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Guest Editors: Andrew C. Papanicolaou, Ioannis Evdokimidis, Theodoros S Constantinidis

Lecture

Pragmatic Conceptualization of Objects in the Brain

Luciano Fadiga

Abstract

Ancient Greek and Latin philosophers were already aware of the difficulty in discriminating between 'objects' intended as material entities belonging to the physical, external world, and 'objects' intended as internal representations of that world. Descartes was the first making a clear, rational distinction between the physical objects (*res extensa*) and their representations (*res cogitans*). However, from a theoretical point of view this remains an open question. Empirical evidence coming from neurophysiology may provide some insight to this vexata quaestio. Despite the classical view, segregating perceptual and executive functions in different sets of brain areas, a large percentage of sensory (visual) and motor neurons are indeed visuomotor. In other terms, the same cell specifically discharges during observation of manipulable objects and during the grasping action directed towards them. Accordingly, objects and objects-related concepts (representations) seem to be the two faces of the same medal. Objects, often created by us, are loci of interaction with our body and their brain representation automatically implies motor interaction. This concept is very close to the classical idea of motor affordance originally proposed by Gibson. Motor control of the grasping hand, visuomotor transformation of objects into hand poses and the relationship between pragmatic and semantic representations of objects/actions are interrelated functions resulting from a continuous interaction between parietal and frontal areas. In humans a similar picture emerges from neuroimaging and transcranial magnetic stimulation studies and prompts interesting links with language as well. In my presentation I will show and discuss the most recent 'state of the art' of the topic integrating the perspective with some recent experimental results from our laboratory.

Luciano Fadiga, professor of Physiology at the University of Ferrara and director of the Center for Translational Neurophysiology at the Italian Institute of Technology, was among the discoverers of mirror neurons and provided the first neurophysiological evidence of their existence in humans. He has further shown a similar system for speech, functional to perception. He has accumulated a long experience in studying the visuomotor properties of primates premotor cortex, in particular concerning objects and space representation. He is actually studying the possible rooting of linguistic syntax in the motor system and the use of mirror neurons in neurorehabilitation. His work has received more than 30,000 citations.