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Effects of instruction on learners' ability to generate an effective pathway in the method of loci

Cristina Massen
Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Bianca Vaterrodt-Plünnecke and Lucia Krings
University of Bonn, Germany

Benjamin E. Hilbig
University of Mannheim, Germany

One of the most effective mnemonic techniques is the well-known method of loci. Learning and retention, especially of sequentially ordered information, is facilitated by this technique which involves mentally combining salient loci on a well-known path with the material to be learned. There are several variants of this technique that differ in the kind of path that is suggested to the user and it is implicitly assumed that these variants are comparable in effectiveness. The experiments reported in this study were designed to test this assumption. The data of two experiments show that participants who are instructed to generate and apply loci on a route to their work recall significantly more items in a memory test than participants who are instructed to generate and apply loci on a route in their house. These results have practical implications for the instruction and application of the method of loci.

Keywords: Mnemonic; Method of loci; Mental image; Imagery; Instructional format.

Humans, as a species, have always been faced with the problem of a restricted memory capacity, and thus developed methods to overcome these natural limitations. A method known since ancient times is the method of loci, which is rated to be among the most effective mnemonic techniques (De Beni & Cornoldi, 1985; Groninger, 1971; Luria, 1968; Roediger, 1980; Ross & Lawrence, 1968; Verhaeghen & Kliegl, 2000; Wang & Thomas, 2000). Employing this method—the invention of which is attributed to the poet Simonides (Yates, 1966)—one first recalls spots or locations (so-called loci) from a well-known path. In a second step the user then pictorially combines these loci with novel, to-be-learned information. To retrieve the information at any later point in time one simply mentally ''walks'' along the path and thereby reactivates the information attached to the loci, which have become the mnemonic anchors for the information.

Previous work on the application of the method of loci has concentrated on its general effectiveness, on the effects of different kinds of learning material and on different learning modalities. For instance, it has been shown that the learning of abstract information benefits from the mnemonic as much as does the learning of concrete information (Wang & Thomas, 2000). Furthermore, although many studies have shown that the loci method is effective with word lists,

Address correspondence to: Dr Cristina Massen, Max-Planck-Institute for Human Cognitive and Brain Sciences, Department of Psychology, Stephanstrasse 1a 04103 Leipzig, Germany. E-mail: massen@cbs.mpg.de

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results are less clear for passages that are to be learned (De Beni & Moè, 2002, 2003; Krebs, Snowman, & Stanley, 1978; Snowman, Krebs, & Lockhart, 1980). Regarding presentation modality, it has been found that the method of loci is more effective for material that is presented orally rather than in a written format (Cornoldi & De Beni, 1991; Moè & De Beni, 2005). In contrast to these studies on effects of the presentation and type of learning material, relatively few studies have addressed the question of whether and how untrained participants are able to generate a good pathway for the method of loci. On the one hand, it can be assumed that participant-generated images have the advantage of referring more to autobiographical elements that aid memory (Cornoldi, De Beni, & Pra Baldi, 1989; Groninger & Groninger, 1988). Consistent with this assumption, a study by Bellezza and Reddy (1978) compared the efficacy of participant-generated and experimenter-generated loci pathways, and found that participants were better with self-generated loci pathways. On the other hand, untrained participants often need some kind of instruction in how to generate effective mental images before they are able to generate suitable loci on a pathway. This raises the question of whether it is possible to optimise instructions given to participants.

