

## **UC Merced**

### **Proceedings of the Annual Meeting of the Cognitive Science Society**

#### **Title**

Perceptual and Experience-Dependent Influences on Location Processes

#### **Permalink**

<https://escholarship.org/uc/item/0jr3d0f3>

#### **Journal**

Proceedings of the Annual Meeting of the Cognitive Science Society, 22(22)

#### **Authors**

Hund, Alyvia M.  
Spencer, John P.

#### **Publication Date**

2000

Peer reviewed

# Perceptual and Experience-Dependent Influences on Location Memory Processes

Alycia M. Hund

(alycia-hund@uiowa.edu)

Department of Psychology, University of Iowa  
E11 Seashore Hall, Iowa City, IA 52242

John P. Spencer

(john-spencer@uiowa.edu)

Department of Psychology, University of Iowa  
E11 Seashore Hall, Iowa City, IA 52242

## Abstract

This experiment investigated how people use perceptual (i.e., axes of symmetry) and experience-dependent information (i.e., remembered possible target locations) to maintain location information in memory over short-term delays. Participants pointed to target locations on a tabletop following variable delays. Analyses of directional error indicated that location memory is repelled from axes of symmetry and attracted toward remembered possible target locations.

## Introduction

Previous experimental findings suggest that two factors produce systematic biases in location memory. First, remembered locations are repelled from axes of symmetry (McNamara, Hardy, & Hirtle, 1989), suggesting that people use symmetry axes to organize space into categories. Second, remembered locations are attracted toward an average or prototypical location within each category (e.g., Huttenlocher, Hedges, & Duncan, 1991; Huttenlocher, Newcombe, & Sandberg, 1994), suggesting that people use a longer-term memory of the *possible* target locations to facilitate memory. Generally, these two factors have been studied using tasks that require participants to remember many locations within task spaces with several symmetry axes. Thus, the factors that underlie memory biases often are confounded, making it difficult to determine whether biases are caused by two competing processes or one process.

Recently, Spencer and Hund (2000) used a simplified task to investigate how location memory biases change over short-term delays. Participants pointed to three remembered locations within a large, homogeneous task space following variable delays. Results indicated that responses were repelled from a midline axis of symmetry. Furthermore, these repulsion effects increased in magnitude over delay.

Here we extend these results to examine whether both factors—repulsion from symmetry axes and attraction toward remembered possible locations—influence how people maintain location information in memory. More specifically, we separated the possible target locations from the midline symmetry axis to determine whether location memory biases result from one or two memory processes.

## Method

Sixty right-handed adults participated. On each trial, 1 of 3 possible target locations appeared on a large tabletop. Following a variable delay, participants pointed to the remembered location. They received accuracy and timing feedback after each trial.

Targets were presented in different layouts relative to the midline axis of the task space (e.g.,  $-60^\circ$ ,  $-40^\circ$ ,  $-20^\circ$  v.  $20^\circ$ ,  $40^\circ$ ,  $60^\circ$ ) such that the mean of the possible target locations was not at midline. In addition, three bias conditions (no bias, bias left, bias right) were included to examine experience-dependent memory effects. Trials were divided evenly among the 3 possible targets in the no bias condition. In the bias conditions, 2/3 of all trials were to a biased target (left or right) and 1/3 of the trials were equally divided between the two remaining targets.

## Results

As reported in Spencer and Hund (2000), directional responses to all targets were biased away from midline. These repulsion effects increased systematically over delays. In addition to midline repulsion effects, participants' responses were biased away from the  $45^\circ$  diagonal symmetry axes when the targets were centered near these axes. Finally, biasing either the left or right target shifted participants' responses leftward or rightward, suggesting that they used a longer-term memory of possible target locations to remember the target location on each trial.

## Discussion

Data demonstrate that location memory biases result from two memory processes. Over short-term delays, memory is repelled from perceived axes of symmetry and attracted toward remembered possible target locations. In addition, data indicate that adults can select particular reference axes to facilitate memory. Future studies are needed to clarify the factors the influence reference axis selection and how experience-dependent effects are built-up over learning.

## References

- Huttenlocher, J., Hedges, L. V., & Duncan, S. (1991). Categories and particulars: Prototype effects in estimating spatial locations. *Psychological Review*, *98*, 352-376.
- Huttenlocher, J., Newcombe, N., & Sandberg, E. H. (1994). The coding of spatial location in young children. *Cognitive Psychology*, *27*, 115-147.
- McNamara, T. P., Hardy, J. K., & Hirtle, S.C. (1989). Subjective hierarchies in spatial memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 211-227.
- Spencer, J. P., & Hund, A. M. (2000). Location memory biases induced by experience-dependent and visually based reference frames. *Manuscript in preparation*.