Types of Higher Nervous Activity. Features of the Human HNA. Physiological Basis of Psychic Functions

Types of Higher Nervous Activity

- This is a set of innate and acquired properties of the nervous system (excitation and inhibition), which determine the characteristics of behavior.
- The concept of " HNA Type" was proposed by I.P.Pavlov.
- The HNA types are based on genotype features.
- Each person has genes of all types of HNA, but they are manifested in different degrees. It depends on the living conditions.

The Classification of the Types of HNA (I.P.Pavlov)

1. Strong, balanced, mobile
2. Strong, balanced, inert
3. Strong, unbalanced
4. Weak

Temperament

- **Temperament** is a set of psychic properties of a person that determine the characteristics of behavior (psychological term).

- The concept of "temperament" was suggested by Hippocrates.

- The basis of different types of temperament is the type of HNA. Temperament is an external manifestation of the HNA type.

Classification of Temperaments (Hippocrates)

1. Sanguine (It characterizes a strong, balanced, mobile type of HNA).
2. Phlegmatic (It characterizes a strong, balanced, inert type of HNA).
3. Choleric (It characterizes a strong, unbalanced type of HNA).
4. Melancholic (It characterizes a weak type of HNA).

The Type of HNA Detection (I. P. Pavlov)

The type of higher nervous activity is based on **the properties of neural processes** (excitation and inhibition):

- **Strong**
- **Balance**
- **Mobility**

Criteria for Evaluating the Strength of Neural Processes

1. **The speed of occurrence of conditioned reflexes**.

If conditioned reflexes are developed quickly, the nervous process is strong.

If you need more than 15 combinations of indifferent and unconditional stimuli to develop conditioned reflexes, then the nervous process is weak.

2. **The degree of expression of conditioned reflexes**.

3. **Duration of conservation of conditioned reflexes**.

Types of HNA Depending on the Strength of Neural Processes

- **Strong Type**

The processes of excitation and inhibition are strong.

- **Weak Type**

The processes of excitation and inhibition are weak.

Criteria for Evaluating the Balance of Neural Processes (Only for the Strong Type)

- If the excitation and inhibition strong are approximately the same, the processes are balanced.
- If the strong of the excitation process is greater than the strong of the inhibition process, the processes are unbalanced.

Types of HNA Depending on the Balance of Neural Processes

- **Strong, Balanced Type**.

The excitation and inhibition strong are approximately the same.

- **Strong, Unbalanced Type**.

The strong of the excitation process is greater than the inhibition strong.

Criteria for Evaluating the Mobility of Nerve Processes (Only for the Strong Balanced Type)

- The mobility of nervous processes can be estimated by the rate of disappearance of one reflex and the development of another.
- If the inhibition of the conditioned reflex and the development of a new conditioned reflex (re-learning) occurs quickly, then the nervous processes are mobile.
- If re-learning is slow, then the neural processes are inert.

Types of HNA Depending on the Mobility of Neural Processes

- **Strong, Balanced, Mobile Type**.

Nervous processes are mobile.

- **Strong, Balanced, Inert Type**.

The neural processes are inert

Value of HNA Types

1. For medicine:
- predisposition to various diseases,
- different course of the disease,
- different subjective attitude to your illness.
2. For interpersonal relationships.
3. For the education of children.
4. For the choice of profession.

Features of the Human HNA

- Social motivations.
- Higher emotions.
- Higher-order conditioned reflexes.
- Speech.
- Higher mental functions (abstract thinking, consciousness, voluntary attention).
- Presence of a second signal system.

The First Signal System is the activity of the brain when specific stimuli act on the sensory organs.
The first signal system includes:unconditioned reflexes and conditioned reflexes.

The Second Signal System is the activity of the brain under the action of verbal stimuli.

The second signal system includes higher-order conditioned reflexes.

The stimulus of the second signal system is the meaning of the word.

The Stimulus of the Second Signal System is the Meaning of the Word

- The word is an abstract stimulus, that is, detached from a specific stimulus.
- A word is a symbol, a substitute for a specific stimulus.
- The word has a generalizing meaning.

  It denotes a group of stimuli that have common properties and perform similar functions.

  For example, chairs are different, but they all have a similar structure and perform the same function (you can sit on a chair).