In this study we focused on the question of whether participants' ability to generate good loci depends on the kind of pathway they are instructed to generate. In ancient times people used loci pathways in a well-known house or building in order to memorise objects or orations. For instance the inventor of the method of loci, the poet Simonides, is reported to have memorised a set of objects by imagining them in specific locations in a well-known room and afterwards mentally walking around the room in order to retrieve the images. Also, actors in Ancient Greece memorised long monologues by imagining the content in locations around the theatre. On the other hand, many modern experimental studies on the application of the method of loci employed paths in a town, for instance the way to one's work (e.g., Moè & De Beni 2005). To our knowledge, it has not been investigated whether the kind of path used for generating anchors has any impact on the success of applying the method of loci or on participants' ability to generate suitable loci. On the one hand, it might be hypothesised that using locations in one's house or in a room might lead to better performance, because these locations are highly familiar and/or have high autobiographical and self-related relevance. On the other hand, loci on the way to one's work might allow for the generation of mental images that are better distinguishable from one another, because they are at a larger distance from one another and thus more distinct. This possibility should be considered, as there are studies showing that the imagination of spatial information corresponds to real-world perception (Kosslyn, Ball, & Reiser, 1978), and that neutral items can adopt distance properties from objects with which they are associated (Petrusic, Baranski, & Kennedy, 1998).

In our experiments we investigated whether participants' ability to generate and successfully apply a loci path would depend on the kind of path they had to generate. In Experiment 1 we used item material from a previous study that had confirmed the superiority of the method of loci relative to a simple rehearsal strategy (Massen & Vaterrodt-Plünnecke, 2006). One group of participants was instructed to generate loci located on the way to their work, whereas the other group was instructed to generate loci on a path in their house. The results showed that participants who generated and applied a path on the way to their work recalled significantly more items from three word lists than participants who generated a path in their house. In a second experiment we replicated the findings from Experiment 1 using different item material, and ruled out the possibility that the effect was due to the specific combination of type of loci path and item material in Experiment 1.

EXPERIMENT 1

Method

Design and participants. A total of 40 participants aged 20 to 47 ($M = 26.0$) were recruited from the University of Bonn campus. Of these 23 were female and 17 were male. Half of the participants were randomly assigned to the ''street-loci'' condition (i.e., loci on the way to one's work), the other half to the ''house-loci'' condition.

Materials. Three lists each comprising 20 items from the category ''groceries'' were used. The lists were taken from Massen and Vaterrodt-Plünnecke (2006) and consisted of groceries from different

subcategories (such as fruit, vegetables, dairy products etc.), which were evenly distributed across lists. Thereby the lists as well as items within a list are relatively similar.

Procedure. Two sessions on successive days (one per day) were conducted with each participant. In the first session participants practised the method of loci. First they were randomly assigned to one of the two instruction conditions (''street-loci'' vs ''house-loci'') and then asked to write down 20 striking locations alongside a well-known path. In the ''street-loci'' condition, participants wrote down 20 loci that were on their way to work, e.g. starting with ''home door'' as a first location and ending with ''university'' as the last. Participants in the ''house-loci'' condition were given the additional information that they could use a typical succession of locations (due to habitual behavioural patterns) as an orientation; e.g., starting from getting out of bed until leaving the house in the morning. Participants did not necessarily have to stick to this hint, it was merely meant to support them when generating a path through the house. After participants had learned the path they were asked to reproduce it on another clear sheet of paper to ensure that the correct sequence had been learned extensively. Next the method was trained using two practice lists (with means of transportation and office accessories as item categories), consisting of 20 items each. Participants were instructed to link the items pictorially with the loci they had selected and to do so preserving the correct sequence of items. The instructions comprised an example of how to link items to locations along an exemplary path (Metzig & Schuster, 1993). Participants were given a total of 2 minutes for learning each list, after which they returned the item list to the experimenter and were asked to reproduce the items on a sheet of paper with 20 numbered rows. In doing so they were instructed to ''walk'' along the path from one location to the next and thereby ''collect'' the items. If a participant remembered a word, but could not remember its position in the sequence, he or she could write it down below the 20 rows. Recall was not limited in time, but was followed by a 2-minute break before the procedure was repeated for the second practice list.

In the second session (on the succeeding day) participants were first instructed to reproduce the loci they had generated the day before. After successful recall they were tested in the same manner as the day before, this time using the three grocery lists, which were given to participants in the same order. The learning intervals and breaks between the cycles were 2 minutes each (exactly matching the previous session). This resembles an average presentation time of 6 seconds per item. This time frame is adequate for generating mental images, as studies with similar conditions have shown (Verhaeghen & Kliegl, 2000).

