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**ABSTRACT:**

Although the main activity in the neurons and neural network of afferent and efferent pathways is the action potential, in the association area and in the anterior parts of the brain, the relationship between the functions and the action potentials is not so strong anymore. Studies, electrophysiological recordings and analyses done in animals of different evolutionary levels and humans still fail to answer the main question about the contribution of the forebrain to the function of the midbrain and other structures. Studies showing that the electrophysiological activities of the forebrain and its structures thought responsible in cognitive functions consist of local and spreading subthreshold slow potential shifts rather than action potentials attracted the attention. They also showed that the action potential patterns of some neurons are modulated by these subthreshold slow potential changes. In order to investigate ongoing activity or responses evoked by physical stimuli or cognitive tasks, single and multiunit activities are recorded by micro and semi microelectrodes and the compound field potentials by gross scalp and cortex electrodes simultaneously. Cognitive electrophysiological paradigms like Oddball (P300), Mismatch Negativity (MMN) and N400, and expectancy paradigms like repeated stimuli and Omitted Stimulus Potential (OSP) are the most common paradigms used in order to analyze the source, propagation and dynamic properties of those activities. Studies aiming to confirm the general information and thinking suggesting that the forebrain establish the relationship between different events in longer time scale than midbrain and other deep structures, and the studies trying to explain if the decision making is the product of a wide neural network or of a small neuron group so called "grandmother cell" and/or how those two mechanisms work together in some conditions, are the hot spots of the today's cognitive electrophysiological studies.