

Brain correlates of perceptual switch during perception rivalry: an ultra-high field 7T functional magnetic resonance imaging study

Nasrin Mortazavi¹, Ekaterina Koshmanova¹, Roya Sharifpour¹, Alexandre Berger^{2,3}, Ilenia Paparella¹, Islay Campbell¹, Elise Beckers^{1,4}, Puneet Talwar¹, Siya Sherif¹, Gilles Vandewalle¹

¹ Sleep and Chronobiology Lab, GIGA-Institute, CRC-In Vivo Imaging Unit, University of Liège, Liège, Belgium

² Institute of Neuroscience (IoNS), Université Catholique de Louvain (UCLouvain), Brussels, Belgium

³ Synergia Medical SA, Mont-Saint-Guibert, Belgium

⁴ Alzheimer Centre Limburg, School for Mental Health and Neuroscience, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands.

Introduction

Perceptual rivalry while viewing ambiguous stimulus leads to repetitive switches between two perceptions of the same image¹. Switches are considered to recruit bottom-up and top-down attentional processes. We aimed to investigate the neural mechanisms of perceptual switch using high resolution ultra-high-field 7-Tesla MRI.

Methods

35 healthy subjects (18-70y; 28 women) were recruited. fMRI (voxel size 1.4 mm³) was recorded for 10 minutes while participants viewed a Necker cube² (10s breaks every minute). Subjects were instructed to report switch of their perception by pressing a button.

Results

Perceptual switches were associated with increased activation in the bilateral intraparietal sulcus (which is involved in attention), the insula (part of the salience network), the occipital cortex (including in an area compatible with V4, involved in shape detection), the left motor cortex, and the right cerebellum (whole-brain FWE corrected $p < .05$) (Fig1).

Conclusions

We report neural substrates compatible with the top-down and bottom-up attentional processes involved in resolving perceptual rivalry. Our results further suggest that perceptual changes of ambiguous figures are associated with a widespread set of brain activation.

Funding: FNRS, ULiège, FEDER, SAO-FRA, Wallonia-Brussels federation

References

1. Blake R, Logothetis NK. Visual competition. *Nature Reviews Neuroscience*. 2002;3(1):13-21.
2. Einhäuser W, Stout J, Koch C, Carter O. Pupil dilation reflects perceptual selection and predicts subsequent stability in perceptual rivalry. *Proceedings of the National Academy of Sciences*. 2008;105(5):1704-1709.

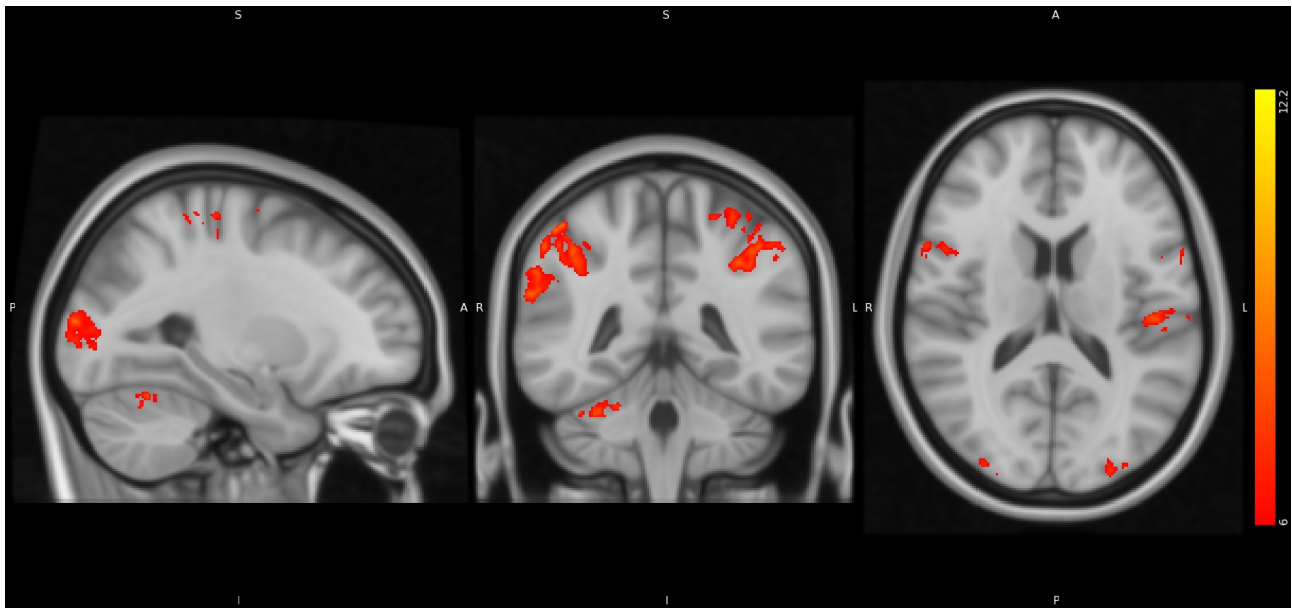


Figure 1