

Training on eye-controlled game: a fMRI study with a healthy subject

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Introduction

In previous studies (Modroño et al., 2015) we showed that the control of virtual elements with the gaze enhances brain activity in sensorimotor regions.

Methods

With the aim of proving this new approach, one male participant was training during four weeks in an eye-controlled version of different arcade games. We registered his brain activity before and after the training during a functional MRI session. Inside the fMRI scanner, he performed a continuous tracking task with an MRI-compatible joystick. The fMRI experiment consisted of two conditions: movement and fixation. Data processing was done using SPM12 software.

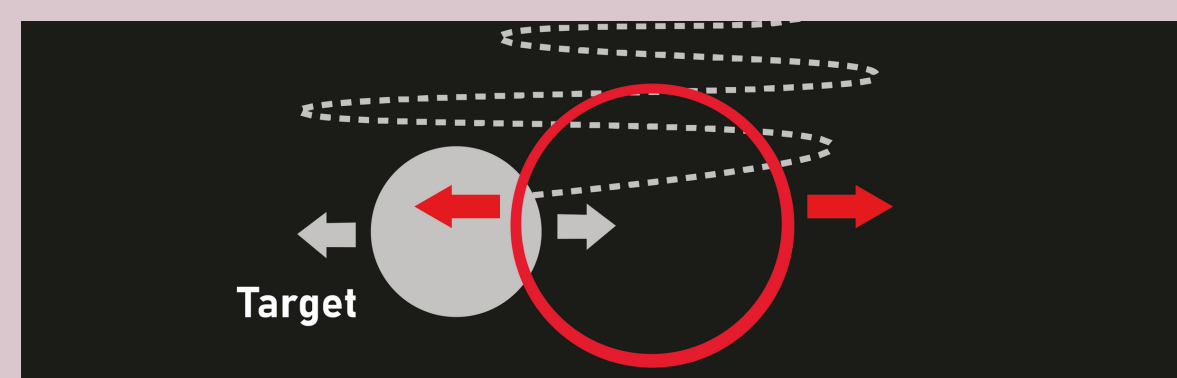


Figure 1. Continuous tracking task performing inside the fMRI scanner

Results

After the training period, the direct comparison between the movement conditions of the two days shows an increase of activity in the cerebellum, supplementary motor area and Brodmann area 4 and 6. The mean absolute error (MAE) measures indicate that the subject improved his performance by 23% during the second day.

