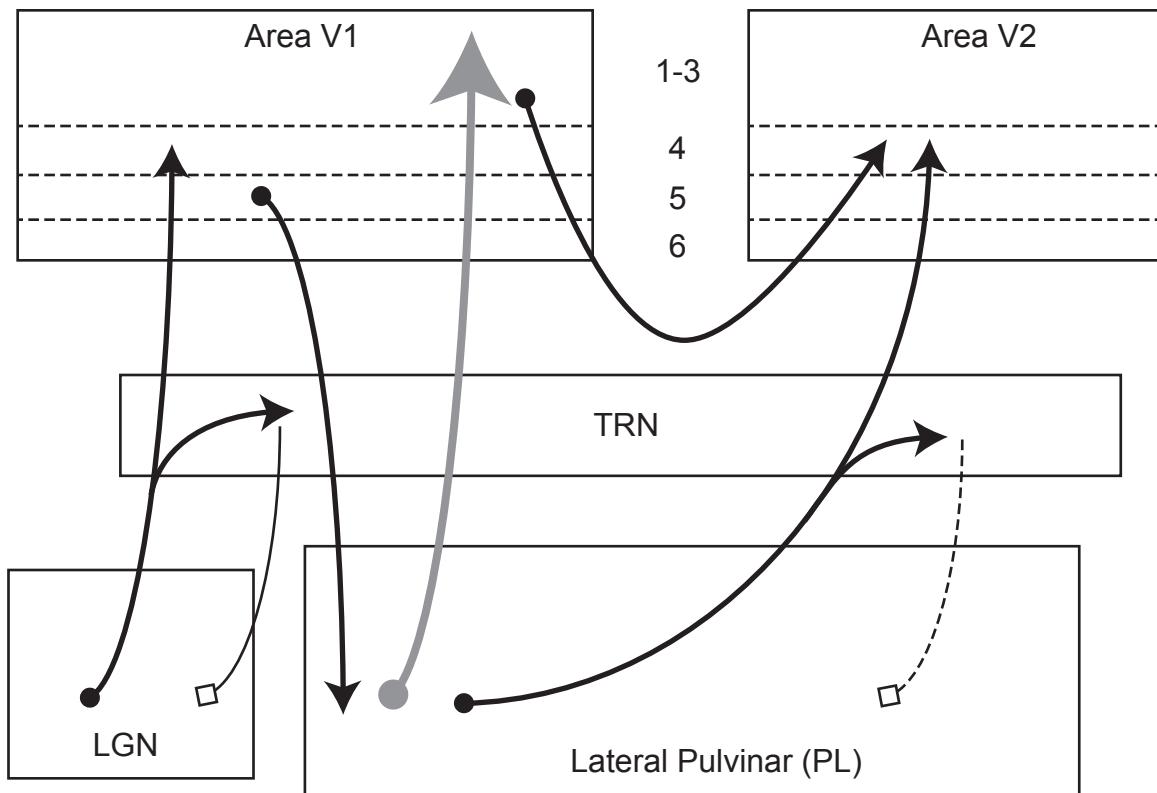
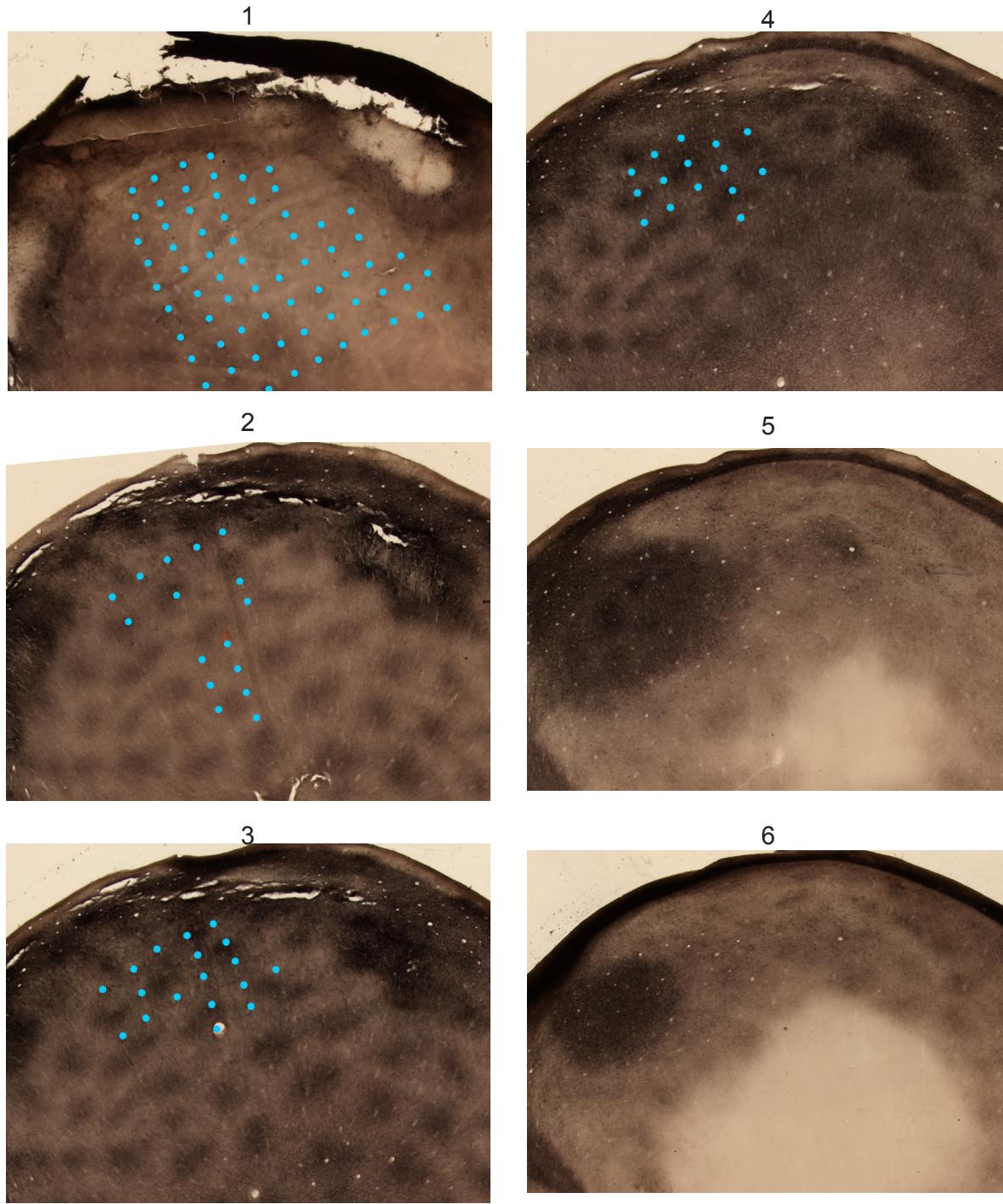


