

VIRTUAL ENVIRONMENTS AS MEMORY MNEMONICS

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Introduction

Since before written history, many different techniques have been used to enhance memory. One of the most prevalent of these techniques, known as mnemonics, was the Method of Loci (Yates, 1966). There were many different forms of this mnemonic, but all involved the use of an environment to aid in item-order recall. Many memory experts practiced a complex form of the Method of Loci where they would have extensive spatial and navigational knowledge of the environment and also be able to picture the blueprint of the environment (looking into the environment from a bird's eye or omnipotent view). This allowed them to zoom in and focus in on specific portions of their chosen environment, using the complexity and spatial richness of the specific portion to associate with the ideas or items to be remembered. The overall ability to focus and use small portions and specific details of the environment to aid in memory allowed these memory experts to memorize virtually infinite lists of ideas and/or items within a single environment. A single environment could even be used for multiple lists because of the special way in which memory experts were trained to expand, isolate, and focus in on specific portions of the environment. However, a more common form required less extensive training. First, the person would objectify the items within a list and place them around a familiar environment. Then, to recall the list in order, the person would imagine navigating the environment along the same path that he or she travelled while placing down the items of the list (Yates, 1966).

While the Method of Loci has not been shown to be a better mnemonic than other methods (e.g. peg method), previous studies have shown that is significantly better than rote repetition or imagery, where words items are

objectified and sometimes linked to other words within the same list (Roedgier, 1980; de Beni & Cornoldi, 1985; Wang & Thomas, 2000; Verhaeghen & Kliegl, 2000). Later studies have also concluded that high concreteness words have a recall advantage over low concreteness words for the Method of Loci (Wang & Thomas, 2000). As well, since the Method of Loci is a mnemonic strategy that requires the visualization and navigation of an environment to aid in item and

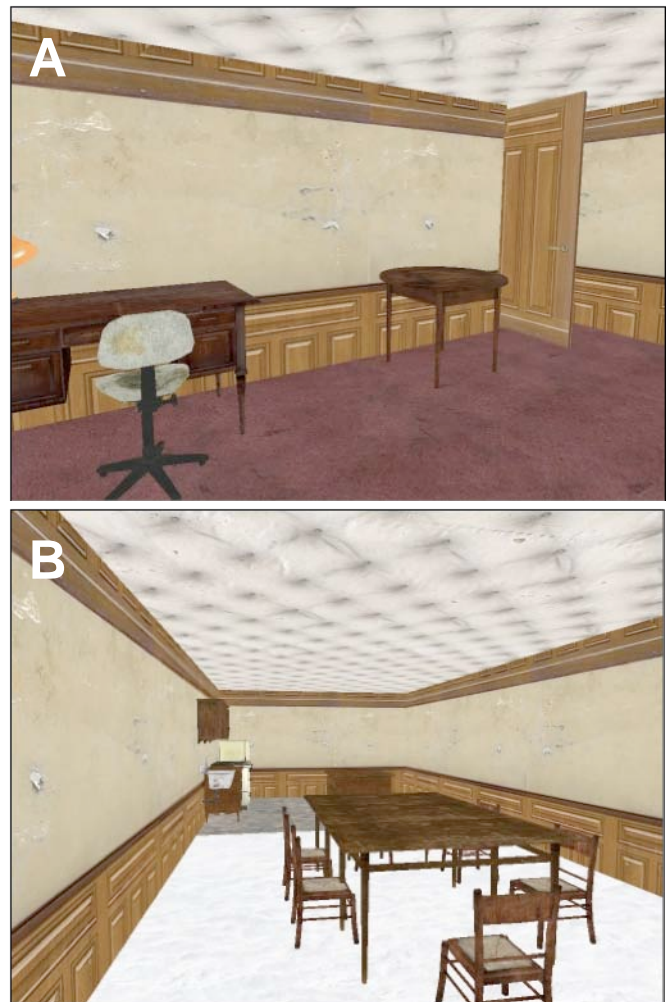


Figure 1. Two screenshots of a virtual environment participants were required to familiarize themselves with. The environment was modeled after a house.

order recall, one could assume that the use of the same loci for multiple items within different lists would cause interference between lists. This was shown to be untrue by several studies finding that the use of a loci location for multiple items does not compromise the effectiveness of the Method of Loci (de Beni & Cornoldi, 1985), and that the Method of Loci is not more susceptible to proactive interference than the rehearsal method (Massen & Vaterrodt-Plunnecke, 2006). Other studies have also found that the Method of Loci requires “a well-memorized Loci pathway, the creation of good images of the items to be memorized and their adequate insertion in each locus” (Moe & de Beni, 2005). In essence, while the Method of Loci requires a well-known environment, the items within the list to be memorized must be definitively objectified into strong and easily recognizable images and also must be strongly associated with the environment used to aid memory recall.

