perceive the airplane as changing shape or size. Experience has taught us that the plane's size remains constant.