SUPPLEMENTARY FIGURE 1

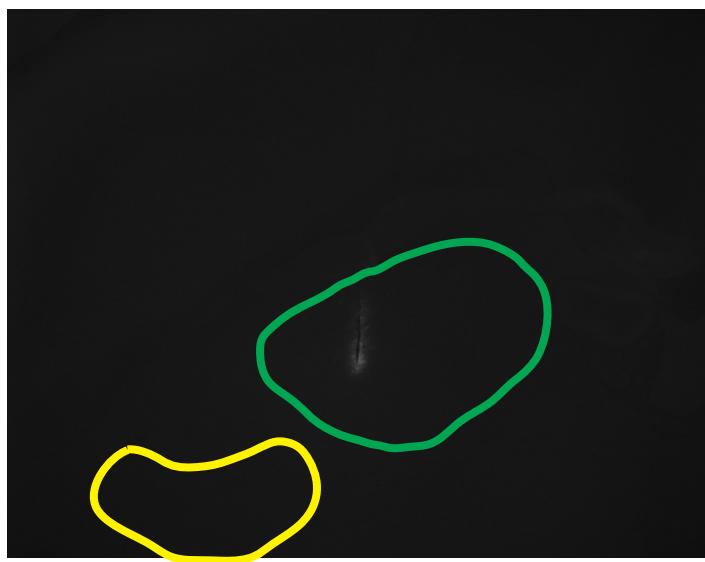
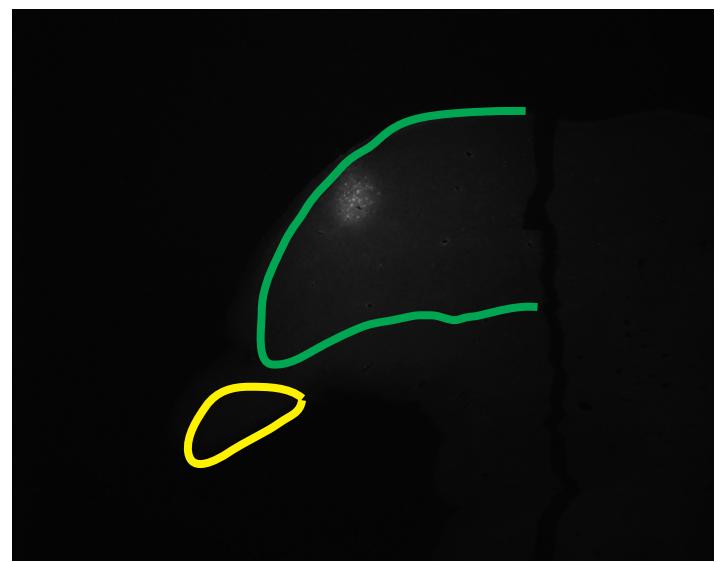
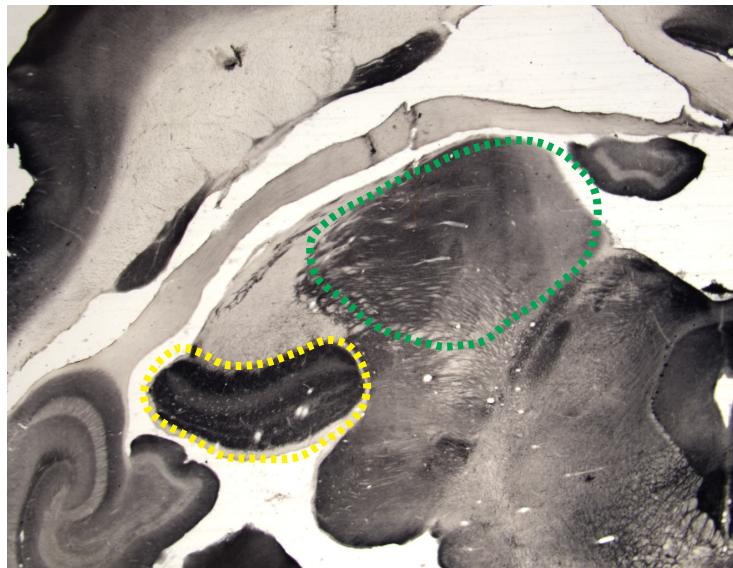
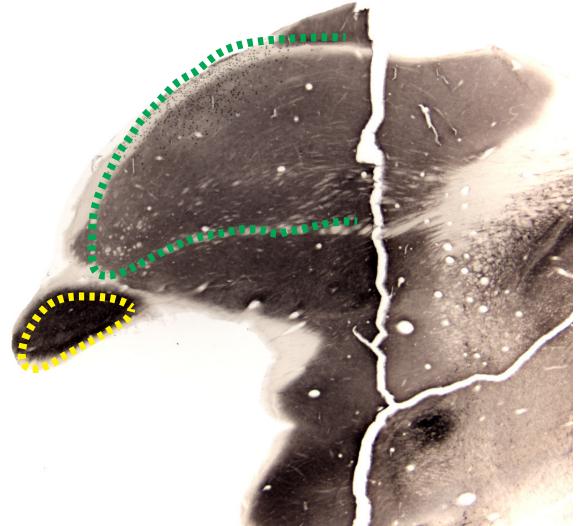


