EFFECTS OF PRIOR INFORMATION ON PERCEPTUAL JUDGEMENTS AND SMOOTH EYE MOVEMENTS ELICITED BY RANDOM DOT MOTION

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Purpose. Previous studies have shown that perception and smooth eye movements share a common motion processing stage. Furthermore, perceptual judgements (Downing 1988) and pursuit (Kowler 1989) can be altered by expectations based on information about the probability of future events. To examine the effects of expectations on direction perception and smooth eye movements, we provided prior information about the likely direction of motion in a random dot display and simultaneously recorded perceptual and oculomotor responses. Methods. On each trial, human observers initially fixated the center of a horizontal strip (0.5^o x 45°) containing randomly distributed stationary dots (3.1 dots/deg^2). After 1000 ms, the stationary dots were replaced with dots moving at 5°/s in random directions. A subset of the dots moved coherently to the left or right. Observers were asked to view each stimulus and report which of the two directions was perceived (yes/no paradigm), but were not instructed to track the dots. The fraction of coherently moving dots varied on each trial, according to the method of constant stimuli. We used two interleaved conditions: cued and uncued. On cued trials, the stimulus was preceded by a cue (0.15^o spot offset 0.3^o to the left or right of initial fixation) indicating the likely direction (80% probability) of the next stimulus. Based on the directions of smooth eye movements and the perceptual responses, we constructed both oculometric (Beutter & Stone 1998) and psychometric curves. Results. We found tight correlations between perceptual responses and eye movements under all stimulus conditions. Cueing produced shifts in the psychometric (mean: 16%) and oculometric (mean: 20%) curves toward the cued directions and slight changes in the slopes. Conclusions. Prior information biases both motion perception and smooth eye movements. These results reveal that perception and smooth eye movements not only have access to a common motion processing stage, but are also similarly influenced by cognitive expectations. Supported by NASA NCC2-1024 None.