# Correlation Between LIP Activation and Interference Processing: An Event-related fMRI study

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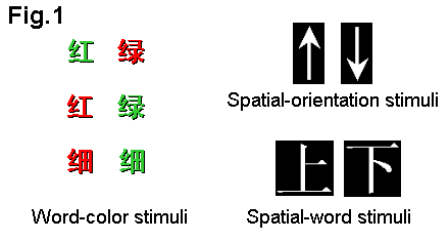
**Introduction** Interferences were often found in many psychological tasks that require subject response to one information dimension of a stimulus and ignore other dimensions. In the Stroop word-color task, interference was found between the task-relevant ink color information processing and the task-irrelevant word meaning information processing. Previous studies have suggested that a cortical network including the anterior cingulate cortex (ACC), the inferior parietal cortex, and the prefrontal cortex was activated during the conflict or interference processing (1-4). However, few studies correlated the relationship between the brain activation levels and the interference levels. In the present study, three Stroop tasks were designed with different interference levels in the stimuli: a word-color task, a space-orientation task and a space-word task. Event-related fMRI was used to investigate whether there is any cortical activation covariant to the interference levels.

**Methods** Stimuli used in the three tasks were shown in Fig.1. For the word-color task, stimuli were three Chinese characters ("RED", "GREEN", "SLIM") in red or green. Subjects were asked to judge the ink color of the character in spite of its meaning. For the spatial-orientation task, stimuli were two arrows (pointed up or down) presented in up, middle or lower visual field. Subjects were asked to judge the arrow's orientation in spite of its location. For spatial-word task, stimuli were two Chinese characters ("UP" and "DOWN") presented in up, middle or lower visual field. Subjects were asked to judge the word's meaning in spite of its location. The percentages of the incongruent stimuli, congruent stimuli and neutral stimuli were 40%, 30%, 30%, respectively. Each stimulus was presented for 250 ms. The time interval between the two successive presented stimuli was randomized with 10 different delays and the average duration of each trial was 6s. Eight subjects (5 males, age from 22 to 28 years) were studied. Subjects were consented prior to studies following the guidance from the IRB of the imaging center. All experiments were performed on a Siemens (Erlangen, Germany) Trio scanner. 3D MPRAGE images were acquired for structural reference. Single-shot, T2*- weighted EPI sequence (24 slices, TR/TE = 1500/30 ms, 4mm thk / 1mm sp, FOV: 24×24 $cm^2$, Matrix: 64×64) was used for functional scans. Functional scans were repeated twice for each task to get 60/40/40 repetitions for incongruent/congruent/ irrespective stimuli respectively. One kind of contrast (Incongruent vs. Neutral) was designed for each task. All data were analyzed by SPM99.

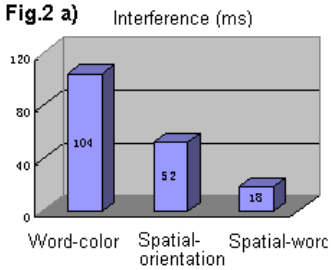
Fig.1



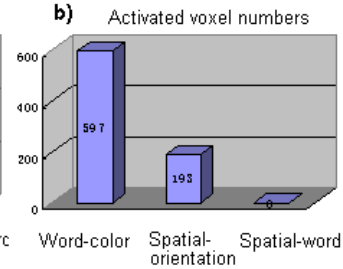

**Results** Mean Reaction time (RT) from behavioral results showed the graded interferences in three tasks ($p<0.005$) from the incongruent stimuli compared to the neutral stimuli (Fig.2a). The fMRI results (uncorrected $p<0.01$, extent threshold: 50 voxels) of the activation volumes in left inferior parietal lobule (LIP) showed significant correlations with the graded interferences. The color-word task showing strongest interference produced the largest activation in left LIP; the spatial-orientation task showing medial interference produced medial activation in left LIP; the spatial-word task showing weak interference produced little activation in left LIP (Fig.2b & Fig3).

**Conclusions** In the present study, three Stroop tasks were designed to produce interference between different stimuli dimensions: word-color, spatial-orientation and spatial-word. Our results revealed correlations between the interference level and the activation voxel numbers in left LIP. Previous study has indicated that LIP is involved in the top-down attentional control (5). Such results suggest that LIP may play an important role in attentional control of interference processing.

Fig.2 a)




b)




## References

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Fig.3