

# **The neural underpinning of bodily and sensory stimulus processing in humans in varieties of conscious and unconscious states**

Marzia De Lucia (marzia.de-lucia@chuv.ch)

In humans, perception and action are influenced by bodily sensations. This is evident, for example, when a feeling of hunger makes food look particularly delicious (perception), or when being out of breath elicits the urge to stop running (action). Recent literature has shown that this body-brain interaction encompasses even more subtle and fundamental aspects of sensory and cognitive processing that occur mostly outside our conscious awareness.

For instance, auditory stimuli are processed differently depending on their timing within the cardiac cycle<sup>1,2</sup>, and these stimuli can, in turn, influence autonomic activity, as reflected by variations in heart rate variability or pupillary responses. These findings encourage a systematic investigation into how bodily signals, including cardiac, respiratory, and gastric rhythms, influence the perception of sensory stimuli and elicit actions.

This thesis aims to quantify the impact of these bodily signals on sensory processing, seeking to identify common electrophysiological mechanisms of this reciprocal interaction across sensory modalities. Potential extensions of this project include investigating whether such mechanisms remain preserved in altered states of consciousness, such as sleep and coma, shedding light on whether they occur independently of conscious awareness of the bodily and external environment.

## **References**

1. Pfeiffer C, De Lucia M. Cardio-audio synchronization drives neural surprise response. *Scientific reports*. 2017;7(1):14842.
2. Pelentritou A, Pfeiffer C, Schwartz S, De Lucia M. Cardio-audio synchronization elicits neural and cardiac surprise responses in human wakefulness and sleep. *Communications Biology*. 2024.