Experiment comparing recall for words encoded freely and with the Method of Loci mnemonic device

Introduction

Mnemonics are formalised methods for encoding information that attempt to improve its later recall (Bellezza, 1981). In the encoding phase, the Method of Loci (MOL) mnemonic device involves the user converting the words that they want to remember into images, and then mentally traversing a familiar setting, placing the images at key positions, or 'loci'. During retrieval, the user retraces the route in their mind, with the intention that they will see the images placed earlier and convert them back into words, recalling not only the information but the order in which it was encoded. The term Memory Palace refers to the imagined setting containing the loci.

Many studies have demonstrated the efficacy of the MOL technique, which appears to be more pronounced for serial recall than nonserial/free recall (Roediger, 1980). McCabe (2015) showed significant improvements between pretest and post-test serial and non-serial recall with undergraduate students memorising a grocery list after creating their own memory palace. Qureshi, Rizvi, Syed, Shahid, and Manzoor (2014) observed significant improvement on assessments of 2 recently learned endocrinology topics with medical students who had MOL training and had been guided in memory place creation.

There appear to be many contributing factors to the success of the mnemonic technique. A series of experiments by Paivio and Csapo (1973) found that words and images that were encoded pictorially were better recalled than those encoded verbally. This provides a partial explanation: the MOL technique requires the encoding of the information as an image, which alone should improve recall compared to the content's original verbal format. Another factor is the developed association between the imagery of something familiar and the word one wants to remember. The familiar object can be recalled with nearly no difficulty, and once recalled, acts as a cue for the associated word (Bower, 1970).

The aim of this experiment is to determine whether the method of loci mnemonic device improves word recall. The existing research into the area informs the directional prediction that a MOL technique produces better recall than no specified strategy, thus leading to a one-tailed hypothesis that: first-year students instructed to use the method of loci mnemonic device will free recall more words from a list of 15 randomly generated words than those not instructed to use a mnemonic device.

Method

The experiment was a repeated measures design. The independent variable was the instruction (or lack thereof) to use the method of loci mnemonic, and the dependent variable was the number of words recalled.

Participants

Participants were a mixed-gender group of n=74 first-year students at Loughborough University.

Materials

The materials used were 2 word lists made with a random word generator (see Appendices A and B), as projector to show slides and a pen or pencil and paper for participants to write their recalled words.

Procedure

Throughout the experiment, all information and instruction was presented both verbally and projected onto a large screen (except where specified). Each condition consisted of 2 phases: memorisation and recall. During the memorisation phase, participants were presented the instructions for the word lists corresponding to the condition, and asked to remember as many words as possible in the Free Recall condition, and to place the words along a familiar route in the MOL condition (see Appendices C and D for exact wording). In the MOL condition, this was followed by a period of 30 seconds in which participants were told to consider their route of choice. Slides with a word list were then presented with a new word appearing every 3 seconds, with all previous items on the list remaining visible. 45 seconds after the initial word was shown (3 seconds after the 15th

and final word) the words were hidden. In the Free Recall condition the word-list slide was untitled, in the MOL condition the slide title read, “Place these items along your route….”. Immediately following this, during the recall phase, another slide was shown instructing participants to recall the words. After a minute-long recall period, participants were shown the complete word list and were verbally asked to score themselves out 15. Once both conditions were finished, participants wrote down their score to be collected by the experimenter.

Results

The mean number of words recalled, number of participants and standard deviation for both conditions are shown in Table 1.

Table 1: Mean number of words recalled, number of participants and standard deviation by encoding method

	Mean	n	Standard Deviation
Free Recall	9.58	74	2.679
Method of Loci	10.08	74	2.768

The mean number of words recalled for both conditions can be seen graphed in Figure 1. As the graph and table show, the mean number of words recalled in the MOL condition were higher than in the Free Recall condition. This is in the direction predicted.

