

Conditioned Reflexes and Their Inhibition

Conditioned Reflexes

- These are individual, acquired reactions of the body to the action of conditional stimuli.
- Conditioned reflexes arise on the basis of unconditioned reflexes due to the formation of new temporary connections between different structures of the Central nervous system.

Types of Stimuli

- **An unconditioned stimulus** is a biologically significant signal (food, water, etc.) that causes an unconditioned reflex.
- **An indifferent stimulus** is an irritant that is not related to a given unconditioned reflex. An orientation reflex occurs to it: "What is it?»
- **A conditioned stimulus** is a signal that triggers a conditioned reflex.

Characteristics of Unconditioned Reflexes

Unconditioned Reflexes:

- Congenital
- Species
- Relatively constant
- Begin with a specific receptive field
- An optional part of the cortex
- The biologically significant stimulus
- Implemented by anatomical pathways

Characteristics of Conditioned Reflexes

Conditioned Reflexes:

- Acquired
- Individual
- Fickle
- Can be developed from any receptive field
- Mandatory participation of the cerebral cortex
- Any of the indifferent stimulus
- They are implemented based on functionally formed time relationships

Rules For Developing Conditioned Reflexes

1. They are formed on the basis of unconditional reflexes.
2. Multiple time matching of indifferent and unconditional stimuli is necessary.
3. The indifferent stimulus must precede the unconditioned.
4. The indifferent stimulus should be weaker than the unconditional one.
5. The normal state of the brain is necessary.
6. Extraneous stimuli (external and internal) should be absent.

As a result, the indifferent stimulus becomes conditional.

Mechanism of Formation of Conditioned Reflexes

- The conditioned reflex is based on the unconditioned reflex.
- A conditioned reflex is considered to be developed when the response is shown to the action of only a conditional stimulus (without reinforcement by an unconditional one).

Temporary Connection

- This is the connection that is formed between the cortical department of the analyzer and the cortical representation of the unconditioned reflex.
- Each unconditioned reflex has a representation in the cortex of the brain that receives impulses from the center of the unconditioned reflex.

Characteristics of a Temporary Connection

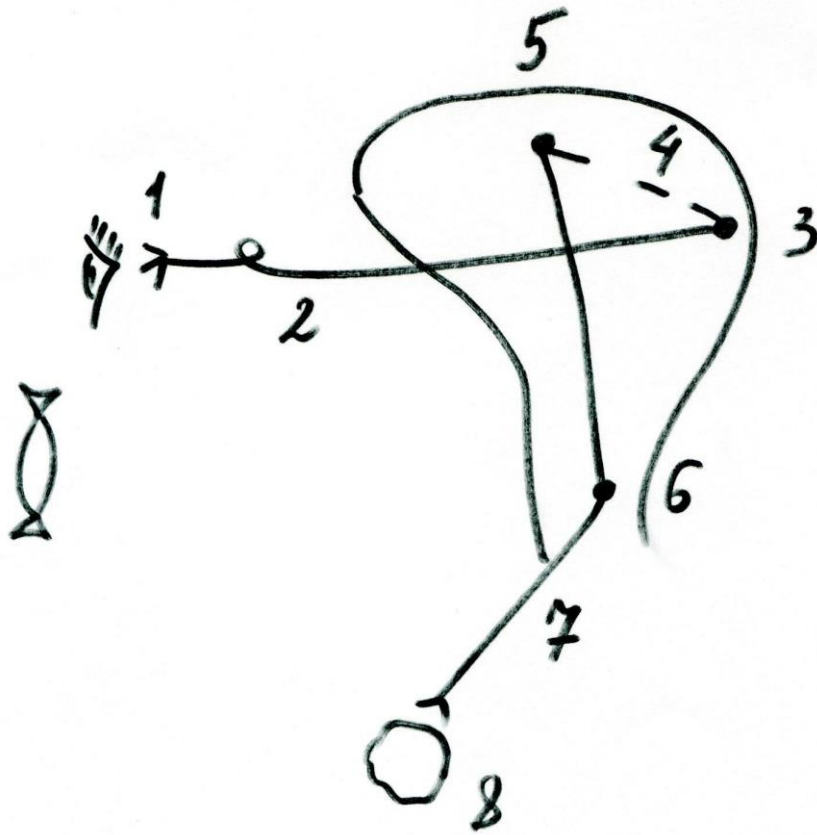
- A temporary connection occurs in the cortex of the brain.
- It is directed from the cortical department of the analyzer that receives the conditional stimulus to the cortical representation of the center of the unconditioned reflex.
- The dominant occurs in the cortical representation of the unconditioned reflex. It has a high excitability and attracts impulses from the cortical department of the analyzer which is excited at the same time.