The Second Signal System is Related to Speech

- **Speech** is a form of communication between people with each other using words.
- **The Mechanisms of Speech**

1. Peripheral apparatus of sound generation

(lips, teeth, tongue, nasopharynx, glottis, vocal cords, laryngeal muscles, lungs, etc.).

2. Analyzers (visual, auditory, somatosensory)

3. Brain (cortical) centers of speech

(motor, associative).

The Speech Centers

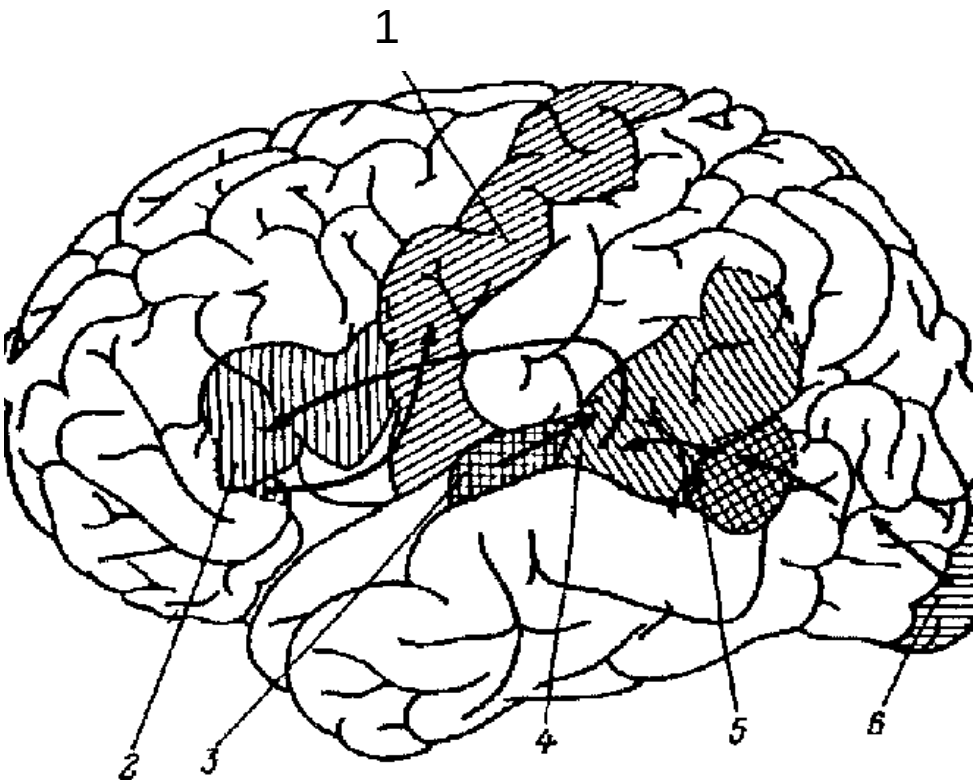
There are two speech centers in the left hemisphere of the brain.

1. **Wernicke center** (in the posterior part of the upper temporal gyrus of the left hemisphere).

This center provides perception and understanding of speech.

2. **Broca's center** (at the base of the lower frontal gyrus of the left hemisphere).

This center controls the implementation of speech reactions, the construction of speech programs (responsible for spoken and written speech).



1. Motor zone
2. Broca's center
3. Primary auditory cortex
4. Wernicke center
5. Angular gyrus
6. Primary visual cortex

Formation of the Second Signal System

- In a child, the second signal system is formed mainly at the age of 1-3 years
- The critical period of speech formation is 5 years.
- Neural connections for building speech centers are lost after 5 years.

Stages of Development of The Generalizing Function of the Word

- **First Degree of Integration**

A word is a specific object.

- **Second Degree of Integration**

The word replaces several similar items.

- **Third Degree of Integration**

The word replaces images of heterogeneous objects.

- **Fourth Degree of Integration**

The word combines a number of generalizations of the third degree.

Features of Reflexes of the Second Signal System

- The reflexes of higher orders.
- Very quickly produced (just one combination of indifferent and unconditional stimulus).
- They are exposed to adverse factors (they disappear first when intoxicated, in a state of general anesthesia).

Bilateral Relationships of the Cerebral Cortex and Internal Organs (K. M. Bykov)

- **Afferent Connections**

- Conditional interoceptive reflexes.
- Diseases of internal organs lead to neurosis.
- Electrical stimulation of internal organs leads to excitation in the cortex (method of induced biopotentials).

