PHYSIOLOGICAL BASIS LABOUR ACTIVITY

Physiology of Labour Activity

- This section of physiology studies the impact of work on the physiological state of the body.
- It justifies the methods of organizing the labor process to maintain high performance and maintain health.

Elements of the Labour Process That Affect the Physiological State of the Body

- Stereotypically repetitive work.
- Forced working position.
- Increased loads on the visual analyzer.
- Nervous and psychoemotional tension.
- The monotony of working the action.
- Hypokinesia.
- Organization of the labor process and recreation (availability of breaks and their filling).
- Adverse production factors (temperature, pressure, humidity, noise, vibration, harmful chemicals, poor lighting).

Physiological Mechanisms of Labour Activity

- Motivation.
- The formation of a dynamic stereotype.
- Participation of the second signal system.
- Increased lability of excitable structures (rhythm assimilation).
- Activation of mental functions (memory, thinking, consciousness).
- Activation of analyzers.
- Activation of the autonomic nervous system and endocrine glands.

The Value of Motivation

- Active purposeful activity is the basis of labor. This activity is motivated by the biological and social needs of a person and is aimed at creating material and spiritual benefits.
- The set of nerve centers is involved in the performance of labor activity. Their work is coordinated which is provided by the dominant mechanism.
- Cortical dominant is the basis of attention, concrete thinking. Movements become coordinated and effective.
- The mobilization of physiological mechanisms of labor activity occurs in accordance with the laws of the functional system.

The Value of a Dynamic Stereotype

- **Positive Value of a Dynamic Stereotype**

Actions are performed at the level of the subconscious, more economical, less tedious, do not require attention and control of consciousness.

- **Negative Value of a Dynamic Stereotype**

Monotony of actions leads to a lack of information, reducing the excitability of cortical cells.

The Value of the Second Signal System

A person mentally (using words) makes a program of activities before starting work:

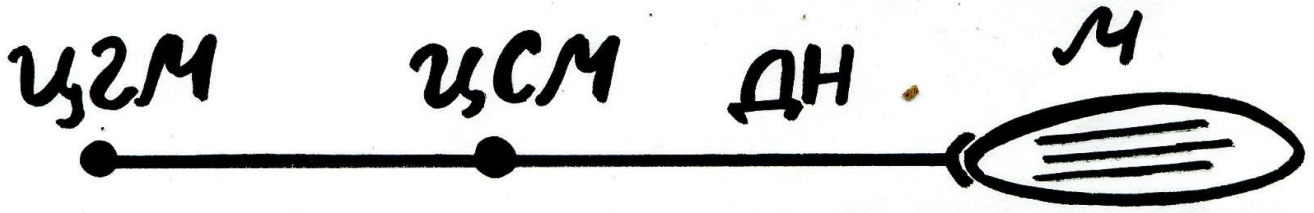
- formulates a goal,
- defines the sequence of operations,
- assumes the result of the activity.

Increasing the Lability of Excitable Structures (Rhythm Assimilation) (A. A. Ukhtomsky)

- Different excitable structures have different duration of the absolute refractoriness phase, hence different lability.
- Structures that have low lability increase it in the course of activity. This is due to the activation of the metabolism.

Excitable Structures with Different Lability:

ЦГМ – center of the brain,
ЦСМ – the center of the spinal cord,
ДН – the motor nerve,
М – muscle



The Value of the Autonomic Nervous System and Endocrine Glands

- The sympathoadrenal and hypothalamic-pituitary-adrenal systems cause the mobilization of energy reserves, fat and glycogen from the depot. Glucocorticoids contribute to the activation of glyconeogenesis. The body's physiological activity increases.
- The parasympathetic system limits the excessive effects of the sympathetic nervous system and helps restore resources that are mobilized by the sympathoadrenal system during work.

Differences Between Mental and Physical Labor

Characteristics of mental labor:

1. Lower energy consumption.

Increasing the muscle tone of certain muscle groups ensures that the working posture is maintained.

2. Lower value of the dynamic stereotype.
3. Greater value of the second signal system.
4. Greater psycho-emotional stress.
5. Inability to stop thinking quickly.