Mechanism for Forming a Temporary Connection

- Changes in the structure of the synaptic apparatus.
- Changes in the conformation of membrane proteins.
- Changes in the activity of neuroglial cells (myelin synthesis).

The Arc of the Conditioned Reflex

(saliva production on the appearance of food)



1. Photoreceptors
2. Optic nerve
3. Cortical department of the visual analyzer
4. Temporary connection
5. Cortical representation of the salivation center
6. The center of salivation
7. Secretory fibers
8. Salivary gland

Classification of Conditioned Reflexes

1. By biological value:

- Vital (food, defensive, etc.)
- Zoosocial (sexual, parental, etc.)
- Self-development (gaming, research, freedom)

2. By the afferent part of reflex:

- Exteroceptive (with visual, auditory, taste, etc. analyzers)
- Interoceptive (proprioceptive (running, walking, etc.); with visceralization)

3. By the efferent part of reflex:

- Somatic (motor)
- Vegetative (secretory, cardiovascular)

Classification of Conditioned Reflexes

4. By the features of reinforcement:

- Positive (supported by an unconditional signal)
- Negative (not supported)

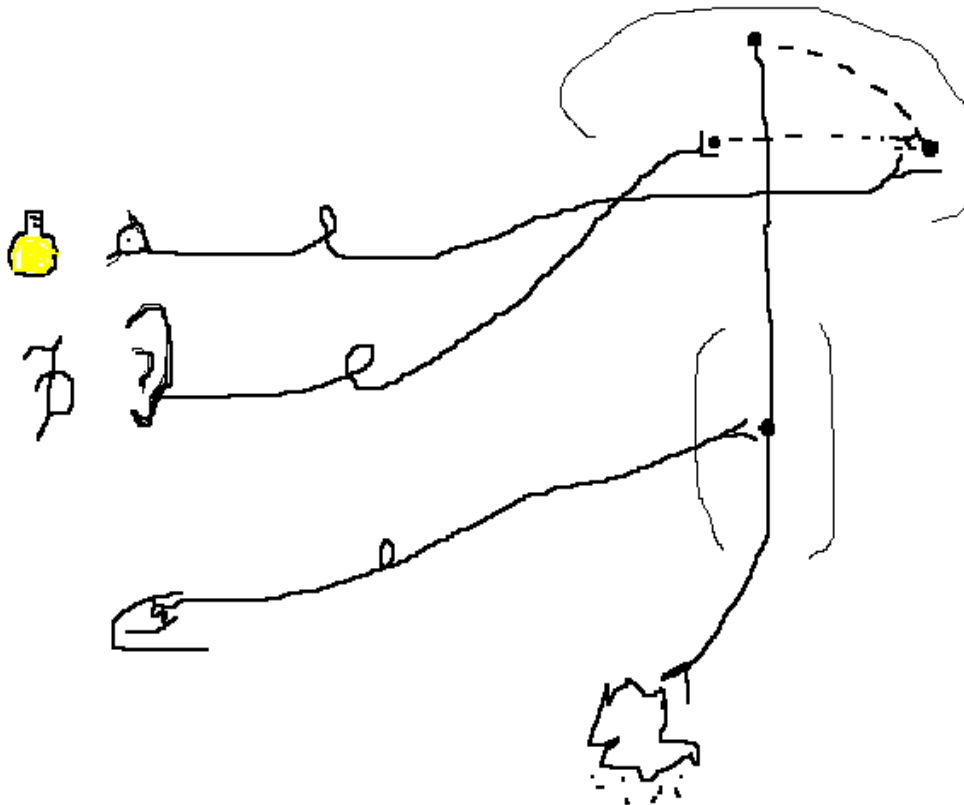
5. By the nature of the conditional stimulus:

- Natural (conditional stimulus is a natural sign of an unconditional stimulus)
- Artificial (in nature, they are not related to the unconditioned stimulus)

6. By complexity:

- 1st order (conditional reflex occurs on the basis of an unconditional)
- 2nd and more complex orders (conditioned reflex occurs on the basis of the developed conditioned reflex of the 1st order or subsequent orders)

The Arc of the Conditioned Reflexes of the 2nd Order



A temporary connection is formed between the cortical departments of the two analyzers.