**Supplementary Figure 1 Thalamo-cortical connections relevant to the experiments** Parvo- and magnocellular layers of LGN provide the driving input to layer 4 of V1. Collaterals of these projections terminate in the TRN, which projects back to the LGN in a spatio-topic manner. Layer 5 of V1 sends driving input to lateral pulvinar, which projects back to layers 1-3 of V1 in primates. In distantly related mammals like cats, the presumed homologue of this projection is confined to layer 1. Lateral pulvinar also projects to layer 4 of V2 as does area V1 from its output layers 2-3. Projections from lateral pulvinar to layer 4 of extrastriate areas send collaterals to the TRN which projects back to lateral pulvinar in a spatio-topic manner. Projections from TRN back to LGN and lateral pulvinar originate from separate regions of TRN.

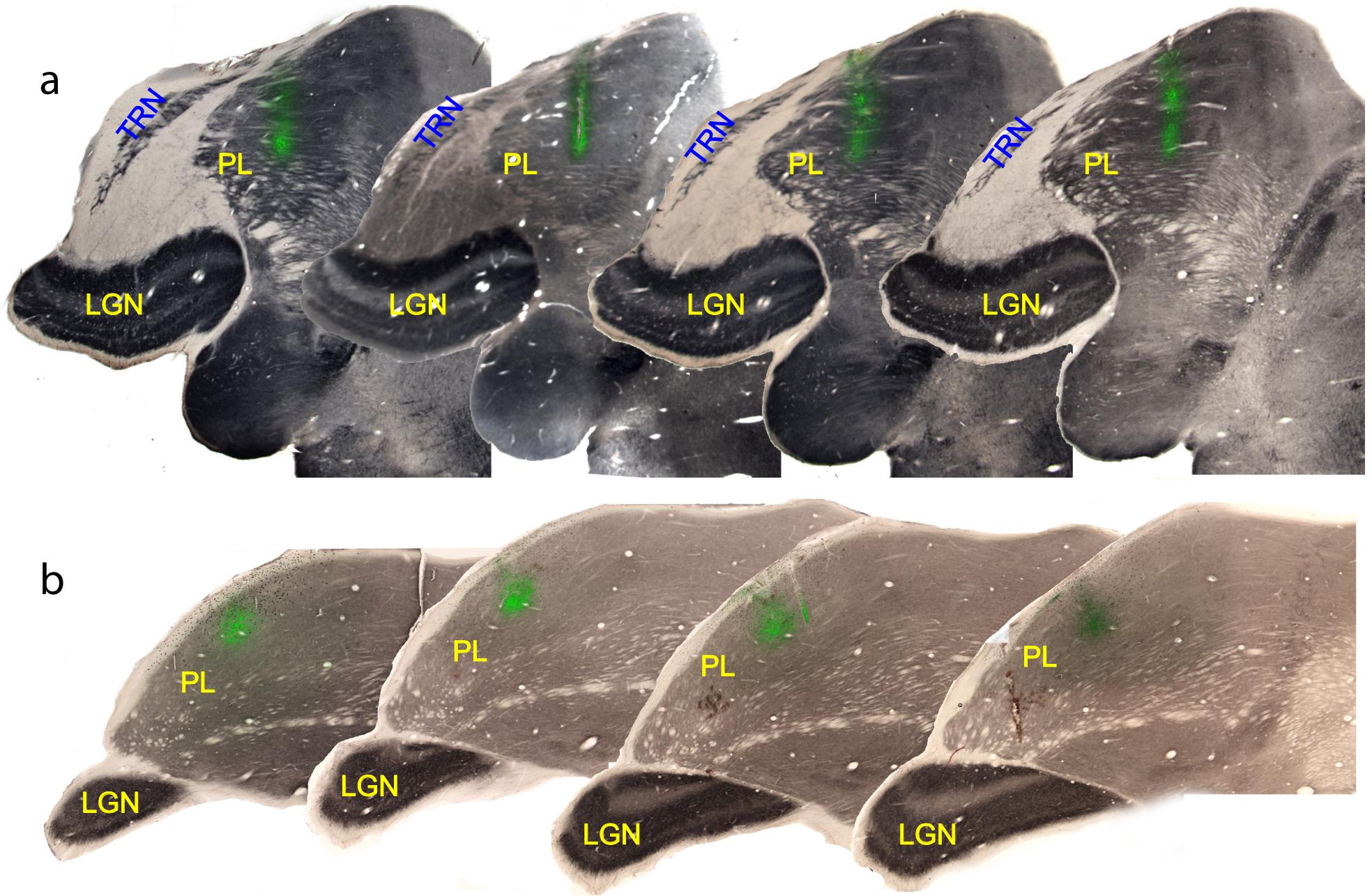


**Supplementary Figure 2 Placement of the multi-electrode array in layers 1-3 of V1**

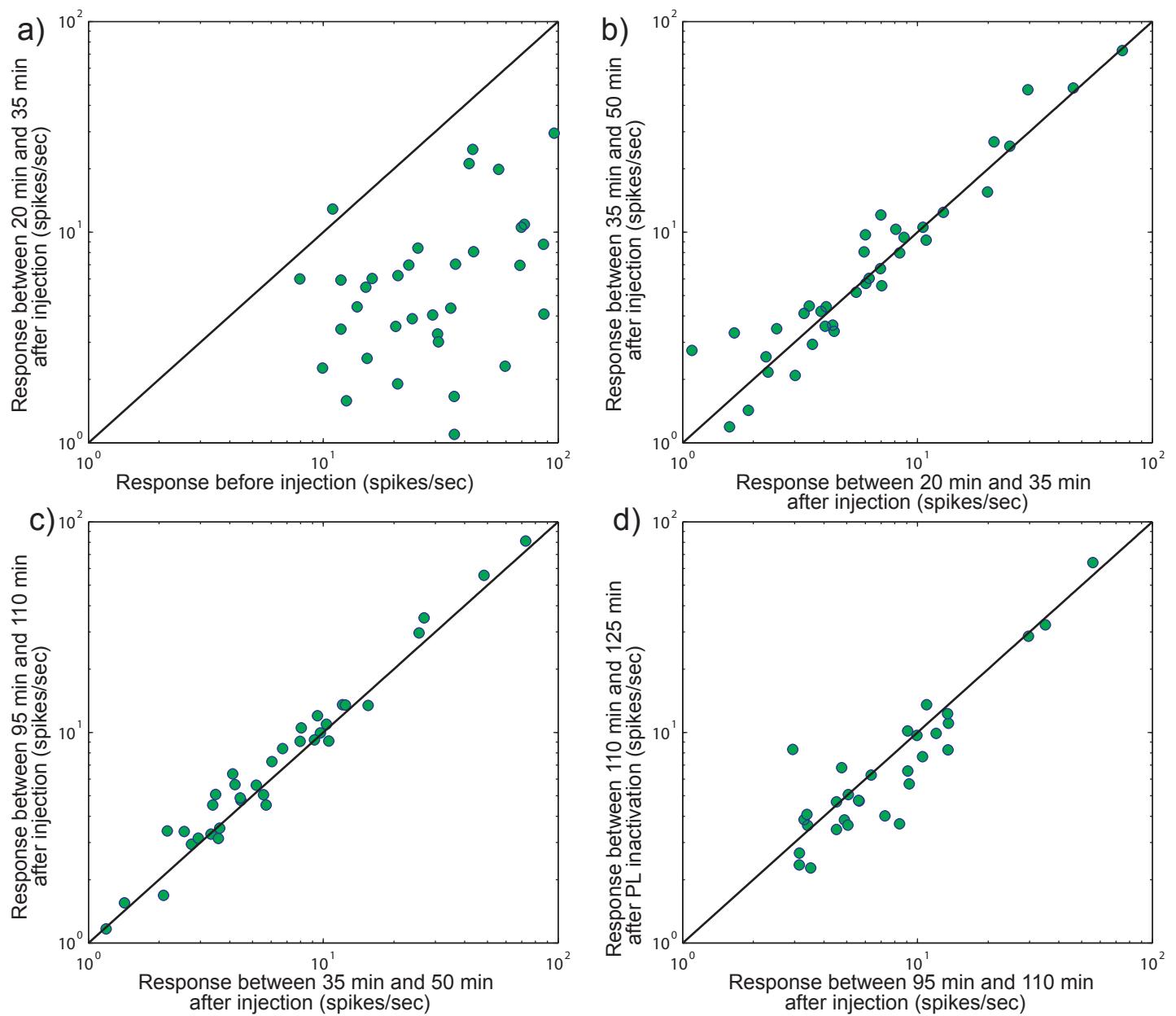
Tangential sections of flattened, CO-stained V1 are shown with sections 1 through 6 representing the most dorsal, superficial layers to the most ventral, inferior layers successively. Note that the CO blobs (dark patches) are centered in layer 3 and are not evident in layer 4 where CO stains uniformly. Blue dots are reconstructed electrode locations. Vasculature can be seen in Section 1 and CO blobs can be seen in sections 2 through 4. Thus, layer 4 starts between section 5 and 6. The electrode tips disappear with the CO blobs, showing that the tips were confined to layers 1-3.

**a****c****b****d**

**Supplementary Figure 3** *The injection was confined to lateral pulvinar and was widely separated from the LGN and the TRN* (a) Micrograph showing fluorescence from the muscimol+BDA injection. Lateral pulvinar is outlined in green and LGN in yellow. The outlines were created using a bright field image of the same sections. (b) Bright field LM image of the adjacent section stained for CO. The outlines shown in (a) are shown at the same spatial locations as dotted lines, in the same color. The two slices were aligned using several fiducial marks including blood vessels and artificial probes placed during tissue sectioning. Comparing (a) and (b), it is clear that fluorescence is confined to lateral pulvinar. (c) and (d) Similar images from the third and last case in which muscimol+BDA was injected.

