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## EFFECTS OF TASK DIFFICULTY AND STIMULUS CONTRAST ON ATTENTIONAL MODULATION IN HUMAN STRIATE AND EXTRASTRIATE CORTEX REVEALED BY fMRI.


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**Background:** We previously reported spatially-specific attentional modulation in human striate and extrastriate cortex using fMRI (PNAS 96:1663-8). Here we extend these studies to investigate the effects of central attentional demands and external stimulus drive. **Methods:** Subjects held central fixation while alternately attending to and performing a task on either foveal or extrafoveal stimulus components during echo-planar imaging at 3T. The extrafoveal stimulus was a rotating radial grating annulus. The foveal stimulus was either a rotating grating disk or rapidly presented (RSVP) streams of letters. The RSVP task required subjects to recognize, store and compare letters and thus taxed high-level processes. Task difficulty was manipulated by changing the number of letters to be processed per trial. The motion task requred low-level judgments of rotation direction. Stimulus drive was manipulated via grating contrast. **Results:** Attentional modulations in striate and extrastriate cortex were greater for high attentional load conditions than for low-load conditions. Striate cortex exhibited greater sensitivity to attentional load conditions than did extrastriate cortex. These results support the hypothesis that prior reported failures to observe attentional modulations in V1 result in part from the low attentional demands of those studies. In stimulus drive studies, modulations occurred at all stimulus contrasts; however, the ratio of attentional modulation to stimulus drive was greatest at low contrast. Directing attention produced response changes equivalent to several-fold changes in contrast. **Conclusions:** The present findings replicate and extend our observations of attentional modualtion in V1. Both high- and low-level manipulations affected attentional modulation in early visual cortex. High-level modulations suggest that visuo-spatial attention is a highly integrative process that spans many cortical regions.


## Key Words: (see instructions p. 4)

1. ATTENTION
2. VISUAL SPATIAL
3. CONTRAST RESPONSE
4. FACILITATION SUPPRESSION

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