

## Development and evaluation of a new virtual reality-based approach to study the sense of agency

**Background:** This Master thesis is part of a large project, in collaboration with the Bern University Hospital Inselspital, where an impairment in the sense of agency, typical of a disorder called “functional neurological disorders”, will be investigated by means of virtual reality.

The sense of agency is defined as the subjective awareness that one is initiating, executing, and controlling one's own action, and is the results of an implicit comparison between conscious motor intention (e.g., I want to move my hand) and motor feedback (e.g., my hand actually moves). Patients affected by functional neurological disorders present neurological symptoms, such as tremor or paralysis, in the absence of an organic lesion of the nervous system. An impairment of the sense of agency might be the source of such disorders.

However, given its intrinsic and subjective nature, an objective measure of the sense of agency is difficult to achieve.

**Aim:** In this project, the student will develop a novel approach, based on head-mounted displays for virtual reality, to objectively measure the sense of agency in healthy volunteers.

**Materials and Methods:** The novel measurement system will be based on existing literature. A virtual environment will be created, where participants will have to perform simple limb movements (e.g., lifting of the hand, extension of the leg), while the virtual avatar will replicate these movements in the virtual world (Figure 1).

Different coherence levels between the virtual and real movement will be implemented, ranging from 100% (the virtual avatar replicates the exact movement of the real limb) to 0% (the virtual avatar moves randomly). At the end of each level, participants will be asked to judge how much control over the movement of the avatar they felt to have had. This question is relevant to measure the subjective sense of agency in relation to an objective degree of coherence.

### Nature of the Thesis:

Development of the novel measurement system: 40%

Evaluation of the developed protocol: 40%

Data analysis: 20%

### Requirements:

Interest in neurological field

Familiarity with programming VR-based applications

Willingness to work in a multidisciplinary environment

### Supervisors:

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### References:

Nahab, F.B., et al., *Impaired sense of agency in functional movement disorders: An fMRI study*. PLoS one, 2017.

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**Figure 1** - A possible example of a participant performing a lifting movement with her arms.