Mental processes

Definition: Mental processes are activities of the Central Nervous System based on specific neuro-physiological structures and accomplishing specific functions

- Example: memory
    - it is an activity of CNS
    - it depends on specific cerebral areas (e.g. hippocampus)
    - it has the specific role to retain information

Mental processes are classified in three main categories:

- cognitive
- affective
- executor

Cognitive mental processes:

- sensation
- perception
- attention
- memory
- thought and language
- imagination

Affective mental processes:

- disposition
- affective reactions:
    - affects
    - emotions
    - feelings
    - passions

Conative mental processes:

- motivation
- volition
- activity

Sensation:

Definition: A sense is a system that translates information from outside the nervous system into neuronal activity. Messages from the senses are called sensations

Examples: brightness, color, distance, consistence, tonality

Steps in sensation:

- Accessory structures – first collect and modify sensory stimuli
    - Examples:
        - Focusing light on the retina by the cornea, pupil iris and lens
        - The energy from sound waves is collected and transmitted to the cochlea through a series of accessory structures, including pinna, tympanic membrane, malleus (hammer), incus (anvil), stapes (stirrup), and oval window.
- Transduction is the process of converting incoming energy of the stimulus into neural activity; it is accomplished by sensory receptors
    - Receptors are neural cells specialized to detect energy of some type
    - Examples:
        - Photoreceptors in the retina are cones and rods
        - Auditory receptors are the hair cells in the basilar membrane
- Transmission is the process of transferring neural activity through the thalamus (except in the case of olfaction) and on to the cortex
- Representing stimuli
    - Information from the left side of the sensory world is represented in the right side of the cerebral cortex and vice versa
    - The primary cortex is the region of cerebral cortex in which a sense is first represented
    - The association cortex are areas of the cortex that integrates information from more than one sense

The problem of coding

- Coding is the translation of physical properties of a stimulus into a pattern of neural activity that specifically identifies those physical properties
- It is the language the brain uses to describe sensations
- Coding is characterized by specific nerve energies: stimulation of a particular sensory nerve provides codes for that one sense no matter how the stimulation takes place
- Example – applying gentle pressure to your eyeball you will produce activity in the optic nerve and sense little spots of light

Senses:

Hearing: detects sound

- Sound is a repetitive fluctuation in a pressure of a medium (like air)
    - the amplitude of sound waves produce the psychological dimension of loudness
    - the frequency of sound waves produce the psychological dimension of tune

Vision: detects light

- Light is electromagnetic radiation (visible light has wavelength from about 400 to about 750 nanometers)
    - light intensity determines its brightness
    - different light wavelengths are sensed as different colors

The chemical senses: Smell and Taste

- Olfaction: detects volatile chemicals that come into contact with olfactory receptors in the nose
- Gustation: detects chemicals that come into contact with taste receptors on the tong and in other parts of the mouth

Somatic senses:

- Skin senses
    - Touch and Temperature
        - nerve endings in the skin generate touch sensations when they are mechanically stimulated
        - some nerve endings are sensitive to temperature and some respond to both temperature and touch
    - Pain
        - protects the body from the damaging stimuli
        - sharp pain and dull, chronic pain are carried by different fibers

Proprioception

- Proprioceptive senses provide information about the body
    - Kinesthesia provides information about the positions of body parts with respect to each other
    - The vestibular sense provides information about the head in space

Perception:

Definition: Perception is the process through which people use knowledge and understanding of the world to interpret sensations as meaningful experiences.

Features of perception:

Perception has six main characteristics:

1. Knowledge based – it depends to the information existing in the memory. (Example: if you do not know what snakes look like your chances of recognizing and avoiding snakes in the woods are poor)
2. Inferential – people do not always have complete sensory information about an object, but their perceptual system make perceptual hypotheses about what they may not see, hear or feel. (Example: seeing your head trunk and arms I can mentally represent your complete body)

3. Categorical – sensations are placed into categories based on common features. (Example: you place certain sounds in a category called “human voice”, even if they sound unlike any other voice or language you have ever heard)
4. Relational – you perceive a stimulus pattern not only because its features, but also because these features are related to one another in a coherent and consistent way. (Example: your ability to perceive that someone is unusually tall requires that you see that person in relation to other people)
5. Adaptive – perception allow you to focus on the most important information needed to handle a particular situation. (Example: people quickly identify stimuli associated with food or other desirable goals, as well as those that are likely to be dangerous)
6. Often automatic – operating without our awareness. (Example: you do not have to stop and ask yourself “Is our behavioral science teacher man?”)

Organizing the perceptual world:

- *Principles of Perceptual Organization*
    - When people perceive objects or sounds they automatically discriminate figure from ground
    - The perceptual system automatically groups stimuli into patterns on the basis of
        - proximity
        - similarity
        - continuity
        - closure
        - orientation
        - common flat
- *Perceptual Constancy*
    - The brightness, size and shape of objects can be seen as constant even though the sensations received from those objects may change
        - size and shape constancy depend on the relationship between the retinal image of the object and the knowledge-based perception of its distance

    - brightness constancy depends on the perceived relationship between the brightness of an object and its background

- *Depth perception*
    - The perception of distance depends partly on stimulus cues and partly on the physical structure of the visual system
        - stimulus cues
            - relative size
            - height in the visual field
            - interposition
            - reduced clarity
            - shadows
        - cues based on the physical structure of the visual system
            - binocular disparity (the fact that eyes are set apart)
            - convergence of the eyes (the fact that eyes must move to focus on the same object)
            - accommodation (the change in the shape of the lenses as objects are brought into focus)

- *The perception of Motion*
    - It results in part from the movement of stimuli across the retina
        - example expanding stimulation of the retina is perceived as an approaching object
    - Stimulation of the retina by moving objects is interpreted along with information about movement of the head, eyes and other parts of the body
        - in this way, retinal stimulation resulting from one's own movements can be distinguish from motion resulting from the movements of external objects