

Study of the Reactivity of the μ Rhythm during Observation, Auditory Perception, and Movement Imitation: Correlation with Empathic Ability

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Abstract—The reactivity of the EEG μ rhythm was studied during observation, auditory perception, and imitation of circular hand movements with a computer mouse and tested for correlation with individual empathic ability. Observation of another person's hand movements was associated with significant desynchronization of the μ rhythm in the hemisphere contralateral to the hand observed (C_3 , a decrease by 6.9%). Auditory perception of the sounds of computer mouse movements (with eyes closed) was accompanied by a significant decrease in the μ -rhythm amplitude (C_2 , by 6.7%; C_3 , by 4.4%). Movement imitation by manipulating a computer mouse at a reference rhythm was associated with a decrease in the μ -rhythm amplitude in C_2 (12.6%), C_3 (23.2%), and C_4 (16.7%). Self-assessment of empathic ability by the Mehrabian–Epstein Questionnaire Measure of Emotional Empathy positively correlated with the μ -rhythm desynchronization averaged over the three central leads in the case of auditory perception, while significant correlations were not observed in the case of observation and imitation of movements. It was assumed that empathic ability is more likely to correlate with activity of logic-related mirror neurons than with that of strictly congruent neurons.

Keywords: EEG, μ rhythm, desynchronization, mirror neuron system, observation, auditory perception, imitation, empathy