Journal of Gerontology
1983, Vol. 38, No. 2, 197–203

Interactive Imagery and Affective Judgments Improve Face-Name Learning in the Elderly[1]

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Groups of elderly adults were taught to learn name-to-face associations using one of three different techniques. In a control group (no image) participants were taught for each face-name pair to select a prominent facial feature and to transform the surname into a concrete word. Persons in a second group (image) additionally were taught to employ interactive imagery to form an association between the prominent feature and the transformed name. The third group (image + judgment) was treated the same as the second except that these individuals were also taught to judge the pleasantness of the image association that was formed. As predicted, improvement following instruction was minimal when no image association was formed but strong when interactive imagery was used. Moreover, those persons in the image + judgment group remembered more names than those in the image group and showed less forgetting on a measure of delayed recall. In addition to replicating and extending the findings of previous research with a different sample, the present study demonstrates that semantic orienting tasks can be used to enhance the retention of visual image associations as well as the simpler stimuli used in prior research.

Key words: Memory, Recall, Paired-associate learning, Aging, Mnemonics

ELDERLY adults often complain of memory problems (Lowenthal et al., 1967) and typically perform more poorly than young adults on tests of long-term or secondary memory (Craik, 1977). Especially problematic for aged persons is the recall of names. A reexamination of data from a large survey, including over 500 elderly people, found forgetting of names to be the most frequent of 18 potential memory complaints (Zelinski et al., 1980).

McCarty (1980) examined a mnemonic device based upon visual imagery associations and found that it substantially improved name recall in young adults. This mnemonic employs a series of logical steps for reconstructing a person's name upon presentation of the face. Its components include (a) identifying a prominent facial feature (e.g., a large mouth); (b) deriving a concrete, high-imagery transformation of the person's name (e.g., "Whalen" becomes "A whale"); and (c) forming a visual image associating the prominent facial feature with the name transformation (e.g., a whale in the person's mouth).

After forming the image associating the prominent facial feature to the name transformation, one recalls the name of the person as follows: (a) identify the prominent feature of the face; (b) use the feature as a retrieval cue for the image association; (c) reconstruct the name transformation from the image association; and finally, (d) decode the name from the name transformation. In addition to demonstrating the effectiveness of the method in young adults, McCarty was able to show that the weakest link in the series was that of remembering the visual image association given the prominent feature of the face. In contrast, participants had little difficulty with each of the other steps, such as decoding the name given the name transformation.

The aim of the present research was to examine the effectiveness of this mnemonic in aged adults. There was concern that the approach might not work in this instance, however, because older adults may have more difficulty than young ones in forming and retaining visual images (Poon et al., 1980; Winograd & Simon, 1980). On the other hand, there is evidence that elderly adults can ben-

[1]This research was supported by the Medical Research Service of the Veterans Administration. We would like to acknowledge the assistance of Danielle Lapp, MA, who taught the groups, Jacques Fessard, MD, who recruited the groups, and Emily Gere for her technical expertise.

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efit from the use of visual imagery mnemonics; they may simply be less inclined to use visual mediators on their own (Hulicka & Grossman, 1967) and fail to use visual mnemonic techniques without explicit prompting (Robertson-Tchabo et al., 1976). This failure among elderly persons to employ spontaneously effective encoding strategies, which they are able to perform, has been discussed in terms of a production deficit (Perlmutter, 1979; Robertson-Tchabo et al., 1976) and offers an alternative explanation for observations that elderly adults fail to benefit from visual imagery mnemonics (e.g., Mason & Smith, 1977).