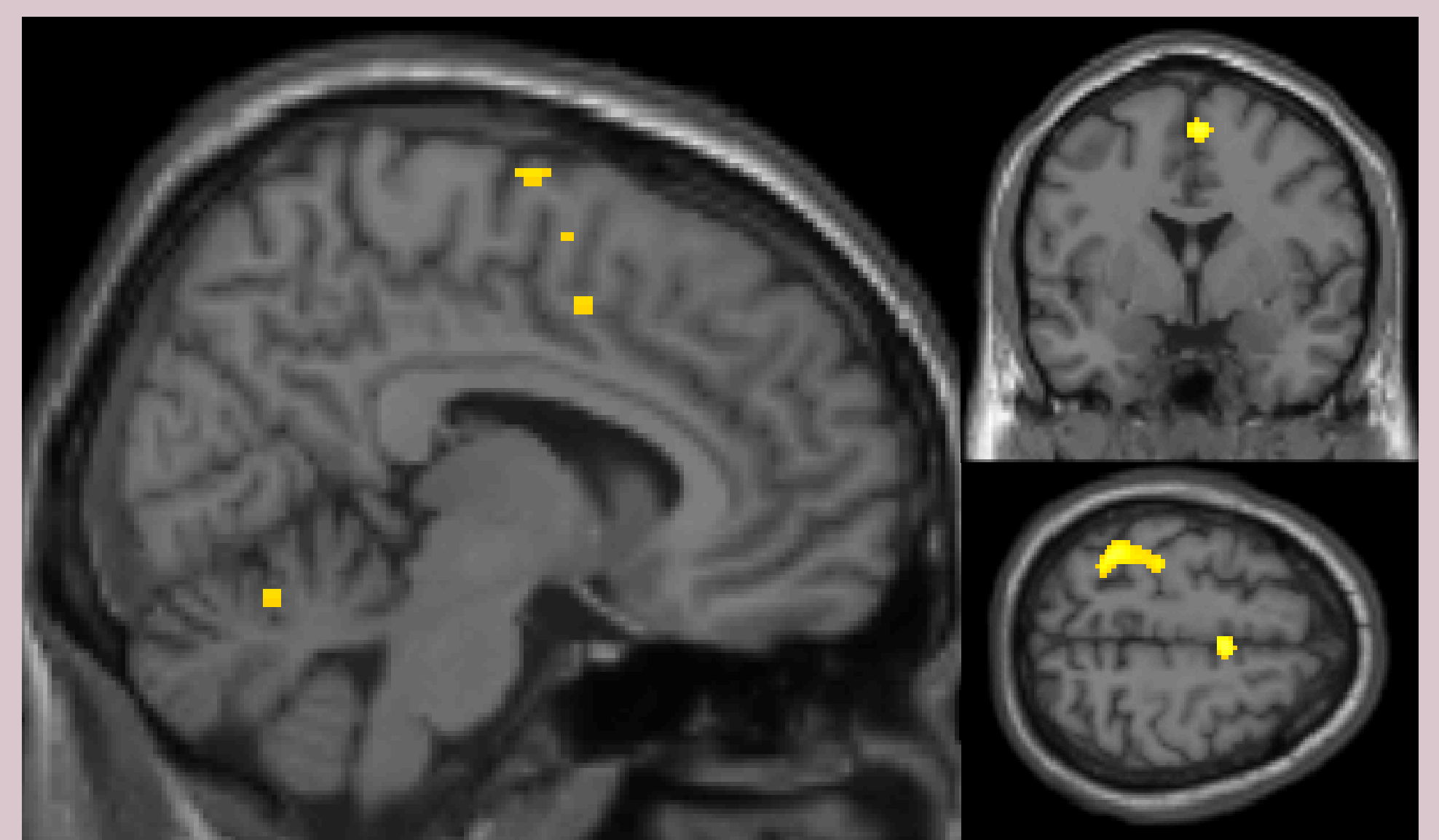


Figure 2. Increases of brain activity after 4 weeks of training ($p < 0.05$, FDR)

Conclusion

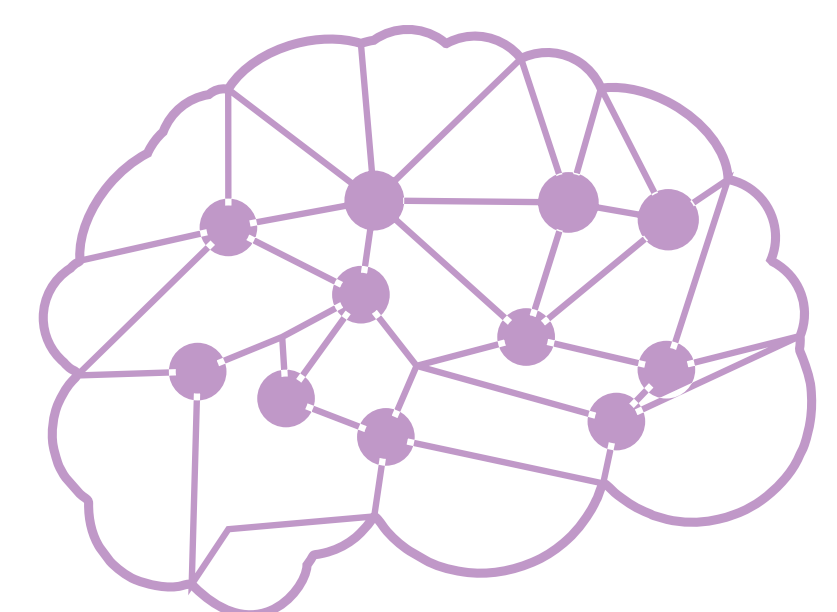
In the line of our previous studies (Gebert J, 2017; Modroño et al., 2015; Modroño et al., 2020) we conclude that the training on eye control of virtual objects can enhance activity in sensorimotor regions, what could be transfer to the hand. This finding may be of interest in the context of neurorehabilitation to activate motor systems and help in the recovery of motor functions in neurological diseases, such stroke, where it is not always possible to resort to limb movements.

References

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