Neural mechanisms of human motor control

Project Leader
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1. Objective

This project aims to elucidate human motor adaptability. Humans can perform daily activities without any difficulty despite changes in the environment, and can master various motor performances such as writing, walking and speaking. The brain is the driver of that flexible motor adaptability. This project will work to determine the neural basis of human motor adaptability, using psychophysiological methods and/or non-invasive techniques such as MRI, tES, and TMS.

2. Project Outline

To that end, the project will consist of the following phases:

(a) Creation of a novel environment (e.g., a rotational velocity-dependent force field in reaching movements through use of a robotic manipulandum), to which the participants are required to adapt.
Clarification of the characteristics of human motor behavior through examination of the process of adaptation to a novel environment.
(b) Measurement of brain activities during human adaptative behavior.
(c) Evaluation of the relationship between human adaptative human behavior and changes in brain activity.

3. Expected Performance

In this project, the successful candidate would be expected to:

(a) work independently on a research topic;
(b) contribute to the supervisor's and lab members' projects; and
(c) publish two or more papers in international journals.

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

(a) background in neuroscience and/or motor control research;
(b) skills in Matlab/Python programming and statistical methodology; and
(c) ability to communicate and write in English.

References

(1) Kadota, H. Hirashima, M. and Nozaki, D. Functional modulation of corticospinal excitability with adaptation of wrist movements to novel dynamical environments. *The Journal of Neuroscience*, 34, pp12415-12424, 2014.
(2) Kadota, H., Sekiguchi, H., Takeuchi, S., Miyazaki, M., Kohno, Y. and Nakajima, Y. The role of the dorsolateral prefrontal cortex in the inhibition of stereotyped responses. *Experimental Brain Research*, 203, pp593-600, 2010.
(3) Kadota, H., Nakajima, Y., Miyazaki, M., Sekiguchi, H., Kohno, Y., Amako, M., Arino, H., Nemoto, K. and Sakai, N. An fMRI study of musicians with focal dystonia during tapping tasks. *Journal of Neurology*, 257, pp1092-1098, 2010.

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