Factors That Cause Psychoemotional Stress in Mental Work

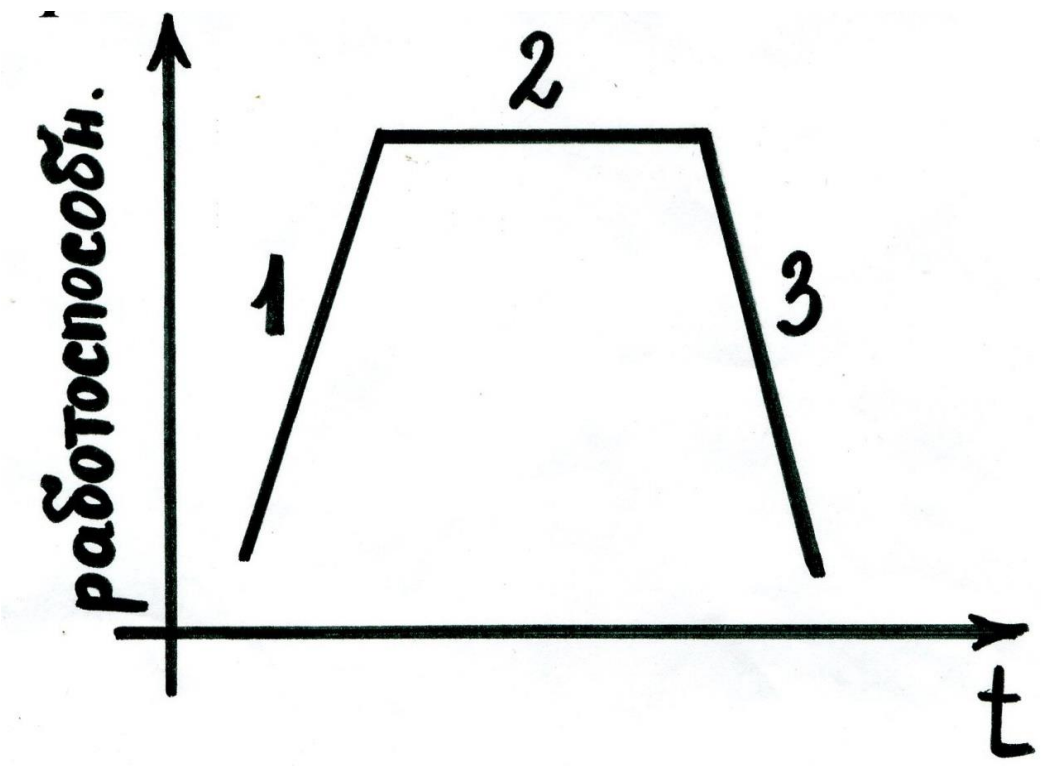
- The perception and processing of large volumes of information.
- The need for simultaneous monitoring of several production processes that change over time.
- Lack of time to process relevant information and make a decision.
- High speed of switching attention from one object to another.
- The need to maintain a high intensity of attention, memory, and thinking for a long time.
- The possibility of an emergency situation and the lack of time to fix it.
- High responsibility for decisions made.
- Irregular working hours, performing work at night.

WORKING CAPACITY. THE MECHANISMS OF FATIGUE

Working capacity is the ability of a person to effectively perform the maximum amount of physical or mental work for a long time.

Phase Changes of Working Capacity

1. The phase of improving of working capacity.
2. The phase of relatively stable working capacity.
3. The phase of reduced working capacity (fatigue).
4. The phase of secondary working capacity improvement.



The Phase of Improving of Working Capacity

- Phase is characterized by increasing of CNS, the cardiovascular and respiratory systems activity, increasing of metabolic processes level.
- The duration of this phase decreases as the severity of the work increases.

The Phase of Relatively Stable Working Capacity

- The phase is characterized by a relatively stable level of functioning of the body's systems and maximum labor efficiency.
- The duration of the phase depends on the severity of the work (the harder the work, the shorter the phase), the psychophysiological state of the person and hygienic working conditions.

