Attentional Filtering of Dot Intensities in Centroid Estimations

Stefanie A Wong-Drew, Charles F Chubb, George Sperling
Department of Cognitive Science, University of California, Irvine, CA 92697, U.S.A.

Substantial evidence suggests that observers can accurately estimate the centroid of a spatially extended target. We investigated whether these mechanisms could be brought under top-down attentional control. Specifically, we asked observers to estimate (with mouse-clicks) the centroids of briefly flashed, sparse clouds comprising either 8 or 16 dots of various intensities under three different attentional instructions: give equal weight (i) to just those dots brighter than the background, (ii) to just those dots darker than the background, and (iii) to all dots. Under all conditions participants did well at achieving the required attentional filter although filter tuning was somewhat compromised in conditions (i) and (ii) for the 16- versus the 8-dot clouds, with intensities near the background receiving less weight than more extreme intensities. In condition (iii), the 8- and 16-dot trials yielded equally variable responses. By contrast, conditions (i) and (ii) showed larger variability on the 16-dot trials compared to the 8-dot trials, suggesting that in these conditions the cost per dot of imposing the required attentional filter is higher than in condition (iii). Summary: In estimating centroids, participants can selectively attend either to the brighter dots or to the darker dots alone; however, they are more accurate when attentional filtering is not required.