The Value of Conditioned Reflexes

- Adaptation of the body to changing living conditions.
- The conditioned reflex has a signal value (it precedes or precedes the occurrence of the unconditioned reflex).
- Conditioned reflexes are acquired and canceled in individual life (flexibility, variability).

Inhibition of Conditioned Reflexes

This is an active process that can result in:

- the disappearance of the conditioned reflex,
- reducing the amplitude of the reflex response,
- the impossibility of occurrence of a conditioned reflex.

Types of Inhibition of Conditioned Reflexes

By origin

- Unconditional inhibition (innate).
- Conditional (acquired over a lifetime).

By the mechanism

- External (the new dominant inhibits the conditioned reflex).
- Internal (inside the conditioned reflex arc, the temporary connection stops functioning).

Types of Unconditional Inhibition

- Fading brake
- Permanent brake
- Extreme braking

A fading brake and a permanent brake are external brakes.

Types of Conditional Inhibition

- Fade-out braking
- Differential braking
- Conditional brake
- Delay braking

Conditional inhibition ensures that the body adapts to changing living conditions.

Fading Brake

- Inhibition of the conditioned reflex occurs under the influence of a new stimulus that causes **the orientation reflex**.
- The orientation reflex quickly fades and the conditioned reflex reappears again.

Permanent Brake

- Inhibition of the conditioned reflex occurs when the body is affected by a stimulus that causes the excitation of pain or visceroreceptors. There is a new dominant that is very important for the body.
- **Biological Significance:**
There is a reaction of the body to the biologically most important stimulus at this moment.

Extreme Braking

- Inhibition occurs when a stimulus of excessive force is applied or when a medium-strength stimulus is applied for a long time.
- The process of inhibition occurs in the reflex arc of the conditioned reflex by the mechanism of cathodic depression (reduction of excitability).
- **Biological significance:**
Inhibition is protective, it protects the cells of the cerebral cortex from exhaustion.

Fade-out Braking

This is the absence of a conditioned reflex response to a conditional stimulus that has ceased to perform its signaling role (the conditional stimulus has ceased to be supported by an unconditional stimulus).

Differential Braking

This is the absence of a conditioned reflex response to stimuli similar to the conditional stimulus, but not having the same biological significance (these stimuli are not supported by an unconditional stimulus).

Conditional Brake

This is the absence of a conditioned reflex response to a conditioned stimulus that acts in combination with another stimulus. This combination is not supported by an unconditional stimulus.

Delay Braking

This is the absence of a conditioned reflex reaction immediately after the action of a conditional stimulus if the reinforcement of the conditional stimulus with an unconditional one occurs later. The reaction appears immediately before the action of the unconditioned stimulus.

Dynamic Stereotype

This is a sequence of conditioned reflexes developed for a strictly defined sequence of stimuli.

The Formation of a Dynamic Stereotype

- Development of a separate conditioned reflex to the appropriate stimulus (light, bell, touch, metronome).
- Multiple presentation of the complex of these stimuli in a certain sequence.

The Value of a Dynamic Stereotype

Positive value

- There may be more complex behavioral responses than one conditioned reflex (sports exercises, work skills, solving typical tasks).
- Actions are performed faster (automatically).
- The result is better.
- Energy saving
- Thinking about actions is not required. The brain is "free" for other activities
- The stereotype is dynamic, meaning it can change when conditions change.

Negative value

- Stereotypical actions hinder creative processes and prevent the emergence of new reactions.

Conditional-reflex Switching

- The same stimulus in different situations causes different reflex responses in the same organism.
- Example: a call at the beginning and end of a school lesson leads to different actions of students.

After studying the lecture, you need to be tested using the Google form service. Please fill in the fields full name, faculty and group number.

Test Link:

<https://forms.gle/C7M9jXi1Y7LfDgVj8>