Results

For each list and each participant the number of correctly recalled items (items that were recalled in the correct position) was counted.[1] Alpha was set to .05 for all statistical tests. Table 1 displays the mean number of correctly recalled items in both groups.

The hypothesis, that different instructions would result in different recall-performances, was tested using a two-way ANOVA with loci type (street vs house loci) as between-participants and list number (list 1 to list 3) as within-participants factors. This analysis revealed a significant main effect of loci type, $F(1, 38) = 4.5, p < .05$, reflecting a better performance of the street-loci group as compared to the house-loci group. Neither the main effect of list number nor the interaction reached statistical significance, $F(2, 37) = 2.7$, $p > .05$ and $F(2, 37) < 1$, respectively.

Discussion

In Experiment 1 we investigated whether instructions on how to use the method of loci (i.e., generate a path to one's work or a path in the house) would influence later recall performance of participants who employ this method to recall lists of items. The results obtained indicate that participants who generated and applied loci on a route to their work showed significantly better recall of item lists than participants who generated and applied loci on a path in their house. This result cannot be due to initial difficulties of learning the loci in the group who used a path in the house, as sequences of loci were thoroughly learned in both groups. This was ensured both

[1] The strict positional criterion was selected because the superiority of the method of loci, as compared to other techniques, shows up especially under these conditions. Taking only the number of recalled items into account (ignoring the position) led to similar results in both experiments.

TABLE 1
Number of words recalled by participants in the different conditions of Experiment 1

Loci	*List 1 M (SD)*	*List 2 M (SD)*	*List 3 M (SD)*
House loci	12.9 (4.9)	13.7 (4.5)	14.0 (4.4)
Street loci	15.6 (4.8)	15.5 (5.3)	17.5 (3.9)

through the training in the first session and through the initial recall of loci in the beginning of the second session, at which participants were easily able to recall all loci. Furthermore, if better memory performance were to be attributed to the initial acquisition of the loci and their sequence, this advantage should have declined in the course of the experiment with each succeeding list. Such a trend is by no means visible, however. The differences between the street-loci and the house-loci groups do not decrease across the three lists (Difference 1: 2.7; Difference 2: 1.8; Difference 3: 3.5; see Table 1).

Although the results obtained in Experiment 1 confirm the hypothesis that the kind of pathway generated has a considerable impact on the success of the method of loci, they raise the question of whether results can be generalised to other item material. As only lists of grocery items were used in the study and groceries are more likely to be encountered within a house than on the street, mental images generated for loci on the way to work may well have been more bizarre or unusual than the ones generated for loci in the house. Stated bluntly, one is more likely to find a banana on one's kitchen table than dangling from a streetlight. The superiority in recall would then be attributable to the specific combination of item material and type of loci path used. We therefore conducted a second experiment to test whether the results of Experiment 1 can be replicated with different item material. To test in addition which impact must be attributed to the specific combination of items and loci, we varied both items and loci in Experiment 2.

EXPERIMENT 2

Experiment 2 addressed the question of whether different instructions for how to use the method of loci would affect not only the recall of groceries but also that of other items. Assuming that loci on the way to work might have generated more unusual images when combined with grocery items, the latter might have been recalled more easily. Therefore, in Experiment 2 we also varied the items to be remembered in such a way that usual vs unusual images would be expected for loci in the house or loci on the way to work. Two new lists of items were generated for this aim, one with objects that are more likely to be encountered in the house, and the other with objects that are most likely to be encountered outside the house. If it is really the instruction that determines performance, then using a way to work should also affect the recall of other items, and a main effect of instruction method is to be expected. Of course this main effect may be further qualified by a significant interaction between method of instruction and item material, and our design allows us to assess the extent and type of this potential interaction.

Method

Design and participants. A total of 120 participants aged 18 to 40 ($M = 23.2$) were mostly recruited from the University of Bonn campus. Of these, 73 were women and 47 men. A 2×2 design was implemented: The type of loci was varied (street-loci vs house-loci), as well as the type of items which, accordingly, were either ''street items'' or ''house items''. Therefore, four conditions were generated (street-loci/street-items; street-loci/house-items; house-loci/street-items; house-loci/house-items), to which the participants were randomly assigned (30 per condition).