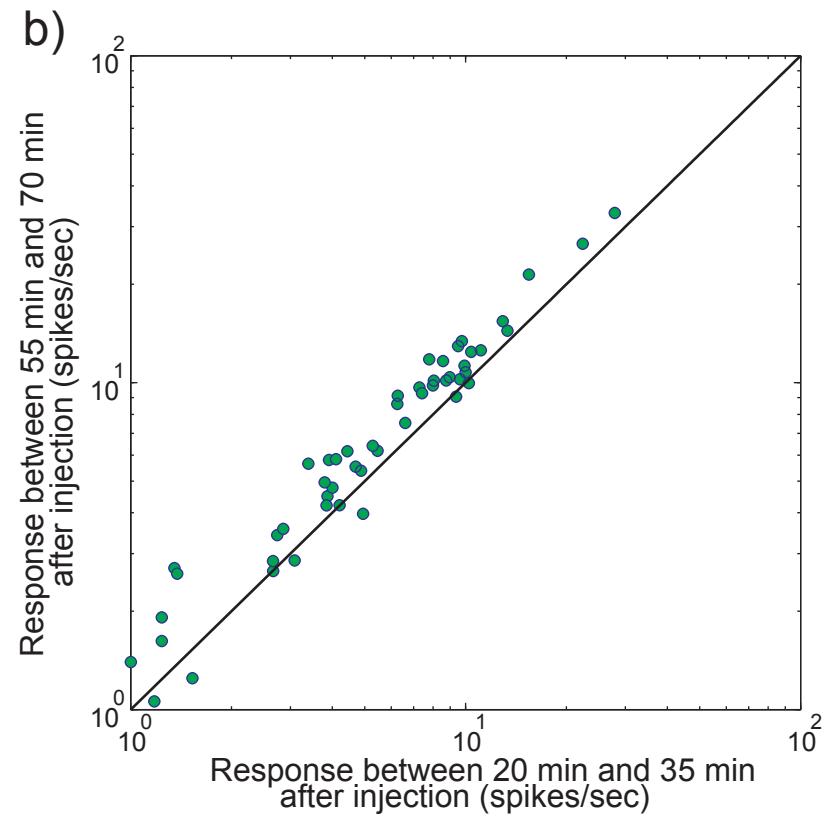
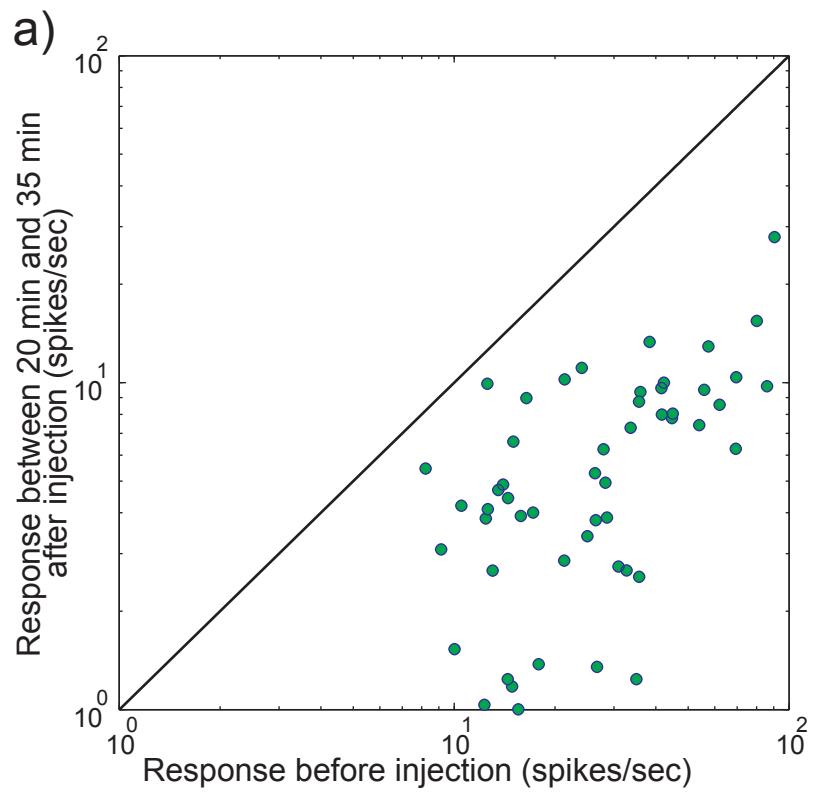


**Supplementary Figure 4** The injection was confined to lateral pulvinar and was widely separated from the LGN and the TRN. Part of the reconstruction of thalamus is shown for two cases. From left to right the sections represent anterior to posterior. Composite images were created as described above (see legend for Fig. 1g). Bright field images are of CO stained sections. Green fluorescence is from the muscimol+BDA injection. It is confined to the region of lateral pulvinar that contains the central visuotopic map. (a) It is clear that the injection was quite far from the LGN and the TRN. (b) TRN was not yet visible even in the most posterior section of this case.



