



Curriculum vitae of Luciano Fadiga

Born in 1961. M.D. (University of Bologna), Ph.D. in Neuroscience (University of Parma). Full Professor of Human Physiology at the University of Ferrara, Faculty of Medicine, and Senior Researcher and Center Coordinator at the Italian Institute of Technology in Genova. Fellow at the University of Parma since 1992. Assistant Professor at the University of Parma since 1997. Associate Professor of Human Physiology at the University of Ferrara (2000-2005). He is currently Coordinator of the PhD Course in Translational Neuroscience and Neurotechnologies jointly established by University of Ferrara and Italian Institute of Technology.

He has a long experience in electrophysiology and neurophysiology in monkeys (single neurons recordings) and humans (transcranial magnetic stimulation, study of spinal excitability, brain imaging, recording of single neurons in awake neurosurgery patients).

Among his contributions:

- (1) The description of the functional properties of the monkey ventral premotor cortex where, together with his Parma colleagues, he discovered a class of neurons that respond both when the monkey performs actions and when it observes similar actions made by other individuals (mirror neurons). It has been suggested that these neurons unify perception and action and may contribute to others' action understanding.
- (2) The first demonstration that a mirror system exists also in humans. He achieved this result by applying transcranial magnetic stimulation (TMS) on the hand motor cortex of human subjects while they were observing others' actions. He demonstrated that the amplitude of observer's hand muscle potentials, as evoked by TMS, was specifically and significantly modulated by the observed actions.
- (3) The demonstration that a similar motor resonance is activated during speech listening and involves tongue-related motor centers. He recently further demonstrates that this motor activation evoked by speech listening is functional to speech perception. This result shows for the first time a

causal relationship between action representation and perception.

(4) The first demonstration that, in humans, the frontal area for speech production (Broca's area) is almost constantly activated by action observation (by several brain imaging experiments carried out in collaboration with San Raffaele Hospital of Milan, USC and UCLA of Los Angeles, HUT of Helsinki, Juelich Brain Imaging Center, Royal Holloway University of London).

(5) The recent demonstration that Broca's area activation reflects a primary role played by this area in pragmatically understanding actions of others. This finding opens new landscapes on the evolution of the human language.

(6) The study of peripersonal space representation in monkey premotor cortex. According to these findings, premotor area F4 contains polymodal neurons (motor, somatosensory and visual) coding the peripersonal space in motor coordinates. This stream of research exerted influence on the understanding of human pathological signs such as the visuotactile extinction following parietal lesions.

Luciano Fadiga is currently leading a group of researchers at the University of Ferrara, where he continues his research on monkey ventral premotor cortex (to elucidate the physiological mechanisms at the basis of mirror neurons visuomotor response) and on humans (by TMS and fMRI, to reveal the link between action representation and language). He further coordinates a project on neuro-rehabilitation of stroke patients by action observation. He is leading a Center of the Italian Institute of Technology (Center for Translational Neurophysiology of Speech and Communication) to investigate the possibility to establish hardware communication between the human brain and some artificial device (brain-machine interfaces). He is now recording single neurons in awake neurosurgery patients to better characterize the functional border of brain tumors. Other fields of his research concern attention and its neural mechanisms in normal subjects and patients.

Luciano Fadiga is reviewer of many international journals in the field of Neuroscience and associated editor of some of them, he was principal investigator in CNR projects on reaching-grasping, he was and is responsible of several European Projects on action and speech recognition and control, he was co-investigator in Human Frontier Science Program and McDonnell-Pew funded projects, he published more than 160 peer-reviewed publications on International Journals. His work has received almost 40,000 (20,000) citations. H-Index=59 (45) according to Google Scholar (Scopus).