Obstacles to mental imagery: How bodily constraints affect apparent motion perception of human body parts. A proposed experiment.

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The implicit knowledge of bodily biomechanical constraints (BC) and the physical notion of impenetrability of two solid objects (OI) are important not only for movement planning, monitoring and execution but also for the perception of others’ movements as during the perceptual completion of an actor’s movements starting from two static photographs flashed in temporally defined successions and varying only in the position of one of the actor’s body parts. However, this is only the case when the central nervous system is given enough time to allow top-down influences to occur: when the same photographs are flashed with a relatively fast flash-rate, perceived apparent motion (PAM) paths are not modulated by either BC or OI.

The proposed experiment introduces an innovative method to investigate the nature of this top-down process. We use an apparent motion paradigm in which pairs of photographs are presented at different flash-rates. PAM consists of body parts moving through or around other body parts, body parts moving through or around fixed objects, or body parts rotating around different angles. During the next months, the experiment will be tested on 20 transradial-hand amputees and 40 able-
bodied subjects. We expect that PAM varies as a function of the flash-rate and an observers’ integrity of body representation. We predict that amputees show more variable PAMs and that this is specific to whether the stimulus is consistent with the side of amputation.

We will adopt an interdisciplinary approach combining behavioral, gaze, and superficial electromyography measures in order to better characterize the neurocognitive effects of amputation also considering aspects such as the use of prosthesis and phantom limb sensation.