Materials. The practice lists from Experiment 1 served as items for the practice phase on session/day 1. In the main phase we first used the grocery lists 1 and 2 from Experiment 1 and then lists 3a and 3b. Lists 1 and 2 were identical for all four groups (conditions), whereas list 3 was varied: list 3a consisted of house items, list 3b of street items (see Appendix). Street items (e.g., police officer, church) were selected to generate rather usual images when linked to street loci, but unusual ones in combination with house loci. House items (e.g., peach, book) were selected accordingly to generate typical images when combined with house loci, but atypical ones when linked to street loci. All words in lists 3a and 3b were taken from a German corpus (Baschek, Bredenkamp, Oehrle, & Wippich, 1977) and were comparable in imageability.

Procedure. Again, sessions were conducted on two succeeding days and resembled sessions of

Experiment 1. Participants were randomly assigned to one of the four conditions, which differed according to loci (street vs house) and item list (3a vs 3b). The practice phase in the first session was exactly the same as described for Experiment 1. On the second day, again, participants were asked to reproduce the loci correctly. Then learning phases followed, starting with the two grocery lists. After that, the third list was presented, which consisted of either street or house items. A 2-minute learning interval was allowed for each list. Again, words had to be written down on a sheet of paper with numbered rows. Any words the exact position of which could not be recalled, were to be written down anywhere below the 20 rows.

Results

As in Experiment 1, the number of correctly positioned items was counted for each list. All statistical tests were performed with $\alpha = .05$. Figure 1 shows the mean number of items recalled from list 3 as a function of item/loci combination (house-loci/house-items; street-loci/street-items; house-loci/street-items; street-loci/house-items).

A 2×2 ANOVA with the factors loci type (street vs house) and item type (street vs house) revealed no significant interaction between both factors, $F(1, 116) < 1$. The main effect of item type was also not significant, $F(1, 116) < 1$. There was, however, a significant main effect of loci type, $F(1, 116) = 5.7$; $p < .05$, which was due to better recall performance with the instruction to use loci on the way to work ($M = 16.7$) than with the house-loci instruction ($M = 14.7$).

To test whether there would be any modulation of the main effect of loci type with list number, we further conducted a repeated-measures ANOVA with list number (list 1 to list 3) as within-participants factor, and loci type (street vs house loci) and item type (street vs house items) as between-participants factors (remember that list 1 and list 2 were the same for both item groups, which differed only with respect to list 3). Table 2 displays means and standard deviations of recall performance for all lists and conditions.

