Supplementary Figure Legend.

Supplementary Figure 1. Samples of fixation stability (during fixation task) measured with the Nidek MP-1 for MD4, MD5, and MD6, labeled accordingly. The blue dots represent 750 samples of the position of the fixation cross on the retina. Each participant's PRL fixation was stable (100%, 99%, and 79% of the samples within 4 degrees for MD4, MD5, and MD6, respectively).

Supplementary Figure 2. Determination of the foveal position for MD5 (right eye). This image shows the marked optic disk (blue crosses) and the computed foveal position (white circle) as well as the fixation locations representing the PRL (blue dots).

Supplementary Figure 3. Occipital pole ROIs for each MD participant. For the right hemisphere of each MD participant, the anatomically defined occipital pole ROI is displayed in yellow on the folded (left column) and inflated (right column) cortex. In both columns a medial view of the hemisphere is shown, although the ROIs typically extended onto the lateral and sometimes ventral surface.

Supplementary Figure 4. Bar charts showing average percent signal change in the *ipsilateral* occipital pole ROI in MD3, MD4 and MD5. In these three MD participants, the PRLs were located in the left visual field and peripheral stimuli were largely confined to the left visual field. Thus, activation in response to the peripheral stimuli would be expected in the contralateral (right) hemisphere and our primary analyses focused on the contralateral hemisphere only. However, data from the hemisphere ipsilateral to the PRL

can potentially provide clues about potential mechanisms of reorganization. If peripheral stimuli presented in the left visual field produce activation relative to the fixation baseline in the occipital pole ROI not only in the contralateral but also in the ipsilateral ROI, this might suggest that feedback from higher visual areas is the likely mechanism since activation in peripheral retinotopic cortex is only found in the contralateral hemisphere. In MD3 (top row), the peripheral stimuli were confined entirely to the left visual field several degrees from the vertical meridian. However, neither foveal nor peripheral stimuli produce significant activation relative to the fixation baseline ($p > 0.25$) and there was no difference in activation between these conditions ($p > 0.1$). In MD4, while the PRL was located in the left visual field, the size of the stimuli meant that they partially entered the right visual field. Stimuli presented at the PRL location produced a small but significant activation relative to the fixation baseline ($p < 0.05$), whereas stimuli presented at the fovea produced no significant activation). However, there was no significant difference in activation between these conditions ($p > 0.1$). Since the stimuli crossed the vertical midline, the small activation relative to the fixation baseline for stimuli presented at the PRL is not indicative of feedback as the underlying mechanism. In MD5, peripheral stimuli were presented roughly 6 degrees from the vertical midline and significant activation in the occipital pole ROI for these stimuli relative to the fixation baseline ($p < 0.01$) was observed. However, given the size of the stimuli (3 degrees wide) and the fixation stability of the participant (< 70% of fixations within 2 degrees - see Table 1), it is likely that stimuli landed close to the vertical meridian and this data cannot provide any clear insight into potential mechanisms. Activation relative to the fixation baseline in the occipital pole ROI was also observed for foveal stimuli ($p < 0.01$) and was not

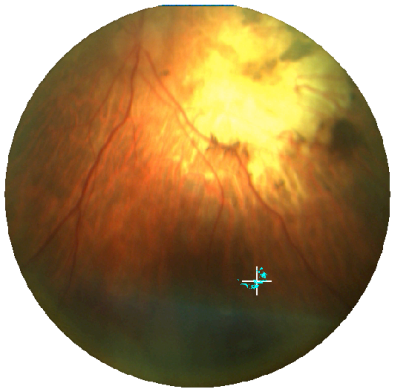
significantly different from that observed for peripheral stimuli ($p > 0.25$). Some foveal activation was also observed in the contralateral hemisphere, although it was not significantly different from baseline (see Figure 3). MD5 had the smallest scotoma of all MD participants and the stimuli were scaled to fit just inside the scotoma. Given the fixation stability of the participant, it is possible that parts of the stimuli occasionally emerged from behind the scotoma during foveal presentations, which may explain the apparent activation to foveal stimuli. Critically, this activation during foveal presentation cannot explain the strong response to peripheral stimuli in the contralateral hemisphere.

