Representational Momentum and Boundary Extension: Evidence Suggestive of a More General Displacement Mechanism

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Introduction

Memory for the position of a moving target is displaced forward from the actual position of the target; this pattern has been called *representational momentum* (for review, see Hubbard, 1995). Memory for the boundaries of a picture is displaced outward from the actual location of the boundaries; this pattern has been called *boundary extension* (see Intraub, Bender, & Mangels, 1992). Both representational momentum and boundary extension involve displacement of memory in the direction beyond the actual stimulus, and both types of displacement have been hypothesized to result from dynamic aspects of memory. Given these similarities, it is possible that representational momentum and boundary extension may reflect the operation of a more general displacement mechanism.

In the experiments reported here, observers were presented with simple square stimuli that were either stationary or portrayed as approaching or receding in depth. The magnitude and direction of displacement in depth (i.e., along the line of sight) was assessed.

Methods and Design

In all experiments, observers viewed targets consisting of computer animated displays that portrayed movement in depth by manipulation of visual angle. In Experiments 1 and 2, targets approached, receded, or maintained a constant distance. In Experiment 3, targets approached, receded, moved toward the left, or moved toward the right. In Experiment 4, one of three different sizes of stationary target was shown, and memory was tested after one of two different retention intervals. In Experiment 5, one of five different sizes of stationary target was shown, and after one of three different retention intervals observers received an auditory cue instructing them to indicate the remembered location of either the top or bottom edge of the target.

Results

In Experiments 1 and 2, faster targets were displaced forward (in the direction of motion) and slower targets were displaced backward. In Experiment 3, motion in the picture plane led to greater forward displacement than motion in depth. In Experiments 1, 2, and 3, greater target velocity led to greater forward (less backward) displacement. In Experiments 1 and 4, memory for stationary targets was displaced away from the observer, and in Experiment 4, the initial displacement away from the observer was followed by a subsequent displacement toward the mean stimulus distance. In Experiment 5, memory for both the top and bottom edges of the target was displaced inward toward the center of the target, a pattern consistent with displacement of the target away from the observer.

Discussion

Displacement in depth consistent with boundary extension or representational momentum was observed in all experiments. The data are consistent with both Freyd and Johnson's (1987) two-component model of the time course of representational momentum and with Intraub et al.'s (1992) two-component model of boundary extension. These data support the hypothesis that representational momentum and boundary extension may be special cases of a deeper and more general extrapolation process that biases spatial memory by distorting memory in directions most consistent with past experience (see also Hubbard, in press).

References

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