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P035-T | Influence of mechanical unloading on the morphofunctional state of the soleus muscle

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During space flights or locomotor pathologies in earth conditions the morphofunctional state of the neuromotor apparatus changes dramatically. One of the main reasons is supposed to be the restriction of support afferentation. In the present work, the morphofunctional state of the m. soleus of rat was evaluated in modeling the restriction of support afferentation of the hind limbs by hanging animals (n = 7) by the tail in the upside down position (≈30°). After 7 days of exposure to the experimental conditions, the isoform composition of titin in the m. soleus and the M-wave parameters were assessed when the sciatic nerve was stimulated. As control data, used data received in the study of intact animals (n = 5).

It was found that in m. soleus of rats after seven days of restriction of support afferentation, there is a decrease in the content of titin N2A isoform relative to the content of myosin heavy chains by 25% ($P < 0.05$). The decrease in the relative amount of titin N2A isoform is accompanied by a 3-fold increase in the relative content of T2 fragment ($P < 0.05$), which indicates a change in proteolysis of the titin N2A isoform of titin. With high-frequency stimulation of the sciatic nerve (50 Hz), a significant depression of the M-response was recorded (the decrement was 42 ± 6%, $P < 0.05$), which indicates a decrease in the reliability of synaptic transmission. Thus, the activity of support receptors determines the morphofunctional properties of the motor system. Restriction of support afferentation initiates morphological changes in the rat's soleus muscle, and also leads to impaired neuromuscular transmission.

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P036-T | The model of artificial neural network, allowing the formation of a motor program generator

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The aim of this study was the search of general rules of constructing of the simple neural networks which was capable to form their own pattern of muscle activity. On the basis of the original software the variants of the neural structures configurations have been tested. These networks can provide the plasticity on the level of conditioning the signals coming from the neural blocks of different functions, which can allow the implementation of the principle of Hebbian plasticity. The principal architecture of dynamic stochastic artificial neural network, provided the facilitation of the execution of the motor program was found.

The present study involved qualitative analysis of neurophysiological data of the principal mechanisms of functioning of relatively simple neural structures. The formal threshold element with formal spike activity without detailed description of the spike shape was chosen as a neuron model. The model of the artificial neural network which provided the simplification of the implementation of the "external" motor program was proposed. The formation of the own pattern generator of muscular activity with the profile of the activity of the prescribed shape for each effectors occurred as a result of repetitions of this motor program. Obtain model allowed us to explain the behaviour of the late responses during frequency stimulation in electrophysiological experiments in situations when performing motor program was familiar to the subject and depended on the context. The described scheme also can explain the necessity of optimal sensory input in restoring pre-existing motor programs, including motor programs after injuries, as well as the necessity of the additional activation or loading for improving of the motor response.

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P037-T | Unsupervised learning of activity patterns in the neonatal rat auditory cortex

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Spontaneous activity patterns in the neonatal rat sensory cortex display region-specific features. Here we aimed to compare the spontaneous activity in the auditory (AC) and somatosensory (SC) cortices of P6-7 rats (N = 7) using machine learning approach. We developed a method to differentiate one second long patches of activity in AC and SC using convolutional artificial neural networks. We trained the network on the most salient patches of activity to learn characteristic AC and SC waveforms and then applied it to the whole traces of spontaneous activity in both structures. We found that spontaneous activity in AC specifically displayed long-lasting megabursts of the local field potential oscillations in a wide range from theta to gamma frequencies and multiple unit activity lasting for ≥7 seconds and occurring at a rate of 40 ± 12 megabursts per hour. The AC