

Supplementary Results

Responses to conventional bar stimuli

The present study indicates that L-IPS neurons encode the orientation of the target stimuli in the grouping detection task that are composed of discrete dots. Do these neurons encode the orientation of the conventional bar stimuli as well? To examine this problem, we also tested the responses to conventional bar stimuli during the fixation task in 36 neurons (20 of 82 neurons in monkey GG, 16 of 25 in FZ). The spatial extent of the bar stimulus (1.2 x 6 deg) matched that of the three dots aligned horizontally or vertically in the target stimuli used in the grouping detection task. We tested the responses of each neuron by using four bars generated by combining 2 orientations (horizontal or vertical) and 2 contrasts (black or white). Most of these neurons (72.2 %, 26 of 36) showed significant increase in the response to at least one of the bar stimuli although the responses tended to be weaker than in the grouping detection task (mean \pm SD, 31.7 ± 20.2 spks/s for the responses to the preferred conventional bar stimulus in the fixation task vs. 36.6 ± 21.4 spks/s for the preferred target stimulus in the grouping detection task). In these 26 neurons that exhibited significant responses to the conventional bar stimuli, a half (13 of 26) showed significant selectivity to the bar orientation ($p < 0.05$, 2-factor ANOVA) and one-third (9 of 26) showed

significant selectivity to the bar contrast. All but one neurons (12 of 13) that showed orientation selectivity to the conventional bar stimuli also exhibited significant orientation selectivity to the target stimuli during the grouping detection task. The preferred orientation was consistent between the two conditions in most cases (10 of 12). These results indicate that some of the L-IPS neurons recorded in the present study can also encode the orientation of the conventional bar stimulus as well as the orientation of the stimulus composed of discrete elements.

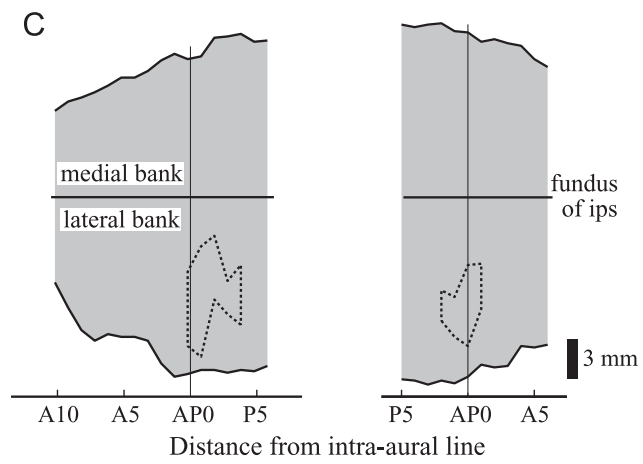
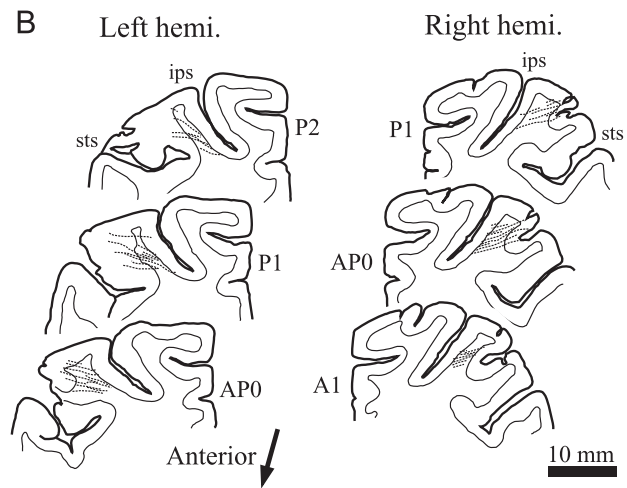
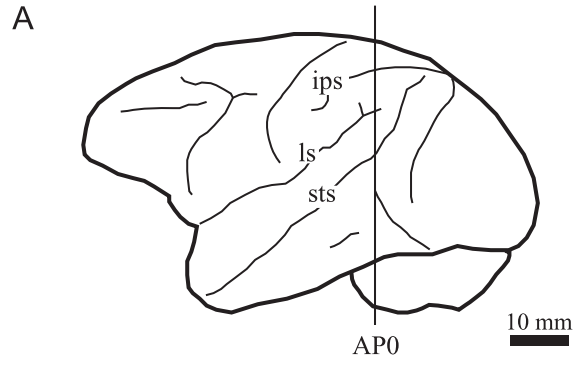
Supplementary Discussion

In the present experiment, each element of the stimulus is a black or white square; it gives no information about whether the entire stimulus is the target or the non-target. The size of each element is 1.2 deg at the edge, and the extent of the entire stimulus is 6 deg. At an eccentricity of 7.1 deg, where the stimulus was presented, the average size of the receptive field is 1.5 deg in V1, 3.2 deg in V2, and 3.9 deg in V3 (Gattass et al, 1981; Gattass et al, 1988). Consequently, the receptive fields of individual neurons in V1 - V3 are too small to determine whether a stimulus is the target or the non-target.

Reference

Gattass R, Gross CG, Sandell JH (1981) Visual topography of V2 in the macaque. *J Comp Neurol* 201:519-539.

Gattass R, Sousa AP, Gross CG (1988) Visuotopic organization and extent of V3 and V4 of the macaque. *J Neurosci* 8:1831-1845.



Supplemental Figure S1 legend

Histological reconstruction of the recording sites in one monkey (GG). Brain slices were examined microscopically and drawn by using a camera lucida. Histologically identified electrode tracks are superimposed on the nearest representative slices at 1 mm intervals.

Electrode tracks were densely distributed in the middle portion of the lateral bank of the intraparietal sulcus (L-IPS) (left hemisphere: A0-P4, right hemisphere: A1-P2).

A: Side view of the brain; the vertical line indicates the intra-aural line (AP0).

B: Coronal sections showing the recording sites. Dotted lines indicate histologically identified electrode tracks projected on the nearest section at 1-mm interval.

C: Location of the recording sites on the flattened intraparietal sulcus. The regions surrounded by the dotted lines represent the recording sites identified by histological reconstruction and are located in the L-IPS. Right and left panels correspond to the right and left hemispheres, respectively. ips: intraparietal sulcus, ls: lateral sulcus, sts: superior temporal sulcus.