If elderly individuals are capable of forming visual images but either fail to do so effectively or do not retain images well once formed, it may be possible to augment the efficacy of visual mnemonics through modifications of the way elderly persons encode visual images. One method is suggested by studies showing how certain instructional sets facilitate retention of visual materials (Bower & Karlin, 1974; Smith & Winograd, 1978; Warrington & Ackroyd, 1975). These studies have shown that recognition memory is improved by requiring people to make semantic judgments of faces as they are viewed. Such findings are readily explained in terms of the amount of elaboration given to a stimulus at encoding; that is, by processing a stimulus in additional, nonredundant ways it is more likely to be remembered later (Craik & Tulving, 1975; Klein & Saltz, 1976). Thus by having elderly adults not only form visual images but also further elaborate upon the images that are formed, it is more likely that they will show improvement after learning visual image based mnemonics.

As a test of this line of reasoning, it was decided to compare the efficacy of two different instructional sets for forming name-to-face associations — one requiring that a semantic judgment be made about each visual image association formed and one requiring no such judgment. The hypothesis was that performing these judgments in conjunction with the mnemonic would result in better name recall than using the mnemonic alone.

Following McCarty's (1980) procedure, three groups of adults were incorporated into the present study. One group of participants (image group) was taught the standard mnemonic technique; that is, they were provided with the prominent feature of the face, name transformation, and image association for each of a series of face-name pairs. A second group of participants (image + judgment group) received identical instructions except that they were also asked to judge the pleasantness of the image association. In line with the stated hypothesis, the latter group was expected to display better name recall.

A third group (no image group) served as a control in order to establish the effectiveness of the standard mnemonic with elderly adults. Participants in this group were treated the same as those in the image group except that they were not taught to form an image associating the prominent facial feature with the name transformation. Based on McCarty's (1980) findings, it was expected that persons in this group would remember fewer names than those in the image group. This condition was found by McCarty (1980) to perform at the same level as other control groups, and so it was used as the only control in the present study.

Testing in the present study was expanded to address other issues related to the use of mnemonics with elderly persons. McCarty had directed his young participants to specific features of the test faces to be learned, provided them with the name transformations, and told them what type of image associations to form during the testing sessions. Outside the laboratory or classroom, however, people would have to perform these often complex operations on their own. In the present study participants were tested both when provided with specific mnemonic components to be used and when they generated their own components. These were labeled respectively the experimenter mnemonic condition and the self-mnemonic condition.

Because of questions of the ability of elderly adults to successfully form new long-term memories even with mnemonics, the durability of the effects was also explored by administering each of these testing conditions again after a 48-hour delay. Through this multiple testing procedure it was possible to examine whether gains could be achieved by elderly persons through the utilization of these techniques, whether elderly adults could effectively employ the techniques with minimal assistance, and whether the memory gains achieved through their use would persist over time.

METHOD

Participants

The participants were all retired, middle-level managers belonging to a retirement fund. The fund conducts courses on various topics for its members and could assure a large homogeneous subject population. Letters were sent to members inviting them to join a brief course on memory improve-

ment. The first 75 of several hundred respondents were assigned to one of three groups on the basis of their preference for dates.

Sixty of these individuals actually reported the first day of the course. Only these participants are considered in the data analyses to be reported. Among these persons the mean age was 65.6 years (sd = 5.4). Analysis of variance yielded no significant differences in age between groups, $F(2,56) < 1$. There also was no significant difference in the sexual composition of the three groups, χ^2 (2) = .17; overall 75% of the total sample was male. Although educational attainment vaired substantially, the three groups were comparable in terms of level of education, χ^2 (4) = .91. Exactly one-third of the sample received only primary education, another third completed secondary school, and the remaining participants had attended college.

The sample was also assessed in terms of health status. No reliable differences were found between groups either in terms of subjective ratings of health, χ^2 (2) = .05, or current levels of medication, χ^2 (4) = 2.69. Within the total sample, 53% rated their health as either excellent or good, whereas the remaining 47% rated their health as average or below average. None reported themselves in poor health. Thirty-seven percent were taking no medication, 28% were taking one prescription drug, and 34% were taking two or more.

Instruction and Treatment Groups

The experiment took place over 5 consecutive days with each day's session lasting 2 hours. The sessions were used both for instruction and for testing. Instruction in the specific mnemonic techniques was provided primarily in the first two sessions.

