A3-24 Neural basis of online control during visually guided reaching

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Involvement of the left posterior parietal cortex (lPPC) in online motor control has been demonstrated using mainly functional magnetic resonance imaging (fMRI, for review see Culham et al, 2006). However, the human homologue to the macaque parietal reach region, or even more detailed functional anatomy of processes involved in motor control, is still controversial (Iacoboni, 2006). One challenge is the spatial co-localization of functions that are also involved in motor execution, e.g. saccades, and motor planning (Astafiev et al, 2003). Because of its high temporal resolution, transcranial magnetic stimulation (TMS) offers the possibility to disentangle these functions. Additionally, it allows to discriminate necessary from co-activated brain areas. Desmurget et al (1999) showed that the ability to react online to a change in visual target position when reaching for it can be disturbed by applying TMS over the lPPC. The goal of the present study was to identify sub-regions in the PPC contributing to the integration of visual information during online control of reaching. A reach-to-target paradigm with two perturbations induced correction upon target and body-related visual information, respectively: Displacement of the visual target and displacement of the visual feedback of hand position. We combined an fMRI localizer task with subsequent TMS experiments. The fMRI localizer gave an overview over the involved areas and enabled the selection of TMS stimulation sites. Inter-individual differences in (functional) neuroanatomy, being apparent in the human PPC (Grefkes and Fink, 2005), were thereby taken into account. The subsequent TMS experiments showed that regions from the anterior part of the intraparietal sulcus into the supramarginal gyrus are crucial for processing of target and body-related visual information during online control of reaching. The TMS effects were spatially selective and correlated with the fMRI activation, thus demonstrating a good spatial resolution of the offline combination of TMS with fMRI.