

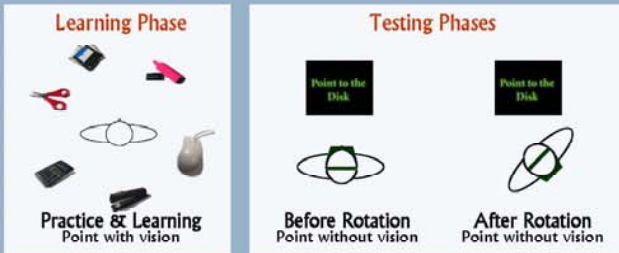
## I. Problem & Question

Spatial updating is the act of keeping track of one's position and orientation relative to local landmarks while moving through an environment. Across updating experiments, the number of target objects that people have been required to update ranged from 1 target (Reiser & Rider, 1991) to more than 10 targets (e.g., Mou, McNamara, Valiquette, & Rump, 2004; Wang & Brockmole, 2003). However, set size effects have not been adequately examined within a single experiment.

**Does the number of target objects (set size) have an effect on updating performance?**

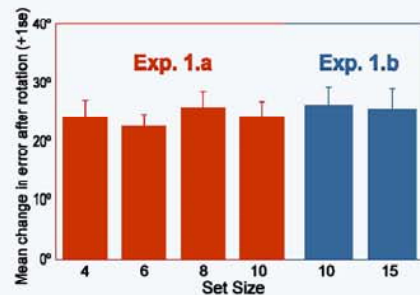
## II. Experiment 1 Intentional Learning Paradigm

Using a traditional updating paradigm, phase (before & after rotation), and set size were manipulated within subjects, with sets of 4, 6, 8, 10 (Exp. 1.a), or 10 and 15 (Exp. 1.b) objects.



**Results: Set size had no meaningful effect on updating**

Updating error was calculated for each target as the absolute difference between signed pointing errors before and after rotation.

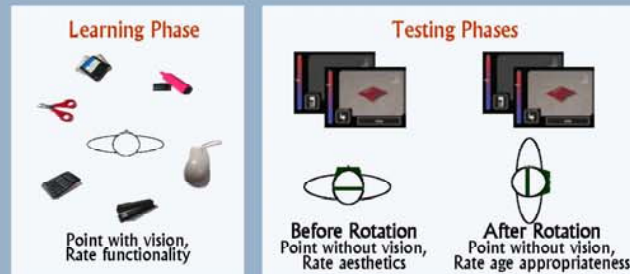
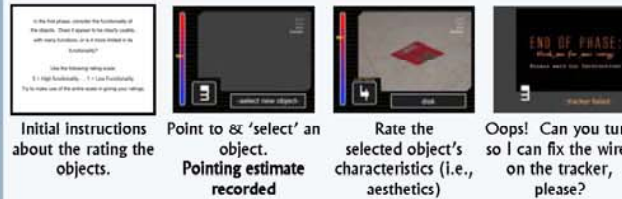


Set size did not have a significant effect (Exp 1.a,  $F(3,75) < 1$ , Cohen's  $f=0.11$ ; Exp 1.b,  $F(1,11) < 1$ , Cohen's  $f=0.03$ ).

## III. Experiment 2 Incidental Learning Paradigm

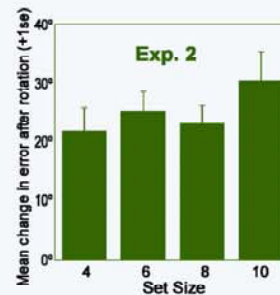
Experiment 2 was presented to participants as user-testing for a prototype of a product-rating interface.

Participants pointed to and 'selected' each object with a pointing device, and then rated the selected object on some scale (e.g., aesthetics) by tilting the pointer up or down. Set size was manipulated between subjects, with sets of 4, 6, 8, or 10 objects.



**Results: Set size had minimal effect on updating**

Updating error was calculated for each target as the absolute difference between signed pointing errors before and after rotation.

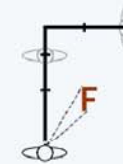


Lack of set size effect cannot be attributed to elaborate encoding strategies (i.e., mnemonics) that were often reported & observed in the intentional learning paradigm.

Set size did not have a significant effect ( $F(3,44) < 1$ , Cohen's  $f=0.26$ ).

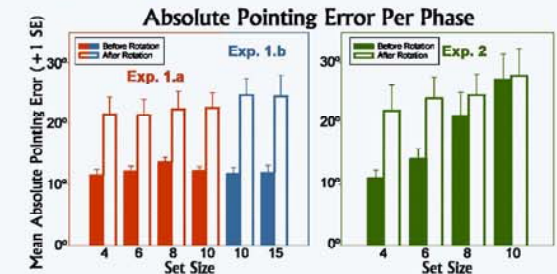
## IV. Measuring Online Updating?

Previous research (Amorim, Glasauer, Corpinot, & Berthoz, 1997) suggests two types of updating, each implying a different memory system.



- Online, WM updating:**  
(Update Target Condition: focus on target while moving, update online)
- Post Hoc, LTM Updating:**  
(Update Path Condition: focus on path while moving, update by reconstructing layout from initial view)

**Results: Our results are consistent with updating via reconstruction from LTM**



An error-prone online updating system could explain the constant increase in error in Exp. 1.a & 1.b., but not the interaction in Exp. 2. The increase in error in Exp. 2 is only significant for set sizes 4 & 6 ( $F's > 6.37$ ,  $p's < .03$ ). An error-prone reconstruction process explains high error after updating, & before rotation with large set sizes.

## V. Conclusions

- Set size had no meaningful effect on post-hoc updating.
- This 'blindfolded pointing' paradigm may engage updating mechanisms based on post-hoc reconstruction, not online updating.

## VI. References

- Amorim, M., Glasauer, S., Corpinot, K., & Berthoz, A. (1997). Updating an object's orientation and location during nonvisual navigation: A comparison between two processing modes. *Perception & Psychophysics*, 59, 404-418.
- Mou, W., McNamara, T. P., Valiquette, C. M., & Rump, B. (2004). Allocentric and egocentric updating of spatial memories. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 30, 142-157.
- Wang, R. F., & Brockmole, J. R. (2003). Simultaneous spatial updating in nested environments. *Psychonomic Bulletin & Review*, 10, 981-986.

Hodgson, E. & Waller, D. (2004, November) *Capacity limits in spatial updating*. Poster session presented at the annual meeting of the Psychonomic Society, Minneapolis, MN, USA.

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