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findings of the RM effect induced by the stimuli without implicit motion as that in frozen-action photographs suggest that MT/MST complex is not necessarily engaged in the generation of the RM effect when the contribution of implicit motion perception is diminished.

The current study examined the neural substrates of the RM effect using a classic paradigm studying the RM effect developed by Freyd and Finke (1984). As illustrated in Fig. 1, three inducing rectangles at different orientations are presented successively to produce a consistent clockwise or anticlockwise ‘‘implied rotation’’ or ‘‘implied motion’’ (i.e., ‘‘motion’’ arising from a sequence of static pictures). Subjects were asked to compare the orientation of a probe rectangle with the remembered orientation of the final inducing rectangle. It was found that subjects’ memory for the orientation of the final rectangle tended to be displaced forward in the direction of the implied rotation (Freyd and Finke, 1984; Kelly and Freyd, 1987). In the control condition, the order of the presentation of the first two rectangles was reversed so that the coherent path of implied rotation was disrupted and no RM effect was found (Freyd and Finke, 1984). In such an experimental design, there is implied rotation in both the RM condition (implied rotation of rectangles with a coherent direction) and the control condition (implied rotation of rectangles with incoherent direcwhether other brain areas are activated by the RM effect under this circumstance.

Nineteen subjects (8 women, 11 men, mean age 26 years, range from 21 to 38 years) participated in this study. Ten subjects participated in Experiment 1, six subjects participated in Experiment 2, and three subjects participated in both experiments. All subjects had normal or corrected-to-normal visual acuity and gave informed consents according to the guidelines of Department of Psychology, Peking University.

The stimuli and tasks were similar to those used in the previous work (Freyd and Finke, 1984; Kelly and Freyd, 1987). As illustrated in Fig. 1, three rectangles of identical dimensions with different orientations were used as the inducing figures. For the RM task, each inducing rectangle was oriented at 20°

P values smaller than an uncorrected *P* value of 0.005 for the group analysis.

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The behavioral performances were analyzed by calculating the percentage of reports that the orientation of the probe rectangle was the same as that of the third inducing figure. Table 1 summarizes the mean percentage of same responses as a function of the actual orientation of the probes relative to the third inducing figure in the RM tasks and the control tasks in Experiments 1 and 2. For each subject and each task, the magnitudes of the RM effect (in degrees) were determined by calculating the weighted mean estimates of the memory shift (i.e., the sum of the products of the proportion of same responses and the distance of the probe from true-same, in degrees, divided by the sum of the proportions of same responses). A shift of zero would be expected if there was no memory distortion. When the inducing figures did not imply rotation in a consistent direction in the control tasks, no significant difference was found between the weighted mean estimates of the memory shift and zero in both experiments (averaged $M = 0.07$ for Experiment 1 and averaged $M = 0.15$ for Experiment 2, both $P > 0.1$). Thus, no RM effect

vals besides the sequence of RM and control tasks. Shorter stimulus intervals in the block design experiment might generate apparent counterclockwise rotation between the probe figure of the prior trial and the first inducing figure of the current trial and thus decreased the consecutiveness of the inducing stimuli in the current trial. This may result in decreased coherence representation or the mental extrapolation within memory representation and thus weakened the RM effect in the block design experiment.

In conclusion, the current study investigated the cortical mechanisms underlying the RM under the condition that the contribution of implicit and implied motion perception was minimized. We found the RM-related activations in the prefrontal cortex but not in the MT/MST complex. The findings suggest that high level cognitive mechanisms underpinned by the prefrontal cortex may be involved in the RM effect. The RM effect may be associated with the spatiotemporal order representation or the mental extrapolation in human working memory.

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