

## **Libet revisited - The effects of mindfulness meditation training on voluntary action and on time perception: a controlled study with experienced meditators**

### **Abstract:**

Intuitively, being aware of one's inner processes to move should be crucial for the control of voluntary movements. However, research findings suggest that we are not always aware of the processes leading to movement execution. The present project investigated first-person experience to the processes of movement initiation and the underlying brain activities which contribute to the emergence of voluntary movement. Moreover, we investigated differences in Libet-type task performance between mindfulness meditators and non-meditators while assuming that meditators are more experienced in attending to their inner processes. Meditators revealed a consistent readiness potential (RP) with correlations between the subjective intention time to act and the slope of the early RP. However, non-meditators did not show this consistency. This result suggests that compared to non-meditators, meditators are more able to access the emergence of negative deflections of slow cortical potentials (SCPs), which could have fundamental effects on initiating a voluntary movement with awareness. Furthermore, we found that self-initiated movements following ongoing negative deflections of SCPs result in a stronger intentional binding effect compared to positive potentials, especially regarding the perceived time of the consequent effect, but no group effect between meditators and non-meditators was found. Our results provide the first direct evidence that the early neural activity within the range of SCPs affects not only the perceived time of one's inner experience to act but also the perceived time of a sensory outcome that is caused by intentional action.

### **Keywords**

Intention, Sense of Agency, Libet experiment, Slow cortical potential, Meditation

### **Published Work:**

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