- **Efferent Connections**

- Irritation of cortical areas leads to changes in the work of internal organs.
- Yogis can control the work of internal organs.
- Neurosis leads to diseases of the internal organs.

Physiological Bases of Psychotherapy

- **Psychotherapy** is a treatment by influencing the word on psychic functions.

- **Types of Psychotherapy**

- **Psycho-therapeutic belief** is an explanation of the cause of the disease, its essence, and the possibility of treatment.
- **Suggestion** is the introduction of thoughts to a person without critic.
- **Hypnosis** is suggestion during a hypnotic state.
- **Autogenic training (self- suggestion)** this is the training of the ability to consciously control the activity of internal organs and the emotional sphere.

Psychic Functions

Personality Traits

- Temperament
- Character (features of HNA due to heredity and external conditions of development)
- Needs and drives

Psychic State

- Emotions

Psychic Process

- Sensation
- Perception
- Representation
- Memory
- Attention
- Thinking
- Consciousness

Sensation

- A sensation is a reflection of the properties of an object or phenomenon in a person's mind.
- The excitation occurs in the primary sensory zone of the cortical part of the analyzer.
- There is a higher analysis of the properties of the stimulus.
- The stimulus can be described.

Perception

- Perception is a complete reflection of an object or phenomenon.
- The excitation occurs in the secondary sensory zone of the analyzer.
- There is a higher synthesis.
- The stimulus can be recognized.

Representation

- Representation is a reflection of an object or phenomenon in its absence, identification of the object or phenomenon.
- Memory mechanisms are involved.

Memory

Memory is the process of remembering, storing, and reproducing information.

Types of Memory

1. By the analyzer that receives the information

- Visual,
- Auditory, etc.

2. The peculiarities of memorization

- Involuntary
- Arbitrary

3. According to the method of memorizing

- Mechanical
- Logical

4. By information storage time

- Short-term (up to 30 minutes)
- Long-term (long time)

Attention

- Attention is the orientation of mental processes to an object or phenomenon.
- **Mechanism:** the emergence of a dominant in the cortex of the cerebral hemispheres.

Types of Attention

- Voluntary
- Involuntary

Higher Psychic Processes

- Thinking
- Consciousness

Thinking

- Thinking is the process of searching for cause-and-effect relationships between objects and phenomena.

Kind of Thinking

- Specifically-shaped (with the help of the 1-st signal system).
- Abstract logic (with the help of the 2nd signal system).

Consciousness

- Consciousness is a subjective reflection of real reality by the brain.

Structure of Consciousness

- **Subconsciousness**

This is the perception of pre-threshold stimuli, automated activity

- **Self-consciousness**

This is an adequate attitude to yourself, an understanding of your place in reality.

- **Consciousness**

This is an adequate attitude to reality.

- **Super-consciousness (intuition)**

This is the ability to make predictions, to anticipate something. It is based on existing experience and accumulated knowledge.

Functional Brain Asymmetry

Functions of the Left Hemisphere	Functions of the Right Hemisphere
Verbal (speech) (understanding of words, symbols, signs). 2nd signal system.	Nonverbal (understanding facial expressions and gestures). 1st signal system.
Orientation in time	Orientation in space
Analysis	Synthesis
Abstract-logical thinking	Concrete-imaginative thinking. Face recognition and identification of objects when they are felt. Talent for music.

Types of Mental Activity (I. P. Pavlov)

- **Art**

The functions of the right hemisphere predominate.

- **Cogitative**

The functions of the left hemisphere predominate.

- **Mixed**

The functions of the right and left hemispheres are expressed in the same degree.

Functional System (P. K. Anokhin)

- The behavioral act is performed with the participation of a functional system.
- A functional system is a dynamic, heterogeneous, self-regulating system, all the components of which, belonging to different physiological systems, interact with each other and provide a useful result.

Types of Functional Systems

- With homeostatic results
- With the end result
- Mixed

Functional System of a Behavioral Act

1. **Formation of the apparatus of afferent synthesis** (associative cortex)
   - Motivation
   - Memory
   - Situational afferentation
   - Trigger afferentation
2. **Decision making** (associative cortex)
3. **Formation of the apparatus of the acceptor of the result of action** (a neural model of the expected result is formed)
4. **Forming an action program** (associative cortex)
5. **Behavioral act** (actions aimed at obtaining a useful result, satisfaction of a need)
6. **Reverse afferentation**

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