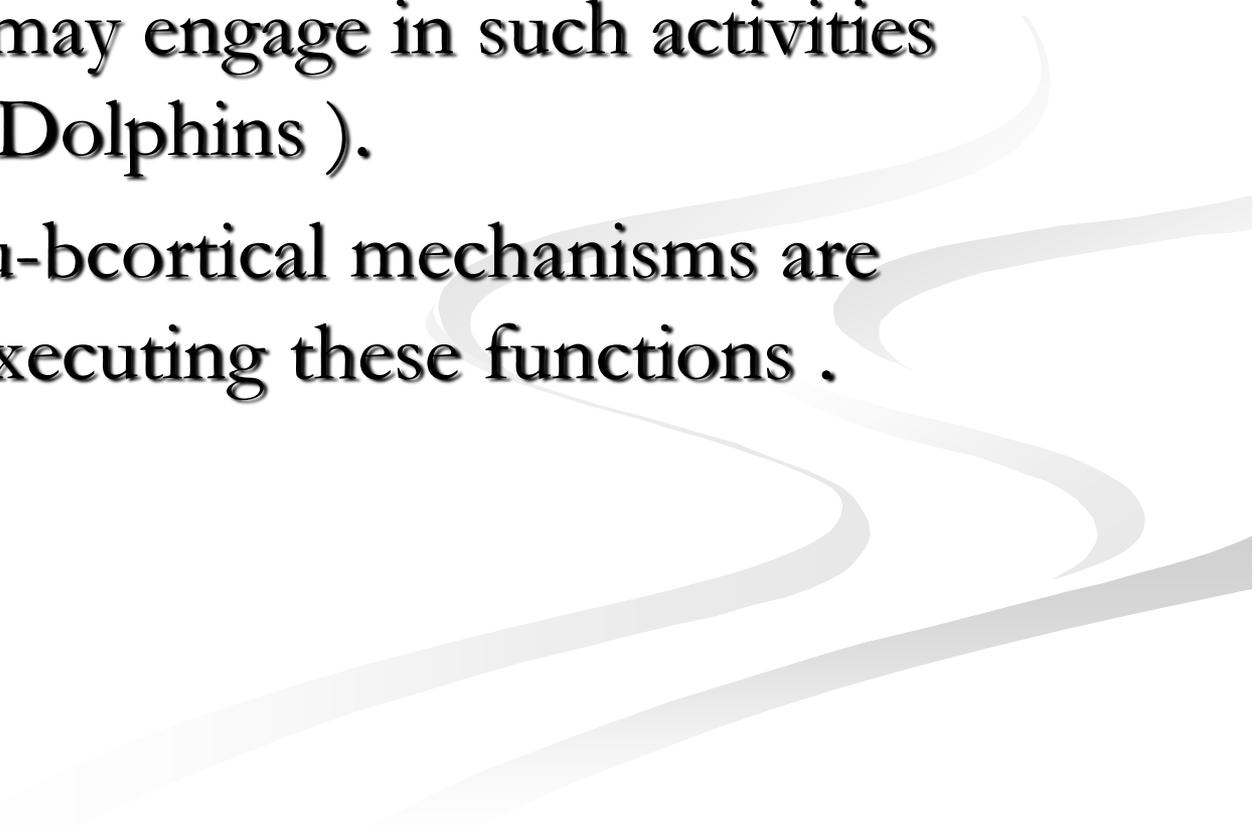


CNS higher functions

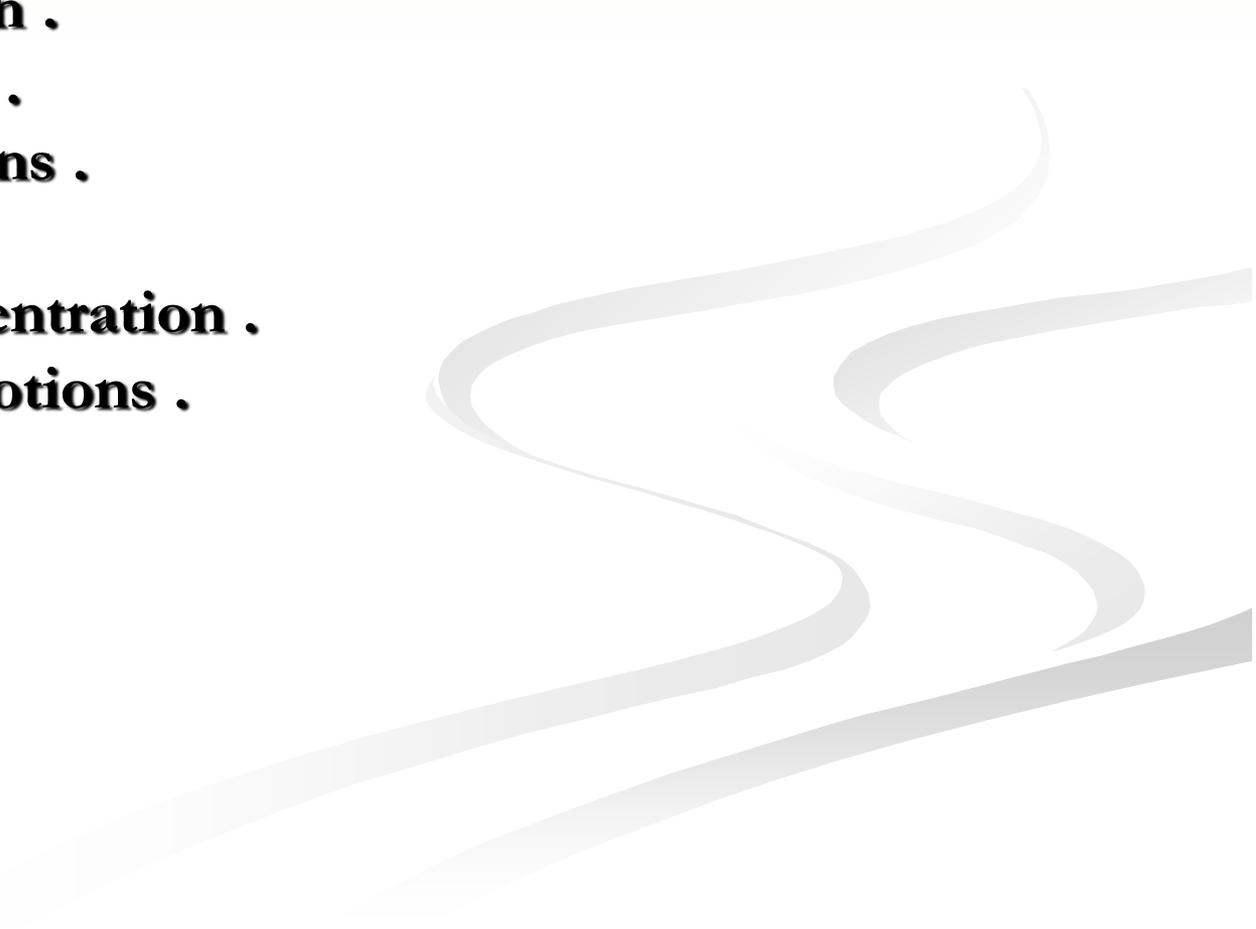
Radwan Banimustafa MD

The slide features a light beige background with a subtle gradient. In the lower right quadrant, there are several overlapping, wavy, light gray lines that create a sense of movement and depth, extending from the right edge towards the center.

Introduction

- Higher functions refers to those cognitive activities that are most developed in man some other animals may engage in such activities (Chimpanzee, Dolphins).
 - Cortical and su-bcortical mechanisms are important in executing these functions .
- 

High CNS functions include :

- **Language .**
 - **Concept formation .**
 - **Problem solving .**
 - **Executive functions .**
 - **Memory .**
 - **Attention – Concentration .**
 - **Expression of emotions .**
 - **Reasoning .**
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- The background of the slide features several thick, light gray wavy lines that flow from the bottom left towards the right side, creating a sense of movement and depth.

Learning

- Capacity to associate and store sequences and patterns of events in time and space
- Discrete stimulus characteristics are stored as individual nerve cell responses, and associated via synaptic links between cells facilitated by Neurotransmitter release at Synapses

Implicit Learning

- Association of simple sequential sensory- motor responses via lower cortical mediation
- Facilitated by neurotransmitter glutamate at synapse; inhibited by GABA .
- Automatic, reflexive, without conscious participation, accumulates by repetition

Explicit Learning

- Complex associations between diverse stimuli/ events that vary in time /space (context)
- More complex cortical mechanisms & long term potentiation effect allows for processing more information
- Facilitated by glutamate binding with NMDA and non-NMDA receptors
- Requires conscious participation
- Hypothesis testing

Emotions

- Difficult to define, generally it is a subjective aspect involving “feelings” and a behavioral aspect seen in changes in facial expression and posture .
- An emotion or mood state may result from sensory or cognitive stimulus .
- Both limbic & autonomic nervous system are involved in the emotions and their expression.

Attention

- The ability to focus your mental effort on certain stimuli (test) while excluding other.
- Selectivity is important aspect of attention .
- Attention is also shiftable mostly at will .
- Attention plays an important role in encoding information in memory (automatic ,effortful processing).
- It is almost impossible to perform two or more difficult activities simultaneously without overloading your focus of attention .

