Individual Differences in Spatial Abilities Predict the Efficacy of the Method of Loci Mnemonic Technique

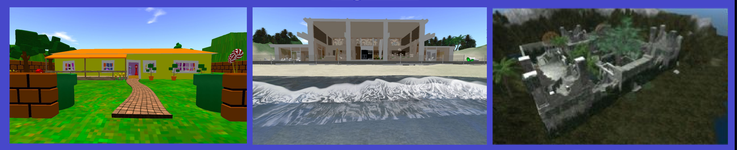
Hera Y. Baek, Ai Ohno, Alvin Vuong, Joey K-Y. Essoe, Nicco Reggente, and Jesse Rissman

Department of Psychology, University of California, Los Angeles

Introduction

- The Method of Loci (MoL) is an ancient mnemonic technique in which one encodes non-spatial information by associating it with the spatial scaffolding of a mentally imagined, familiar environment.[1]
- Our pilot study with two virtual worlds found that the classic benefits of MoL remain robust in our implementation that used virtual environments as memory palaces. This efficacy of the MoL suggests that strong spatial memory can be used to bolster recall of non-spatial items.
- We sought to identify the relationship between recall strength and spatial memory using three distinct virtual worlds where subjects could view and interact with 3D objects.

Figure 1



Toon World | Lagoon World | Ruin World

Methods

Exploration

- All subjects (n=35) explored each of the 3 VEs twice by completing a series of token-collection tasks within each world (Fig 2).
- Upon initial visitation to each world, subjects had 5 min to collect 20 tokens scattered about the environment, using any remaining time to freely explore.
- Subject were then given a second opportunity to visit each world again, and this time they had 3 min to collect the tokens. This ensured all subjects evenly explored each of the VEs and learned the major features and landmarks.

Figure 2

Toon World | Lagoon World | Ruin World

Methods Cont.

Encoding

- Subjects were instructed to walk about each of the VEs as sequence of 15-to-be-remembered 3D objects were rendered in front of their avatar for 30s each (Figure 3). Subjects were told these objects belonged to one of three people: Otto, Pike, and Viola and that they would later be asked to recall the items belonging to each person in the order they were originally presented.

Figure 3

Placing a beer in Toon World | Placing a rope in Lagoon World | Placing a basket in Ruin World

Groups

- Subjects in the MoL group (n= 20) were briefed on the classic implementation and mnemonic benefits of the MoL and instructed to “click” on the objects to as to volitionally “place” them at locations of their choosing in the environment.
- Subjects in the the Control group (n= 15) were not instructed to “place” the objects. Instead, they were briefed on a fabricated mnemonic technique dubbed the “Walk and Learn” strategy that extolled the benefits of learning information while navigating a spatial environment.

Recall

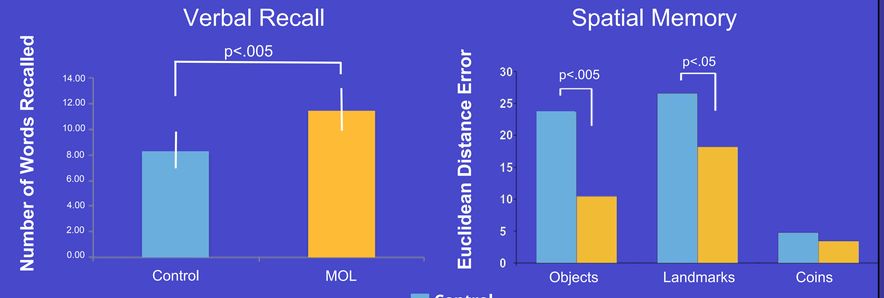
- Subjects were given a maximum of 2 minutes to verbally recall the list of items belonging to each person. All subjects were encouraged to manually recreated the encoding context (environment and spatial proximity) to facilitate their recall.

Spatial Memory Task

- Following recall, subjects were asked to pinpoint the locations of tokens and specific landmarks on a bird’s eye-view map. They did so by dragging a square to one of 4,096 possible locations within a 64x64 grid.

Bird’s eye view of Toon World with Possible pinpoint locations.

Results



Conclusions

- Subjects in the MoL group recalled significantly more items and retained greater temporal encoding order compared to subjects in the Control group.
- Our results reveal a correlation between one’s spatial memory capability (for landmarks and objects) and their list recall performance. This suggests that one’s ability to recruit spatial encoding systems (explicitly enforced by the MoL) is intimately tied to their success at our visual object list learning task.
- This study demonstrates that the benefits of the MoL mnemonic extend beyond its classic mental imagery-based implementation. Our virtual reality learning protocol provides a proof of concept that could encourage widespread use of the MoL.
- Our future directions include plans to characterize the neurological underpinnings of MoL-enhanced recall strength, using fMRI measures of context reactivation.

Contact

Hera Y. Baek (Undergratuate Presenter) – herabaekgmail.com
Nicco Reggente (Graduate Mentor) – nreggente@psych.ucla.edu

Lab Website
http://risemanlab.psych.ucla.edu

References

1) Bower, Gordon H. "Analysis of a mnemonic device: Modern psychology uncovers the powerful components of an ancient system for improving memory." American Scientist (1970): 496-510.