

---

# Division of labor in action control: roles of (pre)supplementary and primary motor areas in Humans

Clemence Roger\*<sup>†1,2,3</sup>, Franck Vidal<sup>1</sup>, Thierry Hasbroucq<sup>1</sup>, Wim Fias<sup>2</sup>, and Boris Burle<sup>1</sup>

<sup>1</sup>Laboratoire de neurosciences cognitives (LNC) – CNRS : UMR7291, Université de Provence - Aix-Marseille I – Pole 3 C Case C 3 Place Victor Hugo 13331 Marseille Cedex 3, France

<sup>2</sup>Department of Experimental Psychology – Ghent University, Faculty of Psychology and Educational Sciences, Department of Experimental Psychology, Henri Dunantlaan 2, B-9000 Gent, Belgium

<sup>3</sup>Cognitive Neuroimaging Unit – Inserm : U992, CEA – CEA/SAC/DSV/DRM/Neurospin center Bât 145, Point Courier 156 F-91191 Gif-sur-Yvette Cedex FRANCE, France

## Abstract

The (pre)supplementary motor areas (SMA/preSMA) are often assumed to be involved in movement planning. However, recent studies suggested that the SMA/preSMA have a role in the conflict resolution between motor actions plans (Ullsperger 2001, Nachev et al. 2007) and in action switching (Isoda and Hikosaka 2007). Additionally the roles of the primary motor cortices (M1s), formally restricted to response execution, are nowadays broadened to other control mechanisms like for instance error prevention (Vidal et al., 2011). Thanks to source localization (distributed and dipolar), we have studied the respective roles of these two areas in action control in two sets of data in which participants were performing conflict tasks (Simon and Eriksen flanker tasks). Distributed source localization (SSLOFO) allowed to extract the generators of the corresponding EEG activities, and to seed the position of the equivalent dipoles used to extract a precise time course of those areas. The results show a division of labor between the SMA/preSMA and the M1s in context-dependent adaptation: both the activation of the correct response and the inhibition of the incorrect one were larger for response switch, but were not sensitive to current compatibility. By contrast, the (pre)supplementary motor area was more active incompatible trials, and all the more in action switch.

---

\*Speaker

<sup>†</sup>Corresponding author: clemence.roger@gmx.fr