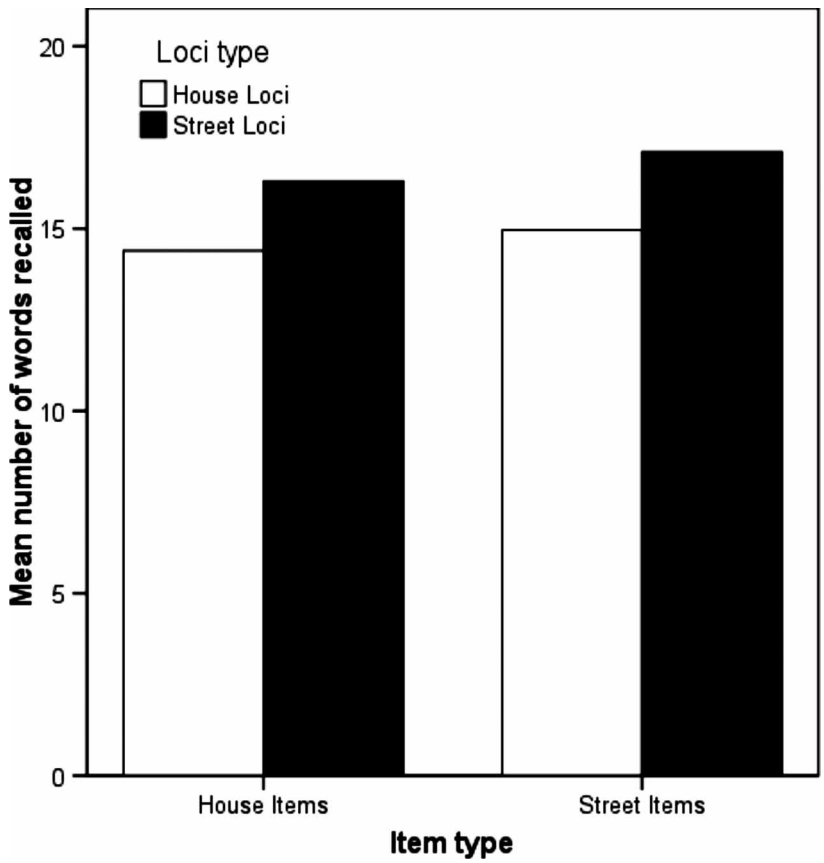

Figure 1. Mean number of words recalled for Lists 3a and 3b as a function of loci group in Experiment 2.

TABLE 2
Number of words recalled by participants in the different conditions of Experiment 2

Loci	*Grocery-items List 1 M (SD)*	*Grocery-items List 2 M (SD)*	*Street-items List 3a M (SD)*	*House-items List 3b M (SD)*
House loci	12.9 (4.6)	12.3 (5.5)	15.0 (4.8)	14.4 (5.2)
Street loci	14.6 (4.6)	14.6 (5.2)	17.1 (3.6)	16.3 (4.7)

The analysis revealed a significant main effect of loci type, $F(1, 116) = 6.4$; $p < .05$, reflecting better performance with the instruction to use a way to work, and a significant main effect of list number, $F(2, 232) = 24.2$; $p < .01$, that was due to an improvement in recall performance from list 1 to list 3. Importantly, neither the interaction of list number and loci type, $F(2, 232) < 1$, nor any other effect reached statistical significance.

Discussion

The results of Experiment 2 replicate those obtained in Experiment 1 in two important respects. First, participants who were instructed to generate loci on a way to work recalled significantly more items than participants who generated a path in the house. Importantly, this result was also found with the different item material of list 3. Second, again this effect was not modulated by task practice, suggesting that it is not confined to early stages in the acquisition and retention of the locations used as anchors for the mnemonic.

GENERAL DISCUSSION

The main results of both experiments can be summarised as follows: In both experiments recall performance was superior when participants were instructed to generate and apply loci on a path to their work as compared to loci on a path in the house. This effect was not significantly modulated by the specific contextual relationship between the items to be learned and the loci to be used.

One explanation for the apparent ease with which participants generate and apply loci on a path to their work might be that these loci and the associated mental images are better distinguishable from one another and thus more distinct. Distinctiveness of items has been shown to influence memory performance (Hege & Dodson, 2004; Howe, Courage, Vernescu, & Hunt, 2000; Rajaram, 1998; Sharpe & Markham, 1992). Furthermore, studies that originate from research on mental scanning and the symbolic distance effect (Kosslyn et al., 1978; Moyer, 1973) indicate that to-be-learned information can inherit the properties of objects with which it is linked (Petrusic et al., 1998). Consequently, a larger distinctiveness of loci due to larger mental distances would be transferred to the items associated with them, resulting in better memory performance. However, loci on the way to one's work might also differ in other important respects from loci on a path in a house. For instance, participants might also generate more complex pathways in a house. Path complexity, as measured, for instance, by the number of crossings or the number of angles on the path, has been shown to influence serial recall of locations on the path (Parmentier, Elford, & Mayberry, 2005). The present experiments were not designed to decide between these alternative explanations, and further work is necessary to clarify the underlying causes for the superiority of loci on the way to one's work.

