EEG SENSORIMOTOR RHYTHM: AMPLITUDE, FREQUENCY, TOPOGRAPHY, AGE-DEPENDENCY AND FUNCTIONAL MEANING

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During the last decade, one can observe a growing interest in doing experimental research involving the analysis of the EEG sensorimotor rhythm parameters in the context of studying various psychological characteristics broadly associated with the functionality of the so called “mirror” neuron system. A great deal of works address the issue of the mu-rhythm reactivity in the process of observing how other people perform certain actions, following the hypothesis according to which an implicit human capacity to understand intentions underlying other people’s behaviors relies upon the functionality of the mirror neuron network. This activity is thought to be at least partly reflected in the excitation of the sensorimotor cortex which can be registered by the EEG desynchronization reaction within alpha- and beta- frequency bands under the central electrodes. EEG sensorimotor rhythm is usually called mu-rhythm and its characteristics are very similar to those of the occipital alpha-rhythm, though its peak frequency is a notch higher while the amplitude is lower. Some researchers see the EEG registered under the central electrodes within the lower beta-frequency band (13-20 Hz) as also reflecting the sensorimotor cortex activity. Both alpha- and beta- components of the mu-rhythm when being desynchronized are thought to reflect the growing muscle and sensory activity. Its alpha-component is usually associated with the activity of the post-central sensory cortex and beta-component – with the activity of the pre-central motor cortex. The reaction of the mu-rhythm desynchronization is registered during people’s voluntary movements, movement imagining, action observation and even hearing other people act. There are however specific differences between alpha- and beta- patterns of desynchronization and resynchronization next to it. The number of modern studies

demonstrates the EEG rhythm under central electrodes which doesn't respond to visual stimulation but is suppressed by voluntary movements and observing others move, already in infants since the age of 11 weeks and having the peak frequency of 2.75 Hz. This rhythm's modal frequency rapidly rises from around 3 to 8 Hz by the end of the 1st year of life. During the following years the frequency growth is not that fast and is stabilized around 10 Hz by the adulthood. This "central" rhythm's amplitude in children is usually higher than that in adults. The functional characteristics of the children's "central" rhythm seems to be quite analogous to those attributed to the mu-rhythm in adults. The mu-rhythm's topographic properties are relatively poorly studied. It looks possible that there are plenty of mu-rhythms generated by different body projection regions and that they demonstrate specific functional properties. The capability of the mu-rhythm to reflect in its reactivity patterns various mental processes attract the variety of experimental studies implementing different research paradigms. The central interest lies in its hypothesized link to the functionality of the mirror neuron system. Still many researchers are prone to ignore the problem's complexity and gaps in our knowledge regarding the mu-rhythm's various properties and its functional role. That is why it is imperative to emphasize the importance of the very carefully planned experimental designs with fewer theoretical speculations to prevent the accumulation of sub-quality knowledge when we try to associate the mu-rhythm properties with the currently highly problematic concept of the mirror neuron system in humans.

***Keywords*:** electroencephalogram, sensorimotor rhythm, mu-rhythm, "mirror" neurons, amplitude, frequency, topography, age-related dynamics.

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