Supplementary Figure 5. Replication in MD4 with different scanners and different protocols. MD4 was scanned twice, on two different scanners with two different experimental protocols. Top row (reproduced from Figure 3): data from the 3.0 T Siemens Trio scanner at the A. A. Martinos Imaging Center at the McGovern Institute, MIT. MD4 viewed blocks of foveal and peripheral stimuli in interleaved blocks. As described in the main text, peripheral stimuli produced significant activity at the occipital pole, visble in the statistical parametric map (left column) and in response magnitude extracted from the occipital pole ROI (right column). Foveal stimuli produced no significant responses at the occipital pole. Bottom row: data from the 3.0 T Siemens Trio scanner at the Martinos Center for Biomedical Imaging in Charlestown. MD4 participated in an identical protocol to MD6 and MD7, viewing blocks of peripheral and foveal stimuli interleaved across runs. Due to technical difficulties, the foveal runs had to be discarded, but during the peripheral runs, significant activation above the fixation baseline was visible at the occipital pole in the statistical parametric map, and in the

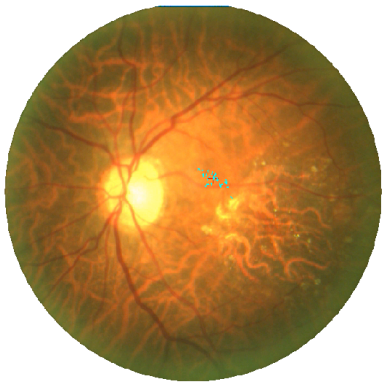
response magnitude extracted from the occipital pole ROI. Thus the differences in the testing procedure between participants with and without sparing cannot account for the pattern of results we observed. Color scale for the parametric maps is the same as in Figure 3.

Supplementary Figure 6. Significant activation in the foveal confluence during passive viewing of flickering checkerboards. MD1 and MD2 were scanned during passive viewing of flickering checkerboards presented at the PRL. While activation elicited by the checkerboards tended to be weaker than that elicited by complex visual stimuli during the performance of a task, nevertheless there was significant activation in the foveal confluence. Checkerboards and a fixation baseline were presented in alternating 18-second blocks during 4 runs each lasting 378 seconds. Activation in the occipital pole ROI was first normalized to the mean of each run and then averaged across cycles of the stimuli. The gray background corresponds to the presentation of the checkerboards. MD1's PRL was at the vertical midline and significant activation in the foveal confluence was observed in both the right (red line) and left (blue line) hemispheres. MD2's PRL was in the left visual field and significant activation was observed in the right hemisphere (red line). Error bars show standard error of the mean across voxels.

