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Does the lateral geniculate nucleus (LGN) pay attention?

David Royal^{1,2,4}; Gyula Sáry⁶; Jeffrey Schall^{4,5}; Vivien Casagrande^{1,2,3,4,5}

1. Ctr. Mol. Neuro, 2. Dept. Cell & Dev. Bio., 3. Dept. Ophthal. & Vis. Sci., 4. Dept. Psych., Vanderbilt Univ., Nashville, TN, USA 5. Ctr. Integrative & Cognitive Neuro., Vanderbilt Univ., Nashville, TN, USA; 6. Dept. Physiol., Univ. of Szeged, Szeged, Hungary

The LGN's dominant input is extraretinal from both cortical and subcortical sources. With "modulatory" synapses (extraretinal) outnumbering "driver" synapses (retinal), fundamental questions have arisen regarding how and in what ways feedforward visual information may be filtered at the LGN. In this study we asked whether presaccadic shifts in attention could influence LGN cell responses. Two monkeys were conditioned to fixate a spot and produce a visually-guided saccade to either a single target presented inside the LGN cell's receptive field (RF) or to one of two identical targets presented simultaneously – one target inside the RF and the other target outside the RF in the opposite hemifield but at the same elevation and eccentricity as the RF. In the one-target condition a change in the fixation color (red = GO; green = NOGO) cued the monkeys, and trials were interleaved. In the two-target condition, reward indicated the correct target for each block of 20 trials. No significant differences in response magnitude were found between the fixation and the single-target conditions (N=90). In the two-target condition, there was a significant increase (mean = 26%) in the magnitude of the target response when the RF was the correct target. This increase was found in 60% of all LGN cells tested (N = 20) in both magnocellular and parvocellular cell classes. These results suggest that attention can have a powerful influence on LGN activity under conditions which demand spatial attention to one hemifield.

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