FMRI COST-BENEFIT ANALYSIS OF SPLIT SPOTLIGHT AND ZOOM LENS SPATIAL ATTENTION MECHANISMS IN HUMAN VISUAL CORTEX

S.A.McMains[1*]; D.C.Somers[1,2,3]

1. Psych, 2. Neurosci., Boston Univ, Boston, MA, USA

3. NMR-Ctr., Dept of Radiology, Massachusetts Gen. Hosp, Boston, MA, USA

Background: How do limitations of spatial attention influence visual cortical processing? The zoom lens model proposes a tradeoff between attended region size and processing enhancement. Using fMRI, Muller et al (2003) confirmed this tradeoff in occipital cortex. McMains & Somers (2004) demonstrated that attention in early visual cortex can also be split into spatially distinct spotlights. Here, we compare attentional enhancement due to a zoom lens vs. that due to splitting the spotlight. Is there greater cost for attending two regions separated by a distractor compared to A) attending two adjacent regions, or B) stretching the zoom lens to include both the distractor and the two attended locations? Methods: Subjects covertly attended 1, 2 or 3 of 5 simultaneously presented RSVP letter streams. Subjects searched for target letters in attended streams, and attended 1 location, 2 adjacent locations, 2 locations separated by a distractor stream, or 3 locations. The critical conditions were compared within retinotopically defined regions of interest. Results: Preliminary findings (N=4) are as follows: As expected, attending to more than one location, in all forms tested, resulted in a cost, as reflected in reduced fMRI attentional modulation, relative to attending to only one location. Surprisingly, no fMRI "cost" was observed for splitting the spotlight to two separated locations relative to spreading the zoom lens across 2 adjacent locations. Furthermore, a benefit was found for splitting the spotlight to ignore the distracting foveal stream relative to expanding the zoom lens to include all three streams. Behavioral benefits for splitting the spotlight were also observed. Conclusions: There is a clear cost for attending to multiple locations. So far, we have failed to observe a cost in visual cortex for splitting spatial attention.

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