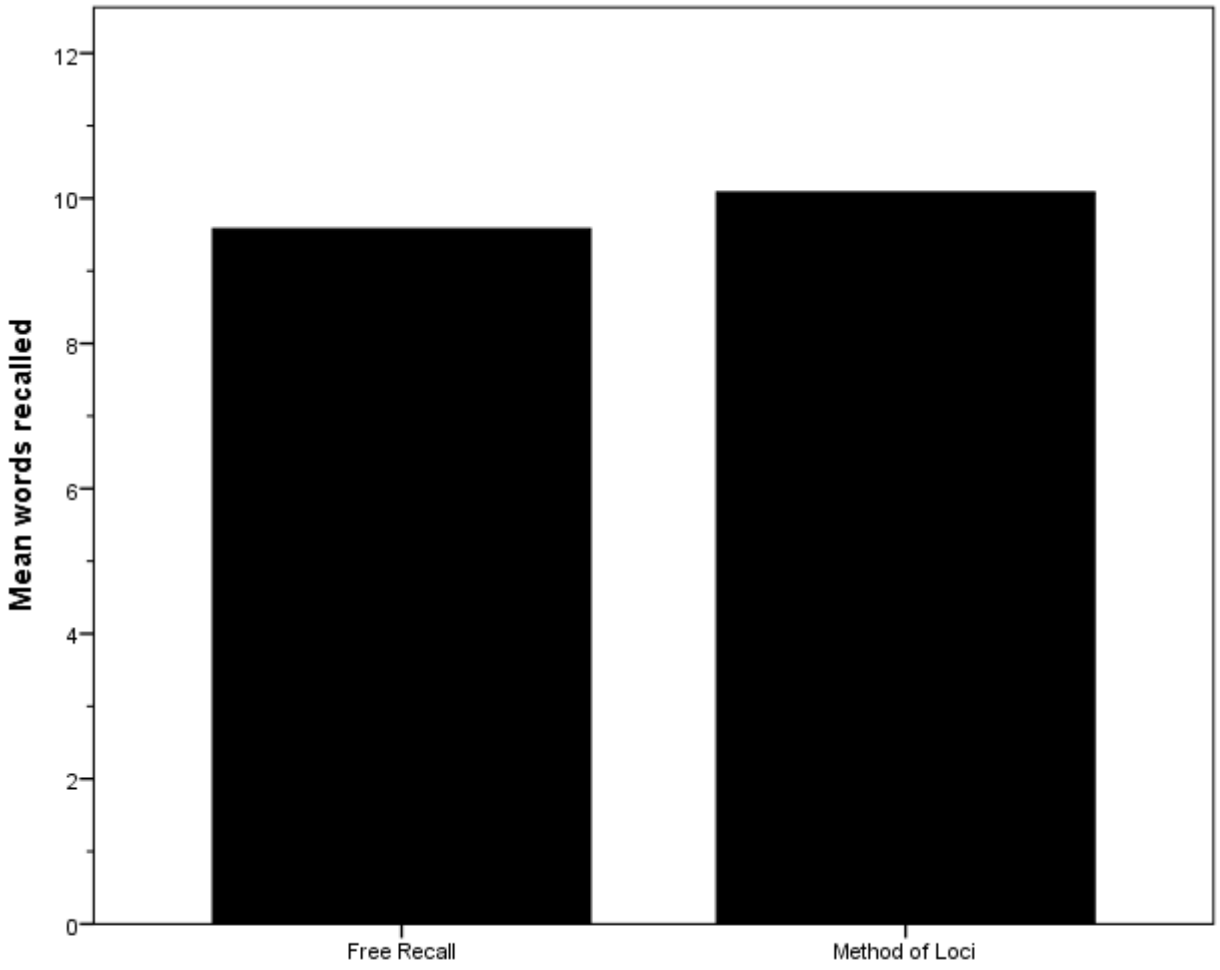

Figure 1: graph showing mean number of words recalled depending on encoding method

Statistical analysis with the paired-samples t-test found no significant difference in recall between conditions (t=-1.523, df=73, p>0.05). Mean (standard deviation) words recalled were 9.58 (2.679) for the Free Recall condition and 10.08 (2.768) for the Method of Loci condition.