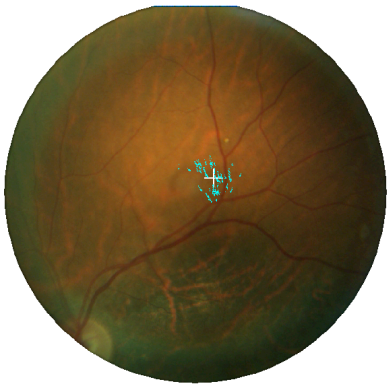
MD4

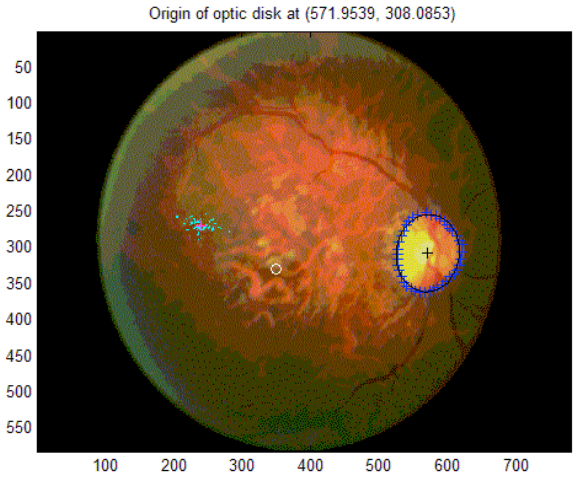


MD5



MD6




Origin of optic disk at (571.9539, 308.0853)
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200
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300
350
400
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500
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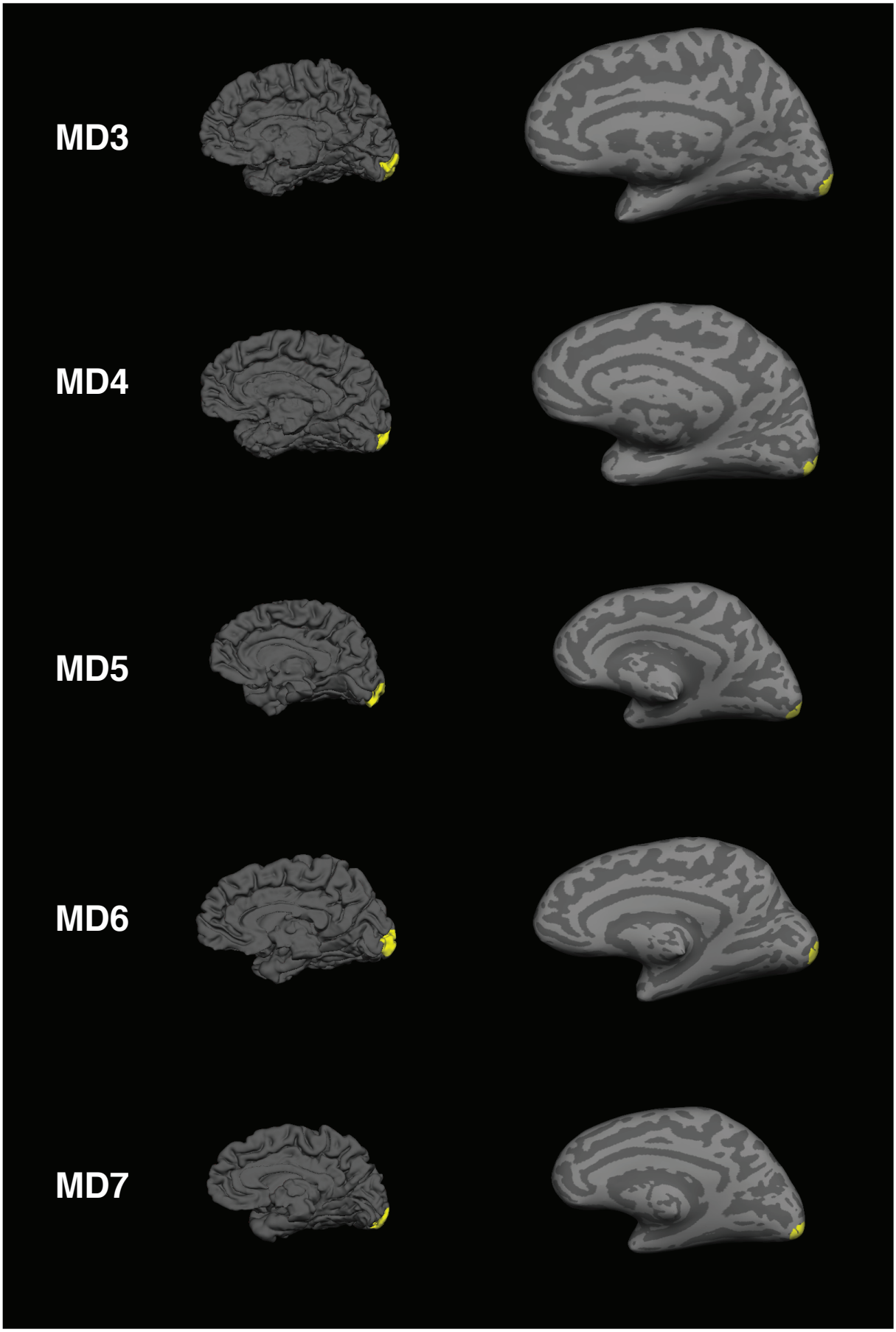
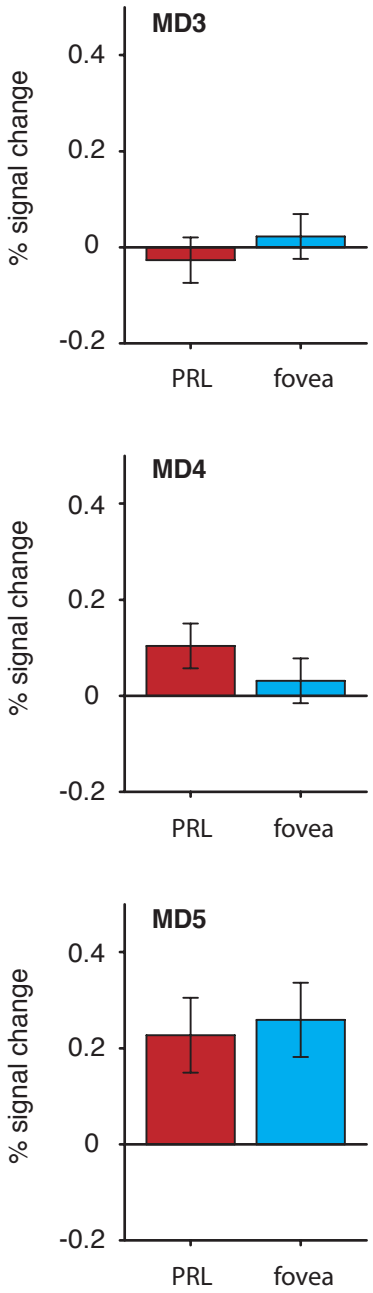
