

Influence of gravity on sensorimotor coordination: computational approach and perspectives

Virtually all studies looking at the role of gravity on sensorimotor control have reached the conclusion that the control of movement was strongly affected by, or dependent upon the effect of gravitational forces. However, the role played by these forces is still far from being fully understood. One reason why the data available keep challenging our current understanding is that the gravitational field influences all stages of sensorimotor processing, including sensory encoding, sensorimotor transformation, motor planning and motor execution. Current models for motor control have suggested that the brain relies on probabilistic inference about the state of the body and environment to optimize the balance between behavioral performance and motor costs. In this talk, I will present previous results on reaching control and object manipulation under hyper- and micro-gravity conditions that we interpreted in the context of this model. We proposed that changes in motor strategies result from errors in our internal representation of the body and environmental dynamics. This approach can be extremely useful to generate testable predictions about motor control under unstable gravity. I will discuss the strengths and weaknesses of this approach and suggest some computational challenges that the central nervous system must solve in an unstable gravitational condition.