The Phase of Reduced Working Capacity (Fatigue)

- Reduced working capacity is associated with the development of fatigue.

The Phase of Secondary Working Capacity Improvement

It is possible to improve performance at the end of the working day.

Mechanism:

- A conditioned reflex associated with the upcoming end of work and subsequent rest.
- ATP deficiency, which occurs when fatigue, stimulates anabolism.

Fatigue is a temporary, reversible decrease in working capacity caused by work.

A subjective feeling, a desire to stop working or reduce the load also occurs.

I. M. Sechenov, 1904

Mechanisms of Fatigue Depending on the Location

- Central
- Peripheral

Causes of Fatigue of an Isolated Muscle

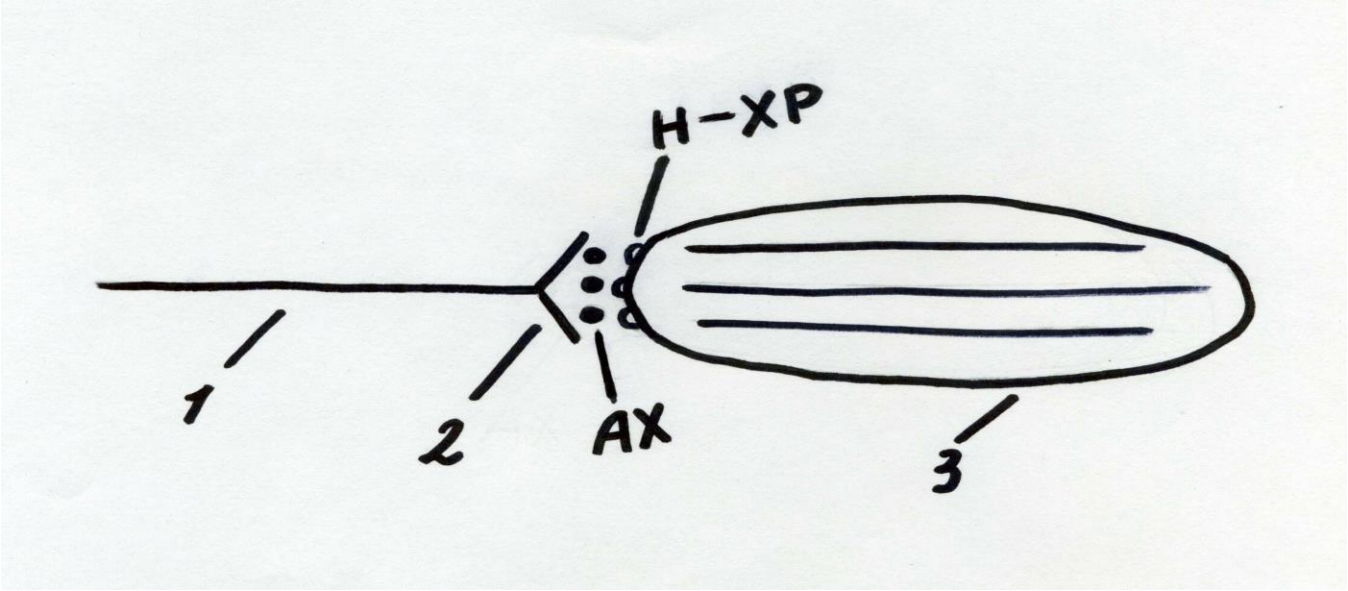
- Depletion of energy resources.
- Accumulation of acidic metabolic products.
- Slower process of ATP resynthesis.
- Insufficient blood supply.
- Reducing the rate of leaching of lactate from the muscles.
- Insufficient calcium mechanisms.

Neuromuscular Preparation

1. The motor nerve
2. Chemical synapse
3. Skeletal muscle

AX – acetylcholine

H-XP – N-holinoretseptor



The Mechanism of Fatigue of the Neuromuscular Preparation

- Reduced inventory of mediator (acetylcholine).
- Reducing the rate of destruction of acetylcholine by cholinesterase.

