Cognition and Action

Neural mechanisms of phantom sensations and pain

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The vast majority of acquired amputees report persistent and vivid sensations of their missing limb, with most amputees reporting that these sensations are painful. Neuroimaging work has demonstrated the preserved representation of the phantom limb in the sensorimotor cortices, and the extent of preservation (i.e. activation) has been linked to the incidence of phantom limb pain (PLP), with movement of the phantom hand engaging activity in typical pain processing areas. This body of literature suggests that an interplay of preserved representation in phantom hand motor control and pain processing may be involved in the generation of PLP. However, it is still uncertain how these factors relate to one another and whether phantom pain lies at one end of a phantom sensation spectrum. With this project we aim to develop new paradigms in order to probe the mechanisms underlying the generation of phantom sensations and PLP both within and beyond the sensorimotor system. This will involve a range of techniques from functional MRI, Transcranial Magnetic Stimulation, high-density EMG, OPM-MEG and computational modelling (drift diffusion modelling, reinforcement learning). We are specifically interested to test (using pre-registered reports) the plausibility of using a predictive coding framework to account for inter-individual differences in PLP.