

# An Event-related fMRI Study of Representational Momentum

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**Introduction** The observer's memory for the offset position of a moving target is usually displaced in the direction of implied motion, and such memory distortion has been referred to as representational momentum (RM) (1-2). Several fMRI studies have suggested that MT/V5 complex maybe activated during the implied motion or RM tasks (3-4). However, our previous study using block-design fMRI did not found MT/V5 activation (5). In the present study, we used event-related fMRI to further investigate the cortical mechanisms underlying RM and the relationships between RM and implied motion.

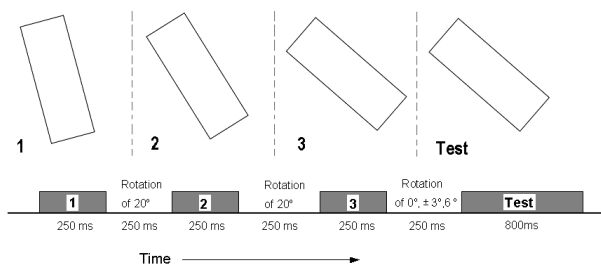
**Methods** The RM task stimuli were consisted of three inducing figures at different orientations which implied an anticlockwise rotation, followed by a probe at one of 5 orientations relative to the last inducing rectangle:  $-6^\circ$ ,  $-3^\circ$ ,  $0^\circ$ ,  $3^\circ$ ,  $6^\circ$  (Fig.1). For the non-representational task (NRM), the order of the first two inducing rectangles was reversed so that no consistent direction rotation was implied. In both tasks, subjects were asked to judge whether the test rectangle's orientation was the same as or different from the orientation of the last inducing rectangle. Nine subjects (6 males, 3 females, age from 21 to 38 years) were scanned in a 1.5 T GE Signa scanner with a single-shot, T2\*-weighted EPI sequence (TR/TE = 2980/60ms, 6mm thk / 2mm sp, FOV:  $24 \times 24$  cm<sup>2</sup>, Matrix:  $64 \times 64$ ) to acquire a set of 12 axial slices. The presenting order of the two tasks was randomized and the average SOA between the two successive trials was 8s. One kind of contrast (RM vs. NRM) was designed. All data were analyzed by SPM99.

**Results** The results of activated brain areas from the group analysis (uncorrected  $p < 0.005$ , extent threshold 30 voxels) were shown in Fig.2. Compared to NRM task, RM task induced stronger activation mainly in prefrontal areas, including right frontopolar cortex, right GFi (Gyrus frontalis inferior) and GFd (Gyrus frontalis medialis), bilateral GFs (Gyrus frontalis superior) and GFm (Gyrus frontalis medius), right Scm (Sulcus callosomarginalis). However, little activation was found in the MT/V5.

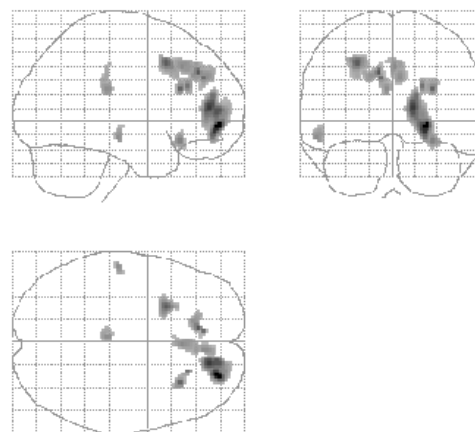
**Conclusions** In previous fMRI studies of RM, their comparisons between the RM tasks and contrasts were often mixed by the stimulus and task requirements differences. Their results of significant MT/V5 activation were reasonable since the implied motion perception was induced in their RM tasks but not in their contrasts (1-2). In present study, subjects were requested to perform the same task in responding to identical simple geometrical stimuli. The only difference between the RM task and NRM tasks is the order of presenting the first two inducing figures. The mixed factor of implied motion perception difference was reduced to the minimum. Consistently with our block-designed fMRI study (5), little activation was shown in MT/V5 but multi activations were found in the prefrontal cortex during representational momentum. Such results suggest that the cortical mechanism of RM is different from motion perception.

## References

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**Fig.1** Rotation paradigm used in RM task



**Fig.2** Activated regions related to RM.