Language

- Language is a system of symbols used to communicate with others , in humans is characterized by organizational rules and infinite generativity .
- Phonology, morphology, syntax, semantics .
- Estimates vary as to how long ago humans acquired language(20-70.000 yrs)
- Biological, Environmental, cultural influences
- Critical period of learning language .

Perception

- Perception is the brain process of organizing and interpreting sensory information to give it meaning .
- How much of a stimulus is necessary for you to see, hear, taste, smell, or feel something?.
- Each of us has an absolute threshold , ie minimum amount of energy that we can detect .

Approximate absolute thresholds for five senses

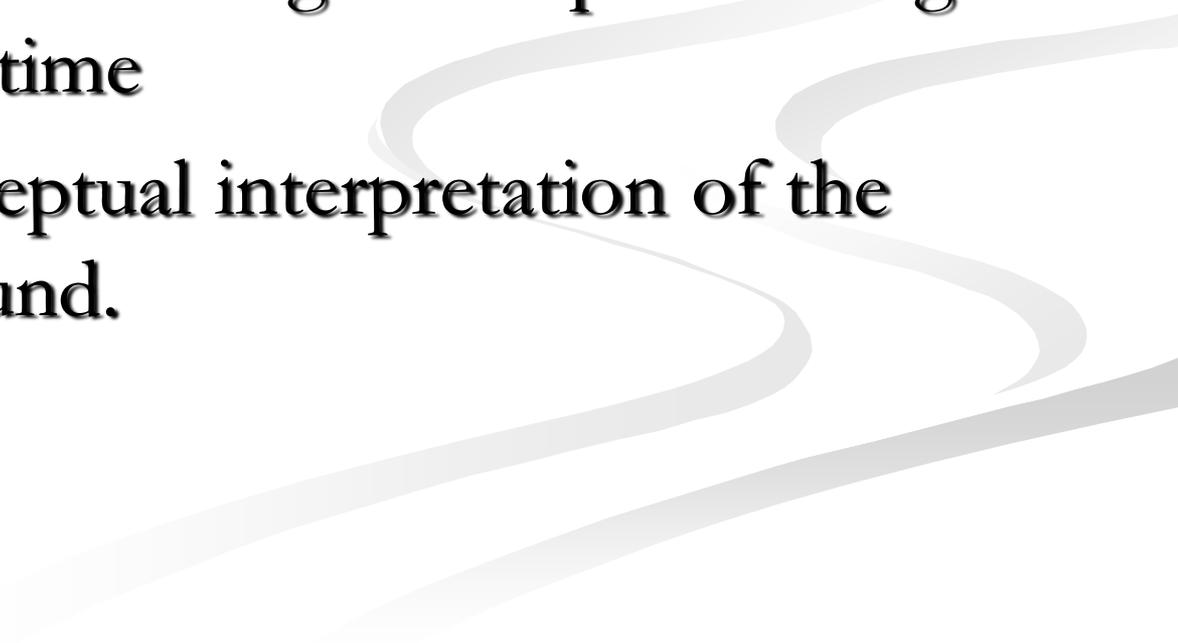
- Vision — A candle flame at 30 miles on a dark clear night .
- Hearing — A ticking watch at 20 ft. under quiet conditions .
- Taste — A teaspoon of sugar in 2 gallons of water .
- Smell — one drop of perfume diffused through three rooms .
- Touch — The wing of a fly falling on your cheek from a distance of one cm.

- Difference threshold or just noticeable difference is the smallest difference in stimulation required to discriminate one stimulus from another 50% of the time .
- Sensory adaptation, habituation or stimulus boredom is weekend sensitivity to prolonged stimulation, it is a mixed blessing .

Visual system

- Light is an electromagnetic energy that can be described in terms of wave length .
- The receptors in the human eye are sensitive to wavelengths from 400-700nm.
- the lens focus light on the retina, chemicals in the retina breakdown light in to neural impulses which the optic nerve transmits to the brain .
- Objects appear colored because they reflect certain wavelength of light between 400-700nm .

Auditory System

- Sounds or sound waves are vibrations in the air that are processed by our auditory system .
 - Frequency of the sound waves is the number of the cycles or full wavelength that pass through a point in a given time
 - Pitch is the perceptual interpretation of the frequency of sound.
- 

- Amplitude is the amount of pressure produced by a sound wave relative to a standard it is measured by decibels (dB).
- Noise rated at 80dB or higher if heard for prolong time can cause permanent hearing loss (quite library 40dB, car horn 90dB, rock band 120dB).
- Timber is the tone color or the perceptual quality of a sound.

Thank you

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