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Long-range memory and non-Markov statistical effects in human sensorimotor coordination

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Abstract

In this paper, the non-Markov statistical processes and long-range memory effects in human sensorimotor coordination are investigated. The theoretical basis of this study is the statistical theory of non-stationary discrete non-Markov processes in complex systems (Phys. Rev. E 62, 6178 (2000)). The human sensorimotor coordination was experimentally studied by means of standard dynamical tapping test on the group of 32 young peoples with tap numbers up to 400. This test was carried out separately for the right and the left hand according to the degree of domination of each brain hemisphere. The numerical analysis of the experimental results was made with the help of power spectra of the initial time correlation function, the memory functions of low orders and the first three points of the statistical spectrum of non-Markovity parameter. Our observations demonstrate, that with the regard to results of the standard dynamic tapping-test it is possible to divide all examinees into five different dynamic types. We have introduced the conflict coefficient to estimate quantitatively the order-disorder effects underlying life systems. The last one reflects the existence of disbalance between the nervous and the motor human coordination. The suggested classification of the neurophysiological activity represents the dynamic generalization of the well-known neuropsychological types and provides the new approach in a modern neuropsychology.

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