Fatigue of the Whole Body is Localized in the Cortex of the Brain

Circumstantial evidence

- The role of emotions in the development of fatigue (the rate of fatigue development depends on the mood).
- Hypnosis (the suggestion of heavy physical work leads to fatigue; conversely, if a heavy load is raised to suggest that its weight is less, fatigue does not develop).
- Reduced physical performance under the influence of fatigue, which occurred in the course of mental work (and Vice versa).
- Faster development of fatigue when working, requiring greater concentration of attention, participation of consciousness.

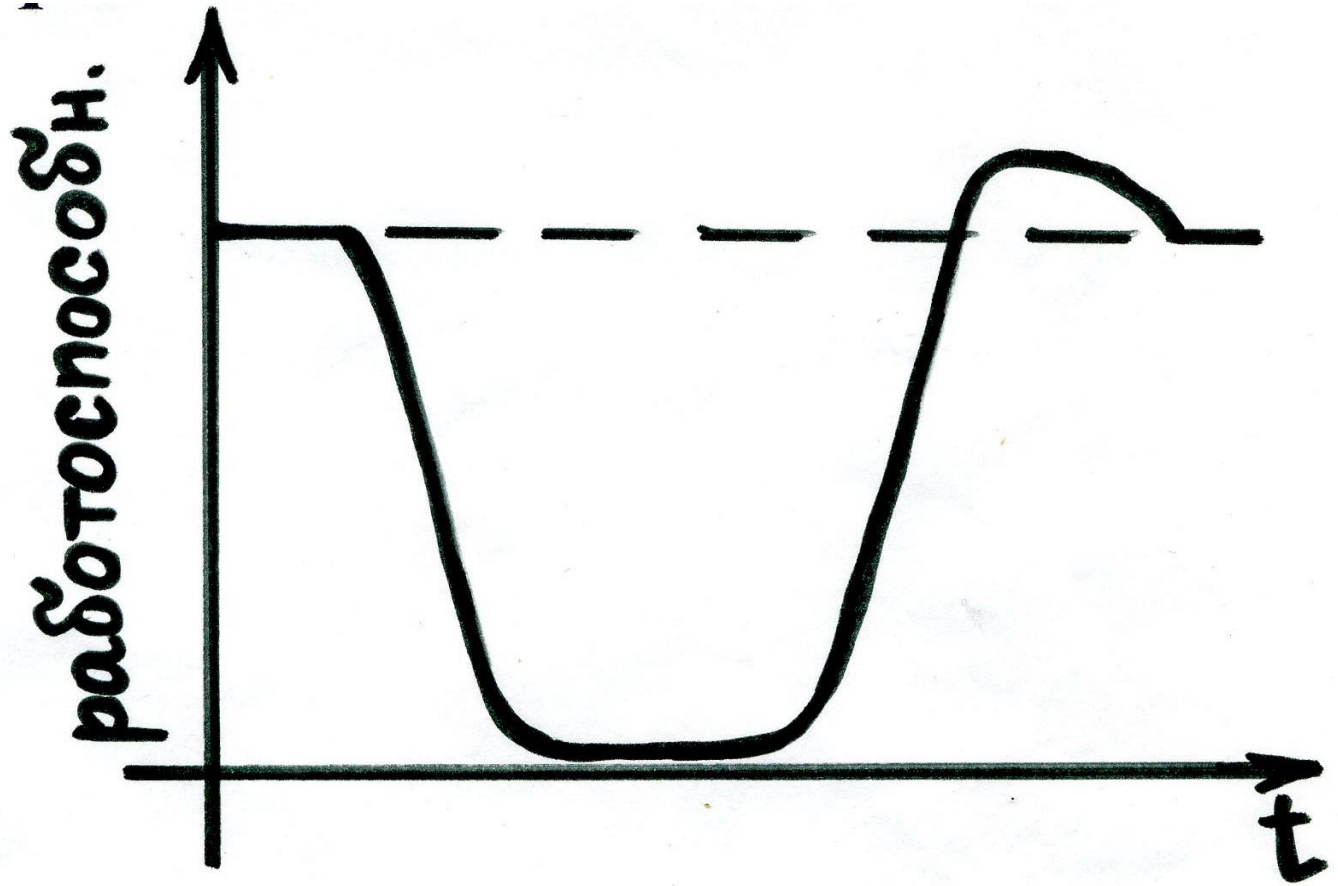
The Cause of Fatigue Cortical Cells

- **Humoral** (decrease in blood oxygen partial tension, glucose concentration, accumulation of acidic metabolic products).
- **Inhibition in the cortex of the large hemispheres**, where many frequent impulses come in the course of work. As a result, the phase of absolute refractoriness is lengthened. Consequently, lability is reduced. The downward activating influence of the cortex is reduced.