The fact that the assumed typicality of the mental images did not have an effect on performance in Experiment 2 might seem astonishing at first sight. However, the advantages of atypicality or bizarreness are controversial with respect to the method of loci. Lorayne and Lucas (1974) emphasised that generated images should be unusual, strange, illogical, or absurd. In contrast, Perensky and Senter (1970) and Senter & Hoffman (1976) found atypicality or bizarreness to have no effect, as long as the generated interactive images are concrete, lively, and emotionally loaded. However, it seems plausible to argue that these very criteria are often met by bizarre mental images (Einstein & McDaniel, 1987).

The results obtained have practical implications for the instruction and application of the method of loci. In general, people seem to be rather reluctant to use formal mnemonics in their everyday life (Soler & Ruiz, 1996). This is often attributed to difficulties in understanding how to apply them and in the initial effort that has to be investigated in order to learn them. Hence, any

advice on how untrained participants are able to find effective loci pathways without having to invest high amounts of effort into studying the underlying technique is useful, and can help learners in pedagogical as well as clinical contexts with a successful and easy application of the method of loci.

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REFERENCES

Baschek, I-L., Bredenkamp, J., Oehrle, B., & Wippich, W. (1977). Bestimmung der Bildhaftigkeit, Konkretheit und der Bedeutungshaltigkeit von 800 Substantiven. *Zeitschrift für experimentelle und angewandte Psychologie*, *24*, 353–396.

Bellezza, F. S., & Reddy, G. (1978). Mnemonic devices and natural memory. *Bulletin of the Psychonomic Society*, *11*, 277–280.

Cornoldi, C., & De Beni, R. (1991). Memory for discourse: Loci mnemonics and the oral presentation effect. *Applied Cognitive Psychology*, *5*, 511–518.

Cornoldi, C., De Beni, R., & Pra Baldi, A. (1989). Generation and retrieval of general, specific and autobiographical images representing concrete nouns. *Acta Psychologica*, *72*, 25–39.

De Beni, R., & Cornoldi, C. (1985). Effects of the mnemotechnique of loci in the memorisation of concrete words. *Acta Psychologica*, *60*, 11–24.

De Beni, R., & Moè, A. (2002). Presentation modality effects in studying passages: Are mental images always effective? *Applied Cognitive Psychology*, *16*, 1–17.

De Beni, R., & Moè, A. (2003). Imagery and rehearsal as study strategies for written or orally presented passages. *Psychonomic Bulletin & Review*, *10*, 975–980.

Einstein, G. O., & McDaniel, M. A. (1987). Distinctiveness and the mnemonic benefits of bizarre imagery. In M. A. McDaniel & M. Pressley (Eds.), *Imagery and related mnemonic processes*. New York: Springer.

Groninger, L. (1971). Mnemonic imagery and forgetting. *Psychonomic Science*, *23*, 161–163.

Groninger, L. D., & Groninger, L. K. (1988). Autobiographical episodes as mediators in the recall of words. *American Journal of Psychology*, *101*, 515–538.

Hege, A. C. G., & Dodson, C. S. (2004). Why distinctive information reduces false memories: Evidence for both impoverished relational-encoding and distinc tiveness heuristic accounts. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *30*, 787–795.

Howe, M. L., Courage, M. L., Vernescu, R., & Hunt, M. (2000). Distinctiveness effects in children's long-term retention. *Developmental Psychology*, *36*, 778–792.

Kosslyn, S. M., Ball, T. M., & Reiser, B. J. (1978). Visual images preserve metric spatial information: Evidence from studies of mental scanning. *Journal of Experimental Psychology: Human Perception and Performance*, *4*, 47–60.

Krebs, E. W., Snowman, J., & Stanley, H. (1978). Teaching new dogs old tricks: Facilitating prose learning through mnemonic training. *Journal of Instructional Psychology*, *5*, 33–39.

Luria, A. R. (1968). *The mind of the mnemonist*. Oxford, UK: Basic Books.

Lorayne, H., & Lucas, J. (1974). *The memory book*. New York: Stein & Day.

Massen, C., & Vaterrodt-Plünnecke, B. (2006). The role of proactive interference in mnemonic techniques. *Memory*, *14*, 189–196.

Metzig, W., & Schuster, M. (1993). *Lernen zu lernen*. Berlin: Springer.

