

1049—5:45

fMRI INVESTIGATIONS OF MOTION AFTEREFFECTS WITH 1st- AND 2nd- ORDER STIMULI D. C. Somers¹, A. E. Seiffert², A. M. Dale³, R. H. Tootell³. MIT & MGH NMR Center, Cambridge, MA¹, Harvard University, Cambridge, MA², MGH, NMR-Center, Charlestown, MA³.

Purpose: Last year, we reported that 1st- and 2nd-order motion produced highly similar fMRI responses across early visual cortical areas. A key perceptual difference between 1st- and 2nd-order motion processing is that adaptation to 2nd-order motion produces little or no motion aftereffect (MAE) under static test conditions. Here we investigate MAEs in an attempt to reveal 1st- and 2nd-order processing differences. This work also serves to extend studies of the fMRI correlate of MAE previously reported by Tootell et al. (Nature 375:139-41).

Methods: Functional MR imaging was performed at 3 Tesla on adult humans. Subjects viewed adapting motion for 60 secs followed by a static test (MAE perceived) and reversing motion followed by a static test (no MAE). fMRI MAE was measured by comparing activation during the two static test periods. Both 1st- and 2nd-order motion were tested. 3-D cortical reconstruction and flattening along with retinotopic mapping was performed for each subject hemisphere.

Results: 1st-order stimuli always produced a perceptual MAE (duration range 9-30s). Most 2nd-order adaptations produced no MAE (duration range 0-2s). Adapting 1st- and 2nd-order motion produced similarly robust fMRI responses (motion - static) in cortical areas V1, V2, V3, VP, V3A, V4v, and MT+. However, 1st-order stimuli produced robust fMRI MAE responses across many cortical areas, while 2nd-order stimuli produced only weak fMRI MAEs. For 1st-order stimuli the fMRI MAE was strongest in MT+ (40s duration) and was five times as strong as the response for 2nd-order stimuli.

Conclusions: These data support the hypothesis that 1st- and 2nd-order motion are processed by distinct, parallel channels located within the same early visual cortical areas. These data also support the conclusion that fMRI MAE responses primarily reflect the physiology of the MAE percept. A smaller additional fMRI component was also observed. This may reflect physiology related to latent MAE effects or other factors.

CR: None

Support: NIH EY-11005 to Edward H. Adelson (DS) and NIH EY-07980 (RT).

Somers, D.C., Seiffert, A.E., Dale, A.M., and Tootell, R.B.H. (1999) fMRI investigations of motion aftereffects with 1st and 2nd-order stimuli. Invest. Ophthalmol. Vis. Sci. Suppl., 40, S1049