

MySpace Lab – PhD Project

Title:

Assessing body perception in healthy subjects and patients with sensorimotor deficits

Project description:

Our body is a special stimulus for the brain. We perceive the world around us and we act through our bodies. Crucially, the body is itself an 'object' of perception because we constantly receive bodily perceptual stimuli from various sensory modalities (e.g. tactile, proprioceptive, muscular, visual stimuli). Different models or representations of the body stored in the brain with specific characteristics and distinct functions have been hypothesized (Bassolino & Serino, 2021). Some body representations focus more on the metrical properties (dimensions) of different body parts, others on the stimuli presented in the space around the body (peripersonal space) (Serino 2019). Moreover, some representations concern the experience of our body, such as the sense of "ownership" and the sense of "agency" whereby we respectively recognize that a body part (e.g. arm) belongs to us and we can control its movements.

To date, there is no consensus on the number and functions of body representations. However, available experimental data seem to suggest that some representations are not fixed, but constructed and updated as bodily information, such as touch or proprioception, changes and as movement occurs. This hypothesis suggests that in patients with sensorimotor disorders, such as post-stroke patients who present alterations in tactile, proprioceptive and/or motor abilities, body representations are altered (Bassolino et al. 2022; Crema et al., 2022).

The PhD project aims to test this hypothesis through two fundamental objectives. The first objective is to develop and test in healthy subjects a battery of behavioral tasks that can quantify body representations related to the perceived dimensions of upper limbs, peri-personal space, sense of ownership and agency.

The second objective involves adapting these tasks to test body representations in post-stroke patients at the beginning and end of the treatment, to document which sensorimotor disorders and brain lesions are associated with specific alterations in body perception and experience and to monitor these distortions during recovery.

Skills to be acquired by the student:

The student will acquire an in-depth knowledge of the literature in the field of neuroscience and more specifically about the perception and experience of the body.

She/he will contribute to the design of innovative experimental protocols for the assessment of body perception, by acquiring methods of psychophysics, virtual reality and movement assessment.

She/he will be involved in the statistical analysis of behavioral data, also through computational models, and in the analysis of brain lesions in post-stroke patients.

The project will be done within the joint collaboration of MySpace laboratory in the Department of Clinical Neuroscience, Centre Hospitalier Universitaire Vaudois (Lausanne, Switzerland), and at the

new Neurorehab Research Center at the Lavigny rehabilitation hospital, led by Andrea Serino and the team led by Michela Bassolino at the Institute of Health, Institute of Health, HES-SO Valais-Wallis, (Sion, Switzerland).

References (max. 3)

Bassolino M, Serino A. Representation and perception of the body in space. *Encycl Behav Neurosci* Second Ed.2021;2-3:640-656. <https://doi.org/10.1016/B978-0-12-819641-0.00137-7>

Serino A. Peripersonal space (PPS) as a multisensory interface between the individual and the environment, defining the space of the self. *Neurosci. Biobehav.Rev.*2019, 99:138-159. DOI:

Bassolino, M. et al. Distortions of body and peripersonal space representations in chronic stroke patients with upper limb motor deficits. *Brain Commun.* In press.

Crema, A. et al. Neuromuscular electrical stimulation restores upper limb sensory-motor functions and body representations in chronic stroke survivors. *Med* 2022, 3, 58-74.e10. <https://doi.org/10.1016/j.medj.2021.12.001>