Discussion

The aim of the study was to determine the efficacy of the MOL technique compared to free recall. It was expected that the words encoded with the MOL technique would have a higher mean recall, but while the results are in the direction expected, they are not statistically significant. As a result, no causal statements can be made from this study.

Considering the similar literature in the field, the directionality of the results was as expected, but the lack of statistical significance was not anticipated. With a similar experimental design, just over half the participants, and also using the paired-samples t-test, McCabe (2015) found a significant difference with a confidence of $p=0.026$.

Qureshi *et al.* (2014) had a similar number of total participants ($n=78$), but split in two for an independent groups design. Despite this, the effects of the MOL mnemonic device were highly significant ($p<0.003$). The major methodological discrepancies between that experiment and this were the teaching of MOL and the creation of the memory palace. Qureshi *et al.* (2014) spent over 3 hours introducing participants in the MOL condition to the MOL technique and guiding them through the process of making and using a memory palace. This increased the likelihood that participants would apply the technique correctly. For this experiment participants were very briefly introduced to MOL during a lecture, and then once again moments before having to employ the technique. The participants also created their own memory palaces, with only 30 seconds to choose a route and familiarise themselves with it, it is unlikely that they would be fully familiar with it. Research by Verhaeghen and Marcoen (1996) suggests that due to their young age, participants would be more likely than older people to both comply with instruction and to use the strategy correctly (with regard to the MOL technique), so participant age is unlikely to have decreased the difference between conditions.

There were other methodological issues with this study that could be improved. All participants did the Free Recall condition before the MOL condition. This could have created order effects that would decrease the difference between the two conditions, such as fatigue from concentrating on the previous task. This could be easily counterbalanced by randomly assigning half of the participants to do the MOL condition before Free Recall condition, although this would require all participants to know what

was being tested at the beginning of the experiment, which could lead to them responding to demand characteristics.

All participants in each condition were shown the same words, in the same order, which may have affected the results if one list happens to contain more memorable words or ordering. Christian, Bickley, Tarka and Clayton (1978) demonstrated that free recall correlates with word imagery, concreteness and meaningfulness. An improvement could be made by selecting words from research by Brysbaert, Warriner, and Kuperman (2014) or Paivio, Yuille, and Madigan (1968) to present words of a similar concreteness, imagery and meaningfulness value and randomising the presentation order of words for each participant or a subset of the participants.

The Free Recall condition had no stipulation about mnemonic techniques, and as the MOL technique had been previously introduced to the participants, some may have been using that or another strategy spontaneously. Participants could be asked to not use any mnemonic strategies they have previously learnt.

Future research could look at the proactive and retroactive interference caused by using the same memory palace for semantically similar and disparate word lists to the original. Another potential avenue would be to compare memory palaces of different type and scale, for example, imagined routes might be looking around one’s bedroom or walking across a university campus.

No significant difference was found between Free Recall and Method of Loci conditions, but given similar research in the field and the methodological flaws of this study, it is most likely that the failure to produce a statistically significant result is due to limitations in the design of the experiment.

Word Count: 1492

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Appendix A - Free recall word list

1. Balloon
2. Forest
3. Watch
4. Crab
5. Fork
6. Sailor
7. Pencil
8. Snake
9. Turnip
10. Glove
11. Jelly
12. Pebble
13. Battery
14. Garlic
15. Door

Appendix B - Method of Loci word list

1. Shirt
2. Eagle
3. Poster
4. Rose
5. Camera
6. Candle
7. Marble
8. Knife
9. Sponge
10. Market
11. Turkey
12. Table
13. Badger
14. Pocket
15. Trifle

Appendix C - Instructions before free recall list presented

- A list of words will be read out at regular intervals
- Try to remember as many as possible
- Once all words have been presented, you will be asked to recall as many as you can by writing them on a piece of paper
- Have your pen and paper ready
- You will be instructed when to start your recall

Appendix D - Instructions before Method of Loci list presented

- A list of words will be read out at regular intervals
- Imagine yourself on a familiar journey/route e.g. your walk to university
- Place the words along your route
- Once all words have been presented, you will be asked to recall as many as you can by writing them on a piece of paper
- Have your pen and paper ready
- You will be instructed when to start your recall