

Cue salience modulates the effects of exogenous attention on apparent contrast

Stuart Fuller^{1,2}, Yunsoo Park² & Marisa Carrasco²

¹:Dept. of Vision Sciences, SUNY College of Optometry, New York, NY

²:Dept. of Psychology, New York University, NY

How does the visual system construct apparent contrast? Actual contrast obviously plays an important role, but exogenous attention to spatial location also plays a role (e.g., Carrasco, Ling & Read, 2004; Fuller, Rodriguez & Carrasco, 2007). Exogenous attention is automatically engaged by briefly presented peripheral “pre-cues”. However, previous studies used only highly salient precues. Little is known about the effect of pre-cue salience. We asked whether the increase in apparent contrast due to exogenous attention is “all-or-nothing” or whether it increases gradually with the salience of the pre-cue.

Psychometric functions were obtained for a 2AFC pre-cue localization task, at 7° eccentricity, 3° above the horizontal meridian, over a range of seven pre-cue contrasts. In the main experiment, a brief single pre-cue was presented at one of the same peripheral pre-cue locations or at fixation (neutral), followed after 110 ms by two 4° Gabor stimuli at 7° eccentricity on the horizontal meridian. Observers reported the orientation of the stimulus that was higher in contrast, allowing us to compute PSE's from which we calculated the effect of each pre-cue in units of equivalent real stimulus contrast. To control for the possible tendency to report on the pre-cued location *per se* (as opposed to the location with higher stimulus contrast) we measured bias in a separate session using 100% contrast post-cues (cues presented after the stimuli) instead of pre-cues.

Observers perfectly localized the pre-cue at ~12% pre-cue contrast. At pre-cue contrasts up to this level, the effect of pre-cue salience can be attributed to changing visibility of the pre-cue. However, the pre-cue's effect continues to increase with higher pre-cue contrasts, indicating that the degree of attentional modulation is in part controlled by physical characteristics of the pre-cue even when it is perfectly visible. The post-cue had no effect, implying that the stimulus choice was indeed mediated by apparent contrast and not cue bias. Thus exogenous attention is not “all-or-nothing” but rather affects apparent contrast by an amount that depends pre-cue salience, presumably because high contrast pre-cues attract attention more effectively to the cued location.