

# Relating yourself to visual scenes incongruous with body posture: An fMRI study

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## Introduction

To advance our previous study [1], we performed fMRI to investigate brain activation of subjects seeing scenes that matched or did not match with the supine posture in a magnet. We specifically examined the following factors in this study. (a) In addition to a bird's-eye view and the sky [1], we designed a scene of "no direction" - microgravity in outer space. (b) The target to which volunteers made responses was fixed in the middle of the monitor, whereas it moved horizontally in the previous study [1]. The fixation made volunteers suppressed eye movements. As we found characteristic activation in the parahippocampal gyrus previously, we focused on this area in this study, too.

## Materials and Methods

Nineteen healthy normal volunteers participated in this study (age 20-46, F/M = 3/16, all right-handed, all gave written informed consent). Three fMRI experiments were conducted in a block manner (five rest and four task blocks, each 30 sec, total 4 min 30 sec). In one experiment (Supine), volunteers looked at a space shuttle fixed in the middle of their vision with a background of the sky in the task blocks (Fig. 1). They turned a key under their right index finger when the shuttle went red color (twice per block). In another experiment (Prone), the shuttle was shown with a background of a mountain scene that could be viewed from the sky. Finally, in the "Space" experiment, volunteers viewed the shuttle with an outer space scene. All these backgrounds were moved downward to the direction of volunteers' feet at a constant pace. These animations were created using the Adobe LiveMotion software (Adobe Systems, Inc.) and displayed using IFIS-SA system (MRI Devices, Inc.). An EPI sequence was used on a 1.5 T scanner (MAGNETOM Avanto, Siemens, Erlangen, Germany) using the following parameters: TR 3000 ms, TE 56 ms, FA 90 deg, FOV 220 mm, 64x64 matrix, slice thickness 3.2 mm with 0.8 mm interval, 30 axial slices, 90 images per slice. After preprocessing of realignment, coregistration, spatial normalization and smoothing, the signal intensity during the task blocks as compared with the rest blocks was estimated using SPM2 (London College University). A random-effect group analysis was employed to compare the 3 experiments ( $p < 0.05$ , uncorrected).

## Results

Bilateral activation in the posterior parahippocampal/fusiform gyri was confirmed during the Prone condition. This area could be interpreted as the "parahippocampal place area (PPA)", which was associated with visual scene processing in a viewpoint-specific manner [2-4]. The PPA activation was also found in the comparisons between the Prone and the Space, as well as the Prone and the Supine (Fig. 2). There were no differences between the Space and Supine conditions in activation in this area.

## Discussion

The PPA has an important role in relating the observer to the visual scene [2-4]. The intense activation in the PPA during the Prone condition suggested the demand for relating volunteers to the scene incongruous with the body position. On the other hand, they need not exert much effort to imagine the Space as well as the Supine conditions. Our findings help to understand the effect of the supine posture, one of the "ecological" factors during fMRI [6].

## References

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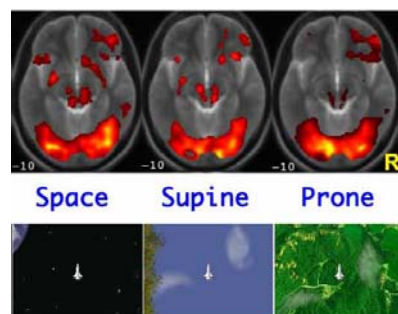


Fig. 1 Three task conditions and their activation relative to rest blocks.  $N = 19$ ,  $p < 0.05$ .

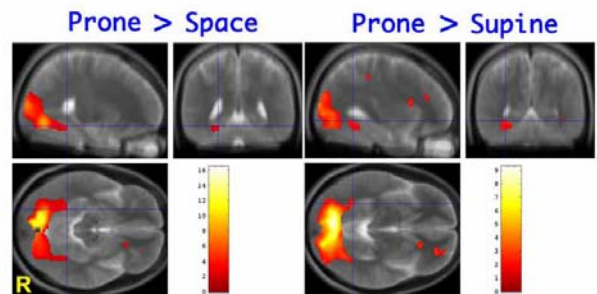


Fig. 2 The Prone experiment induced intense activation in the "parahippocampal place area" as compared with the Space/Supine experiments.  $N = 19$ ,  $p < 0.05$ .