A Decrease in the Downward Activating Effect of the Cerebral Cortex is Evident:

- violation of coordination of reflex activity,
- violation of a dynamic stereotype,
- violation of the physiological activity of working organs,
- violation of trophic action of the nervous system.

Restoring Working Capacity

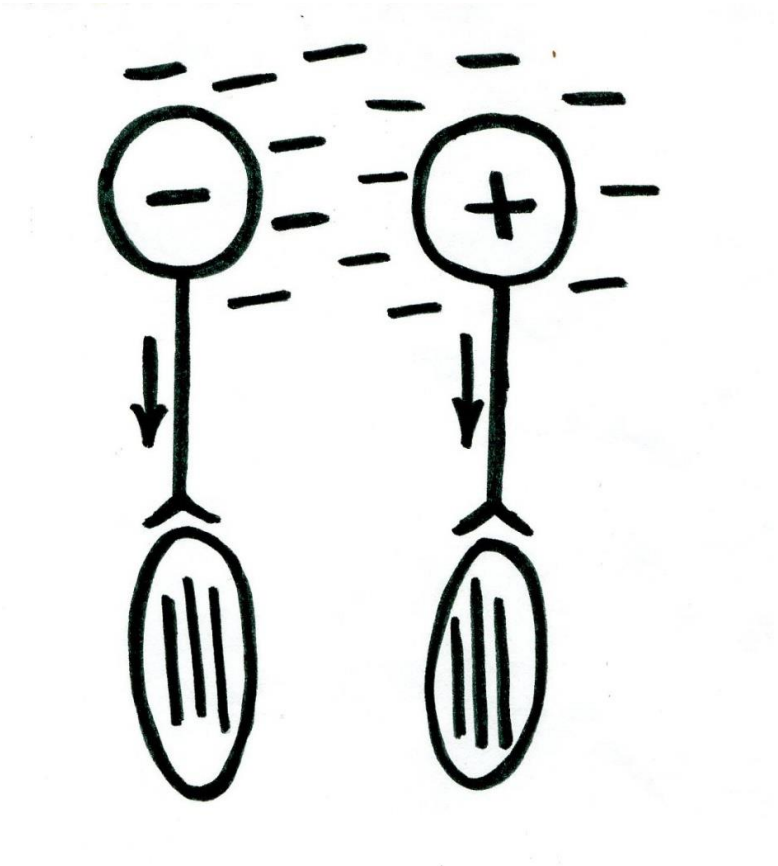


Active Rest (I. M. Sechenov)

It is performing any other activity that differs from the previously performed work.

Physiological Mechanisms of Active Rest

- When a person works, a dominant (center of dominant excitement) occurs in the cortex of the brain. When fatigue occurs in this center, inhibition occurs.
- The change of activity leads to the emergence of a dominant in another center.
- The new dominant increases the inhibition of the first center.
- As a result, working capacity is restored faster.



Reasonable Alternation of Work and Rest (I. M. Sechenov)

The ratio of work and rest time (passive and active) should be 1:2. When the 8-hour working day, the rest, including sleep and various activities, can be up to 16 hours:

- working day-8 hours
- rest-8 hours,
- sleep-8 hours.

Fatigue Criteria

Subjective criteria:

- subjective feeling of fatigue.

Objective criteria:

- reduced working capacity,
- increasing the number of errors,
- reduced attention,
- violation of the dynamic stereotype,
- changing the function of the analyzers,
- changes in the activity of the cardiovascular and respiratory systems, manifested by a violation of the

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