Methods

We conducted a serial recall paradigm with typed response varying concreteness per list. A 3 x 2 x 5 factorial design was used, manipulating instructions between groups, word concreteness, and list. Participants randomly assigned to one of three groups: Method of Loci (traditional), Method of Loci (Virtual), and uninstructed. Every participant was given five minutes to navigate and familiarize themselves with a virtual environment created in Half Life 2 (see Figure 1). There were three environments, and participants were randomly assigned to one of them. Afterwards, participants were given memory instructions according to their assigned group with the Method of Loci groups given a description of the Method of Loci paraphrased from *The Art of Memory* (Yates, 1966) and the uninstructed group was given no specific memory method instruction. The traditional Loci group was instructed to use their home whereas the virtual Loci group was instructed to use the environment they had just familiarized themselves with as the environment for their

memory strategy. After being given the instructions and indicating their understanding, participants were presented with a memory task consisting of ten lists, with recall immediately after each list and the lists alternative between high and low concreteness. All participants were asked to verbally express their strategy while they were using it during the memory task (e.g., participants within both Method of Loci groups were to verbally express how they were associating the words in the lists with the environments, while participants within the uninstructed group were free to use any strategy so long as they verbally expressed this method while using it) and every participant was audio recorded during the memory task. At the end of the task, participants were given a questionnaire to complete which included measures for gaming experience, prior knowledge of the Method of Loci, and compliance to memory method instructions for number of lists presented. Data was analyzed according to the strategy the participants used rather than the group the participant was assigned to.

Results and Discussion

The results of our study indicate that using an unfamiliar virtual environment is not significantly different than using a real and familiar environment for the Method of Loci. Our results also affirm previous research findings that the Method of Loci is an effective memory mnemonic for both item and order recall, and that it is more effective for concrete words than abstract words (See Figure 2). We also found that the Method of Loci is neither more nor less susceptible to proactive interference than uninstructed memory. However, we found that a fair proportion of participants were not compliant with their instructed memory strategy according to audio verification (from the audio recordings) as well as on the self report questionnaires.

These findings suggest that the virtual variant of the Method of Loci can function as effectively as its traditional counterpart and that

participant compliance to experimental instructions should be verified for research data.

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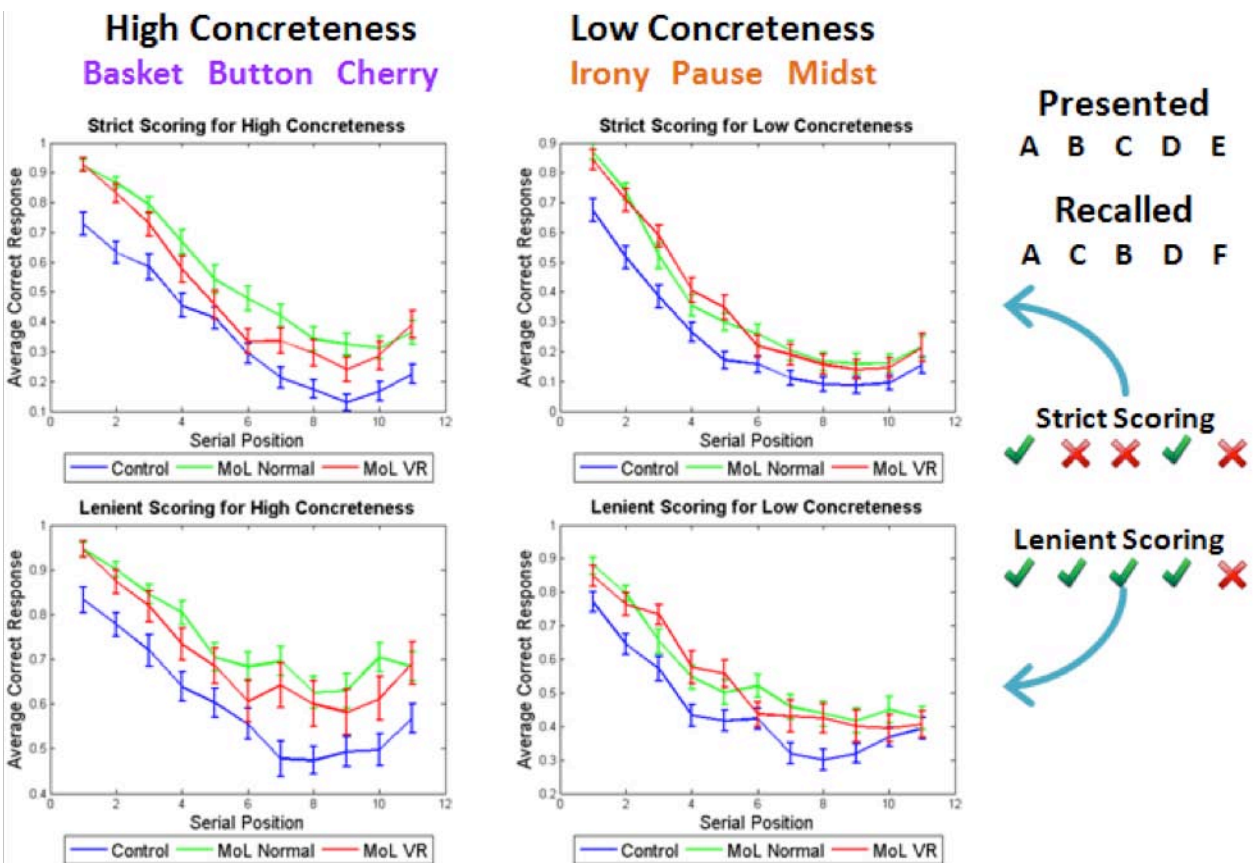


Figure 2. Summary figure of results for both item (lenient scoring) and order (strict scoring) memory across high concreteness and low concreteness lists.