



## Multi-finger synergies in Parkinson's disease

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We studied the performance of healthy persons and patients with early-stage Parkinson's disease during the accurate force production by one finger and by the four fingers of the hand pressing on individual force sensors. Using the recently developed methods for the study of multi-finger synergies, we computed indices related to optimal control of the fingers, the ability of a finger to produce force independently from other fingers, the ability of the fingers to compensate for each other errors, and the ability to adjust multi-finger synergies in preparation to a quick action. Compared to healthy controls, the patients showed lower indices of finger individuation (higher enslaving), lower indices of force-stabilizing synergies, impaired ability to adjust synergies in preparation to a quick force pulse, and lower consistency in following an optimization principle. This was true in the on-medication state; off-medication, the differences from the controls increased. These results imply an important role of subcortical structures, in particular of the basal ganglia, in the organization of multi-finger synergies. The developed methods can be used for early detection of Parkinson's disease.

**Mark L. Latash** received M.S. in physics of living systems from the Moscow Physics-Technical Institute and PhD in physiology from Rush University in Chicago. He is interested in the control and coordination of multi-element systems participating in the production of voluntary movements, the control of posture, multi-joint reaching, finger coordination, and the neurophysiological mechanisms underlying motor control. Mark Latash is also interested in the neural control of apparently atypical movements such as those performed by persons with Down syndrome, healthy elderly, and persons with neurological disorders, as well as in the effects of practice on motor coordination. Currently, Mark Latash is a Distinguished Professor and Director of the Motor Control Laboratory (Department of Kinesiology at Penn State). He served as the Founding Editor of *Motor Control* (1996-2007) and as the first President of the *International Society of Motor Control* (2001-2005). He published about 300 papers in refereed journals and several books including *Control of Human Movement* (1993), *Neurophysiological Basis of Movement* (1996, 2008), and *Synergy* (2008). Mark Latash is a Fellow of the *National Academy of Kinesiology* and a recipient of the *Bernstein Prize* (2007).

Moderator: **dr. Nejc Šarabon**

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so predavanja uveljavljenih nevroznanstvenikov, ki ustvarjajo izven meja Slovenije. Predavanja se dotikajo svežih, v slovenskem prostoru manj uveljavljenih nevroznanstvenih tem in ponujajo možnost za utrinjanje novih raziskovalnih idej ter vzpostavljanje mednarodnih raziskovalnih povezav.

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