Moè, A., & De Beni, R. (2005). Stressing the efficacy of the loci method: Oral presentation and the subject-generation of the loci pathway with expository passages. *Applied Cognitive Psychology*, *19*, 95–106.

Moyer, R. S. (1973). Comparing objects in memory: Evidence suggesting an internal psychophysics. *Perception & Psychophysics*, *13*, 180–184.

Parmentier, F. B. R., Elford, G., & Mayberry, M. (2005). Transitional information in spatial serial memory: Path characteristics affect recall performance. *Journal of Experimental Psychology: Learning, Memory & Cognition*, *31*, 412–427.

Perensky, J. J., & Senter, R. J. (1970). An investigation of "bizarre" imagery as a mnemonic device. *Psychological Record*, *20*, 145–150.

Petrusic, W. M., Baranski, J. V., & Kennedy, R. (1998). Similarity comparisons with remembered and perceived magnitudes: Memory psychophysics and fundamental measurement. *Memory & Cognition*, *26*, 1041–1055.

Rajaram, S. (1998). The effects of conceptual salience and perceptual distinctiveness on conscious recollection. *Psychonomic Bulletin & Review*, *5*, 71–78.

Roediger, R. L. (1980). The effectiveness of four mnemonics in ordering recall. *Journal of Experimental Psychology: Human Learning and Memory*, *6*, 558–567.

Ross, J., & Lawrence, K. A. (1968). Some observations on memory artifice. *Psychonomic Science*, *13*, 107–108.

Senter, R. J., & Hoffman, R. R. (1976). Bizarreness as a nonessential variable in mnemonic imagery: A confirmation. *Bulletin of The Psychonomic Society*, *7*, 163–164.

Sharpe, L., & Markham, R. (1992). The effect of distinctiveness of bizarre imagery on immediate and delayed recall. *Journal of Mental Imagery*, *76*, 211–220.

Snowman, J., Krebs, E. W., & Lockhart, L. (1980). Improving recall from prose in high-risk students through learning strategy training. *Journal of Instructional Psychology*, *7*, 35–40.

Soler, M. J., & Ruiz, J. C. (1996). The spontaneous use of memory aids at different educational levels. *Applied Cognitive Psychology*, *10*, 41–51.

Verhaeghen, P., & Kliegl, R. (2000). The effects of learning a new algorithm on asymptotic accuracy and execution speed in old age: A reanalysis. *Psychology and Aging*, *15*, 648–656.

Wang, A. Y., & Thomas, M. H. (2000). Looking for long-term mnemonic effects on serial recall: The legacy of Simonides. *American Journal of Psychology*, *113*, 331–340.

Yates, F. A. (1966). *The art of memory*. Chicago: University of Chicago Press.

APPENDIX

Street items (list 3a)	House items (list 3b)
1. Bettler (beggar)	1. Fleisch (meat)
2. Schiff (ship)	2. Kochtopf (saucepan)
3. Grab (grave)	3. Pudding (pudding)
4. See (sea)	4. Ofen (oven)
5. Felsblock (boulder)	5. Hausschuhe (slippers)
6. Krankenwagen (ambulance)	6. Butter (butter)
7. Fabrik (factory)	7. Harfe (harp)
8. Polizist (police officer)	8. Kaffee (coffee)
9. Pferd (horse)	9. Bügeleisen (iron)
10. Straße (road)	10. Gabel (fork)
11. Fluss (river)	11. Klavier (piano)
12. Auto (car)	12. Hammer (hammer)
13. Schmetterling (butterfly)	13. Kühlschrank (refrigerator)
14. Nonne (nun)	14. Geschenk (present)
15. Allee (alley)	15. Pfirsich (peach)
16. Rasenmäher (law-mower)	16. Bargeld (cash)
17. Raupe (caterpillar)	17. Pfeffer (pepper)
18. Frosch (frog)	18. Buch (book)
19. Kirche (church)	19. Gemälde (painting)
20. Berg (mountain/hill)	20. Bleistift (pencil)