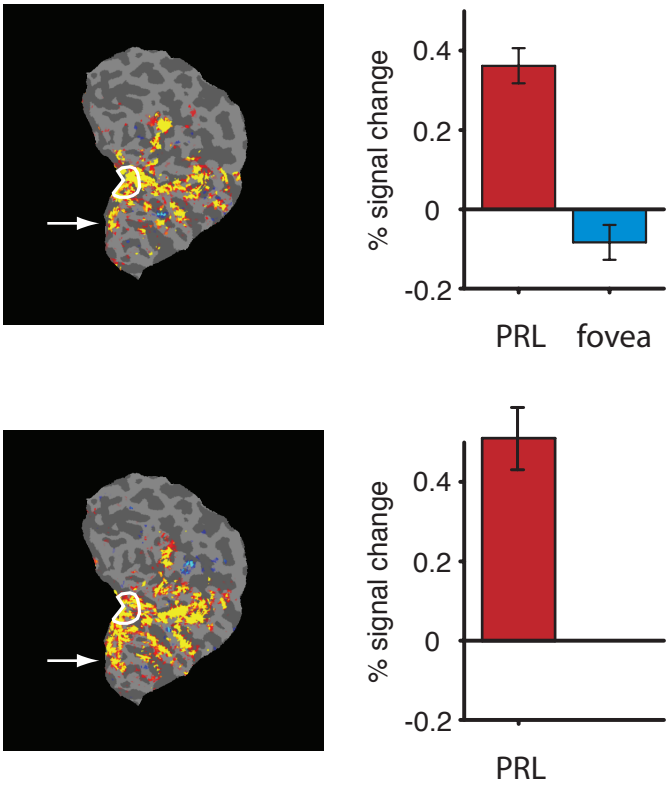
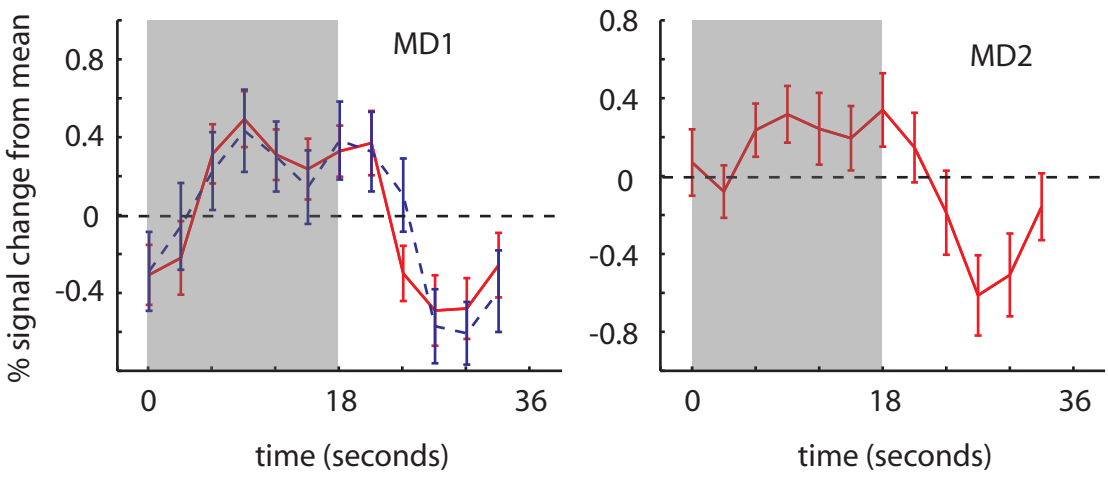
200
300
400
500
600
700


MD3
MD4
MD5
MD6
MD7


MD3
0.4
0.2
0
-0.2
% signal change
PRL
fovea
MD4
0.4
0.2
0
-0.2
% signal change
PRL
fovea
MD5
0.4
0.2
0
-0.2
% signal change
PRL
fovea


0.4
0.2
0
-0.2
% signal change
PRL
fovea
0.4
0.2
0
-0.2
% signal change
PRL


% signal change from mean
0.8
0.4
0
-0.4
MD1
0
18
36
time (seconds)
0.8
0.4
0
-0.4
-0.8
MD2
0
18
36
time (seconds)