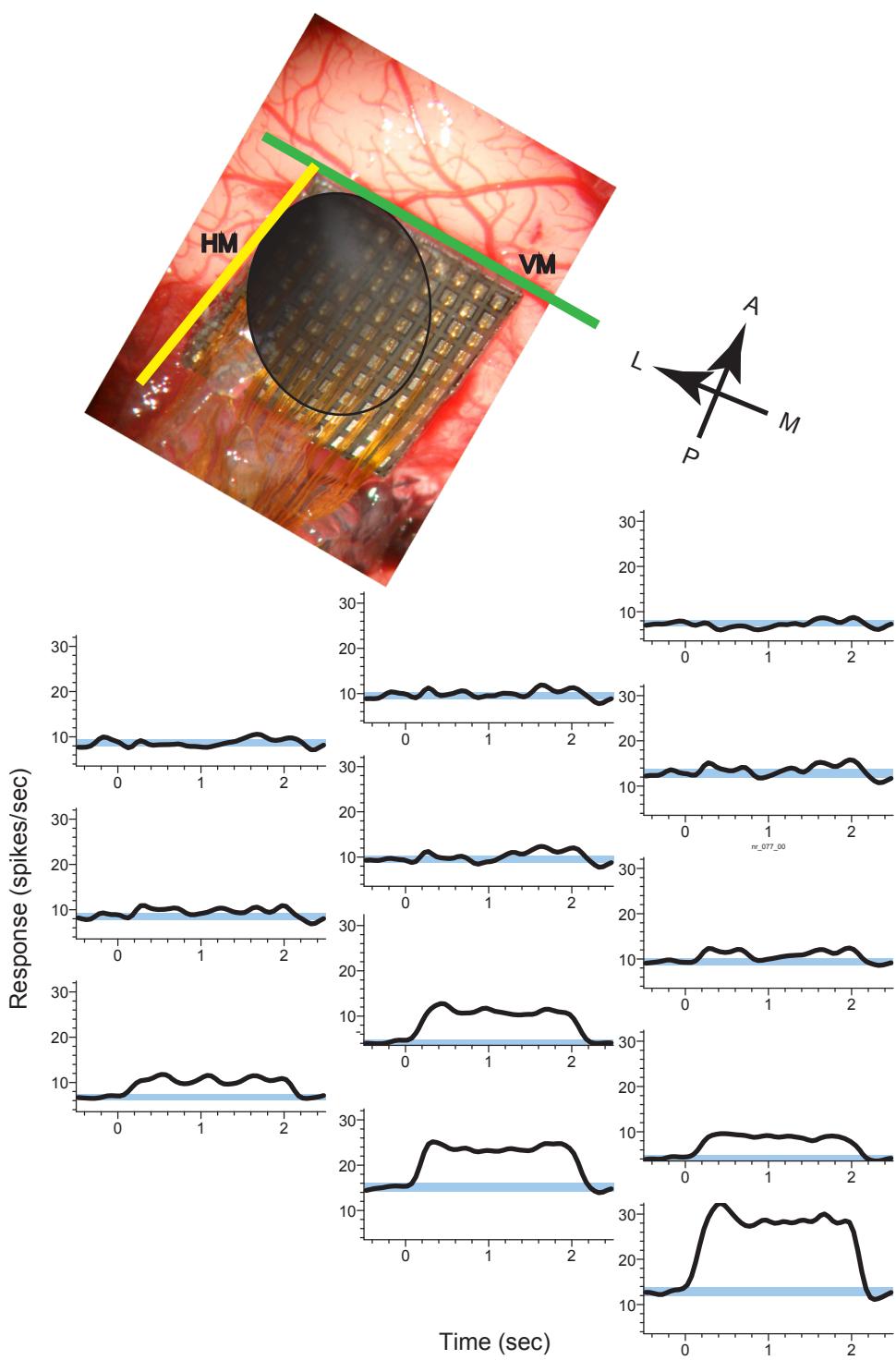
**Supplementary Figure 5** *Temporal dynamics of changes in V1 responses following muscimol*

**injection in lateral pulvinar** (a) Comparison of V1 responses before and after lateral pulvinar injection. V1 responses were averaged over the 15 minute interval prior to the injection and from 20 min to 35 min post-injection. (b), (c), and (d) Comparisons of average V1 responses in 15 minute intervals through the 125 minutes following the injection showed that almost all the change in V1 responses occurred within 35 minutes of the injection.

