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### **On the functional states of nerve cells (a new approach)**

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What is the difference in the reaction of neurons to favorable and unfavorable irritants?

It should be noted that current research has not yet yielded any results. Most research tends to regard excitation and inhibition as the two functional states of neurons. We find this claim to be false, as there is a substitution of one notion for another. From our point of view, excitation and inhibition are the working (operational) states, but not the functional states.

We suggest that the term “functional state” should be employed only in those cases in which one has to characterize the current ability of the system to perform working (operating) actions. This ability may be described with qualitative adjectives such as “good” or “bad”, “better” or “worse”, “the best” (“excellent”) or “the worst” . Some functional states have specific names. For example, fatigue is a functional state. Besides, it’s not clear how to distinguish a good functional state of a nerve cell from a bad functional state of one. At present, it seems impossible to differentiate excitation with a good functional state background from the one with a bad functional state background.

The analysis of numerous scientific data showed that at present there are many reasons to consider the response of nerve cells to any irritant (i.e. unfavorable factors) as an adoptive reaction that has several stages. Alongside these changes in adoptive stages, changes in the degree of cell membrane polarization (i.e. membrane potential) occur.

We distinguish four adaptive stages in the reaction of nerve cells to irritants and unfavorable factors (see figure): (I) hyperpolarisation ( or hyperpolarizing inhibition); (II) hyperpolarising (posthyperpolarising) excitation; (III) depolarising excitation; (IV) depolarising inhibition. Each of these stages is characterized by its own peculiarities of the elapse of living processes , the functional capacities of neurons and also different resistance to unfavorable factors. In fact, there are two types of neuronal excitation: excitation with a good metabolic and functional state background (posthyperpolarising excitation) and excitation with a bad metabolic and functional state background (depolarising excitation). There are also two types of inhibition: inhibition with a good metabolic and functional state background (hyperpolarizing inhibition) and inhibition with a bad metabolic and functional state background (depolarising inhibition).

The proper understanding of the processes in the nervous system make it possible to approach the decision of a whole number of fundamental problems of psychophysiology.

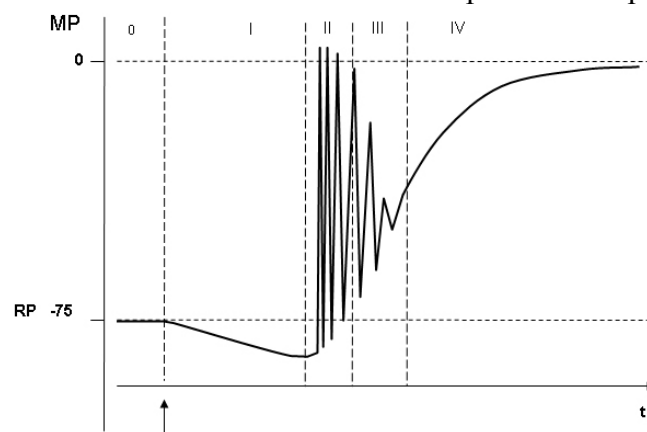


Figure. Variation in membrane potential (MP) and change in the state of neural tissue under the action of stimuli with time (t). The functional state goes through the following stages of change: 0 – rest, I – hyperpolarization silence (“inhibition”), II – posthyperpolarization excitation, III – depolarization excitation, IV – depolarization suppression (“inhibition”). An arrow indicates the beginning of the action of the stress-stimulus. RP – resting potential level.