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Editorial

Introduction to Neuromechanics, a New MDPI Open Access Section of Biomechanics

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Welcome to Neuromechanics, a section of Biomechanics published by the Multidisciplinary Digital Publishing Institute, MDPI [1]! Biomechanics examines human and animal movements through the laws of physics from a molecular to a systems level. Neuromechanics is a subsection of biomechanics and studies how the nervous system controls the generation of muscular force and the production of voluntary movement [2]. The complexity of the processes involved in generating the motor command and transforming this command into voluntary movement gives rise to neuromechanics [3]. Historical and didactic partitioning created artificial boundaries between the mechanics of movement and the neural control of movement. The Neuromechanics section aims to thin, if not dissolve, the contours between these fields of knowledge.

There are fundamental questions for the field to address:

- How do muscles, afferent sensors, and neural networks interact when generating single and multi-joint voluntary movement?
- How does the system, in its totality and its elements, respond to external perturbations?
- How do sensory organs feed back to the muscles and adapt to interventions designed to increase motor performance in patients, older adults, and athletes?
- What are the diagnostic and prognostic markers (i.e., transfer functions) characterizing and quantifying the coupling between a neural command and the ensuing motor behavior?
- What is the time course and nature of responses of these markers to short and long-term motor-cognitive, rehabilitative, robotic, and other therapeutic interventions and training programs designed to increase athletic performance?
- What are the neural processes underlying gait variability, quantified by dynamical systems outcomes in health and disease?
- What is the functional relevance and time course of association between the markers of intervention-induced neuroplasticity and behavioral outcomes such as upper extremity function, walking mechanics, postural control, and musculo-tendon quality in health and disease [4]?
- How can new mechanical modeling of motor actions improve athletic performance and patients' functional ability in daily activities?
- How could integrative neuromechanical analyses monitor and improve athletic performance and the upper and lower extremity movements of patients using imaging and non-invasive brain stimulation (NIBS)?

With advancements in technology from the molecular to the modeled system level, neuromechanics is strategically positioned to advance the diagnoses and prognoses of clinical conditions and analyze and increase sports performance. The Neuromechanics section will welcome submissions to report novel data on:

- Multi-array electromyography to detect adaptations to interventions at the motor unit level [5–8];
- Quantification of task-specific excitability of the brain's motor network and its neuroplasticity following interventions using non-invasive brain stimulation, NIBS [4,9–11];

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- Force generation in fresh and fatigued states by skeletal muscle from the cellular to system level and its adaptation to treatments, supplemented by neurophysiological measurements in health and disease [12,13];
- Dynamic characterization of tendon properties and tracking the adaptation of tendons to interventions using high resolution imaging [14–18];
- Imaging and stimulation techniques used during motor tasks to understand the task-dependent modulation of neural commands to control force and motor performance [19,20], and the neuromechanical modeling of healthy, impaired, and robotic motor functions.

In short, Neuromechanics will consider submissions that critically, and with novelty, examine the interaction between the mechanics of the motor system and its neural control in a cross-sectional and longitudinal manner across the lifespan in health and disease.

Submissions can take the form of invited reviews, perspectives, and articles, per the instructions for authors. We plan to have Special Issues organized by guest editors. The editorial board welcomes submissions to Neuromechanics with the intention of providing rapid, constructive, and rigorous peer reviews. Published papers will reach wide audiences free of charge, as Neuromechanics is a member of the open access publishing family.

Conflicts of Interest: The author declares no conflict of interest.

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Short Biography of Author

Tibor Hortobágyi received his PhD in kinesiology at the University of Massachusetts, Amherst, USA. He was the director of the Biomechanics Lab in the Department of Kinesiology at East Carolina University, Greenville, NC, USA. Since 2011, he been a professor of healthy aging in the Center for Human Movement Sciences, University Medical Center, University of Groningen, The Netherlands. He received funding from the National Institutes of Health, the European Commission, and the Dutch Ministry of Health. His work focuses on the neuromechanical characterization of human movement and neuromechanical mechanisms of adaptations to interventions in health and disease. The gait and balance work examines the effects of age and interventions on neuromechanics of gait and balance. The motor learning work focuses on brain and neuromechanical mechanisms of motor skills acquisition, retention, and transfer using EEG, MRI, and NIBS in health and disease. He is a fellow of the American College of Sports Medicine and an associate editor in: the Brazilian Journal of Motor Behavior, Experimental Gerontology, Frontiers of Physiology, Journal of Neurobiology and Memory, Medicine and Science in Sport and Exercise, and Physiology International. He was an amateur national level high jumper (208 cm) who now climbs via ferratas, plays the cello, collects art, and travels extensively.