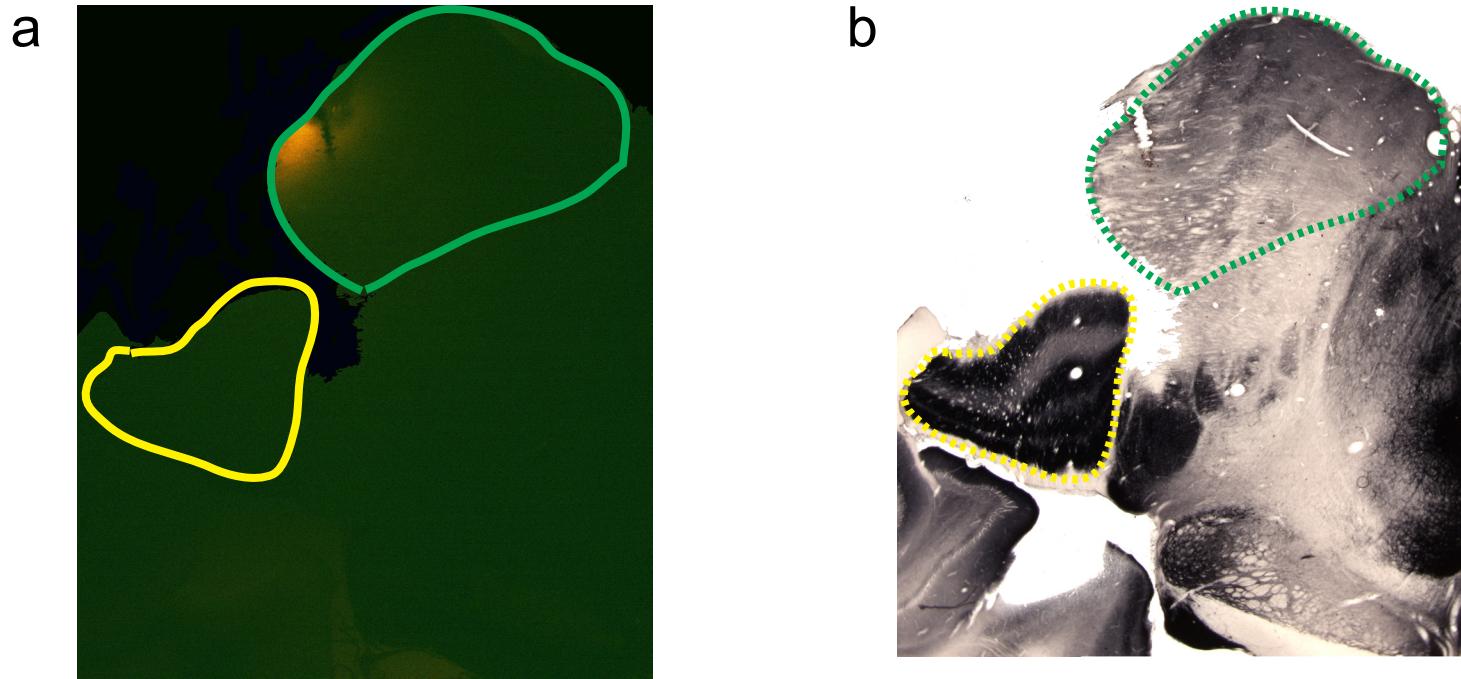


**Supplementary Figure 6 Temporal dynamics of changes in V1 responses following muscimol**

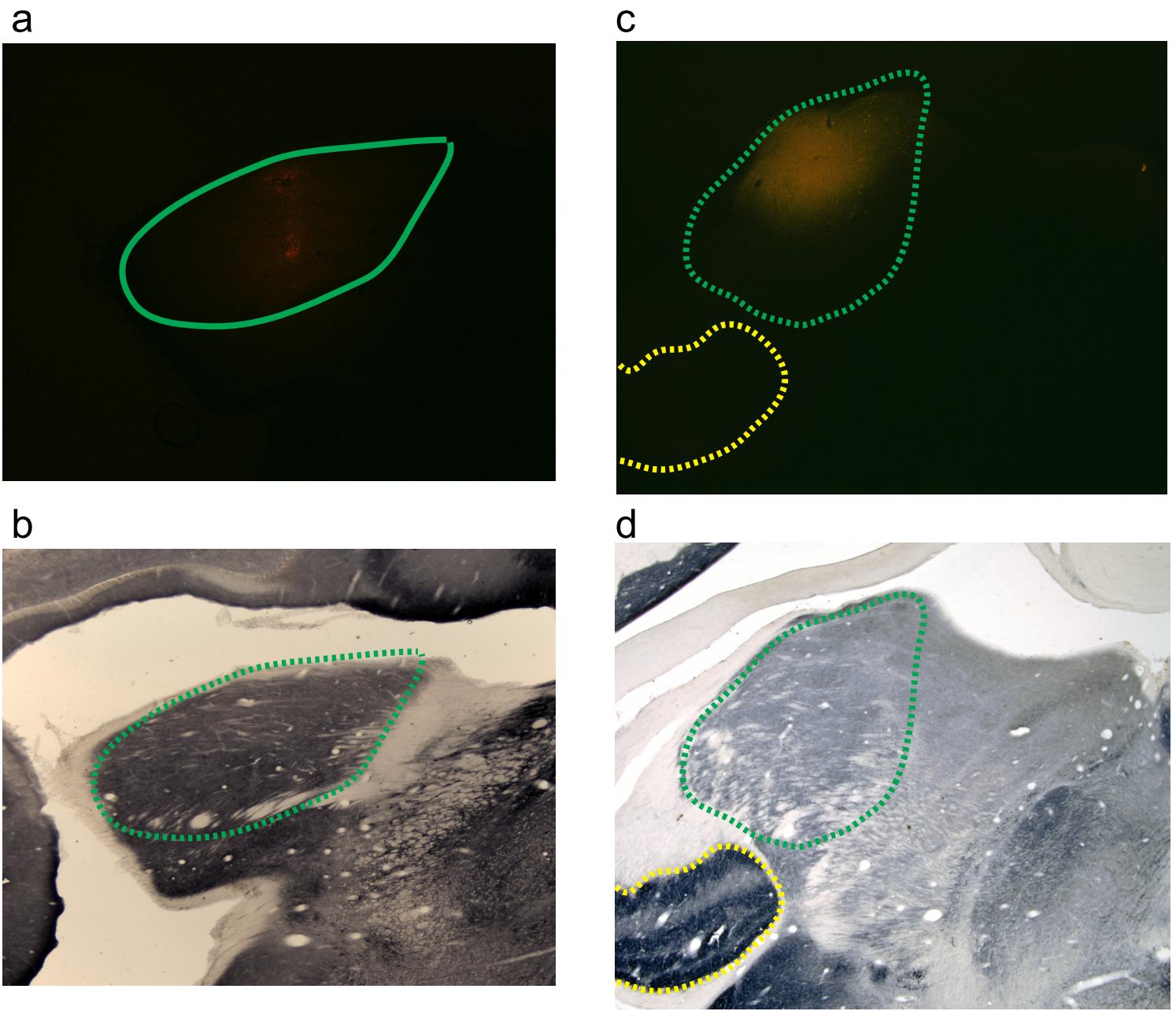
**injection in lateral pulvinar** Same as Supplementary Figure 5, for another case of muscimol injection.



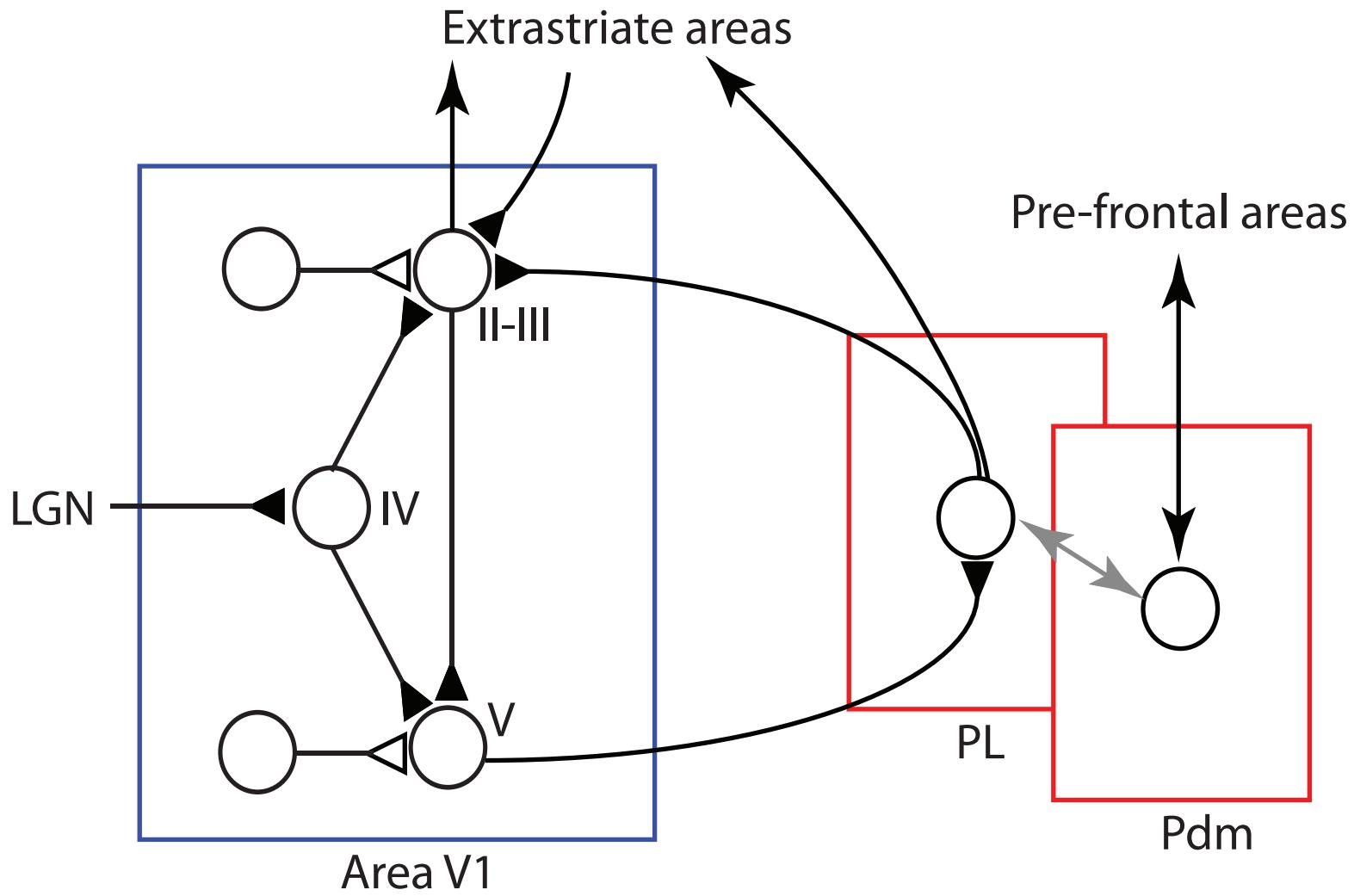
**Supplementary Figure 7** Spatial extent of influence in V1 of a focal muscimol injection in lateral pulvinar. The array placement on V1 is shown at the top. CO staining confirmed the array to be entirely inside V1 and the top row of electrodes to be roughly parallel to the V1-V2 border, marked by the vertical meridian (VM) in green. The spatiotopic region and extent in V1 of the corresponding region of injection in lateral pulvinar is shown schematically by the black oval. Receptive fields of V1 neurons near the darkest part of the oval entirely overlapped with the lateral pulvinar receptive field at which the injection was made. Electrodes further away from this corner of the array sampled V1 receptive fields that were further away from the injected lateral pulvinar receptive field. Simultaneously measured PSTHs for V1 neurons sampled by electrodes near the bottom edge of array are shown below. In all 3 animals studied, input-driven V1 responses increased gradually as the distance of their receptive fields increased from the lateral pulvinar receptive field at which the injection was made. No rebound was observed in the region of V1 sampled by the array.



**Supplementary Figure 8** *The injection was confined to lateral pulvinar and was widely separated from the LGN and the TRN* Same as Supplementary Figure 3; sections shown are for the GABA injection case



**Supplementary Figure 9** *The injection was confined to lateral pulvinar and was widely separated from the LGN and the TRN* Same as Supplementary Fig. 3; sections shown are for the two BMI injection cases



**Supplementary Figure 10** A putative role for pulvino-V1 circuit in controlling visual responses and bottom-up salience A simplified, lumped representation of major, known V1-pulvinar-V1 and intra-V1 connections in the primate are shown. Open synapses represent lumped inhibition and closed synapses, excitation. Net excitation and inhibition might be roughly balanced. In supra-granular layers, sparse but strong excitatory synaptic inputs from lateral pulvinar (PL) are included in this balance. Net inhibition might be broadly tuned at the preferred orientation of the neuron. Under normal conditions, the V1-pulvinar-V1 “loop” sustains the development of the visual response over time. Inactivating lateral pulvinar will yield the pattern of results obtained in our study. Other sub-nuclei such as dorso-medial pulvinar (Pdm) connect with higher cortical areas shown to be involved in top-down control of selective attention. Intra-pulvinar interactions between different sub-nuclei might occur through large interneurons (grey arrow), the TRN, or through overlap of visuotopic maps in architectonically distinct sub-nuclei. This might allow for coordination of top-down and bottom-up signals in selective attention (see Discussion).