Instructions common to all groups. — During the first session all participants received a general introduction to the experiment. They were then taught to encode faces by searching for and indentifying a distinctive feature for each face they encountered. This instruction was accompanied by practice in which the faces of other class members were studied. The second day completed instruction on the mnemonic. Initially, all participants were treated identically and were taught how to transform names into concrete, imagable objects. Practice exercises were conducted as on the first day.

The variations in instructional material across groups were introduced on the second day after participants had been taught how to encode faces and names as separate units. There were three groups of participants in total. They were labeled the no image (n = 21), image (n = 21), and image + judgment (n = 18) groups.

No image group. — This control group received no further instruction in the encoding of faces and names. That is, they were taught only to identify a prominent feature of the face and to develop a transformation for the name of each photographed person seen during the course of the experiment. The remaining instruction time was spent discussing the history of mnemonics.

Image group. — The second group received treatment identical to that of the no image group; however, in addition, participants were taught to form a visual image incorporating both the prominent facial feature of the person and a concrete transformation of his or her name. It was stressed that these two components of the image be seen interacting physically. For example, the transformation for Mr. Whalen, a whale, was imagined physically in his mouth, the prominent feature. Practice in constructing visual image associations was given using the faces and names of class members.

Image + judgment group. — This group was treated identically to the image group except that particpants were further told to make a judgment about the pleasantness or unpleasantness of the visual image association.

Testing Materials

Name recall was tested using three unique sets of testing materials. Each set contained slides of six male and six female faces and sheets of paper on which fictitious names paired with the faces were written. These three sets of face-name pairs were assigned randomly to one of three sets of study trials.

The faces used in the present study were taken from a high school yearbook. A pool of approximately 100 male and 100 female slides was created initially by photographing those persons dressed in a nondistinctive manner. From this initial pool of faces, 36 were chosen for which at least three of four judges agreed as to the person's prominent facial feature. These were then grouped into three sets of six male and six female faces equating as best as possible the distribution of prominent facial features within each set. Thirty-six common surnames were then chosen and assigned randomly to the faces.

Study Trials

Three types of study trials were administered. These represented different conditions under which participants initially learned the face-name pairs. These were presented on consecutive days of the experiment.

No mnemonic (day 1). — This set of study trials was presented at the beginning of the first class session, prior to any instruction in mnemonic techniques. The 12 face-name pairs comprising a set were presented consecutively for a period of 1 minute each, and in the same random order for all participants. As each face was displayed on a projection screen at the front of the classroom, that sheet of paper giving the person's name was held underneath by the experimenter who also read the name aloud. Participants were instructed to learn, as best they could, the name of each person they viewed.

Experimenter mnemonic (day 2). — This set of study trials was presented after participants had received all of the day's instruction for their group. For these trials the same procedure was employed as used for the no mnemonic trials, except participants were provided not only with the name but were also verbally given the prominent facial feature for that person and a name transformation appropriate for the person's surname. This information was provided to all participants regardless of their group. In the image and image + judgment groups participants were also provided with an image association connecting the prominent feature of the face to the name transformation. They were instructed to listen carefully for each mnemonic component and to use them as previously instructed. Persons in the image and image + judgment groups differed in that the latter group alone was also told to rate the image association on a 7-point scale having anchors that ranged from extremely pleasant to extremely unpleasant.

Self mnemonic (day 3). — These study trials also followed the general procedure of the no mnemonic study trials, but in this case participants were asked to generate mnemonic components for each face-name pair on their own. That is, persons in each of the groups were instructed to select a prominent feature for each face and to develop a transformation for each name. Participants in the image and image + judgment groups were also asked to generate an image association linking the two and, in the latter group, evaluate its pleasantness.

Testing Procedure

Immediate tests of name recall were given after each of the study trials; in addition, participants were tested for their ability to recall the names learned during the experimenter mnemonic and self-mnemonic study trials after a 48-hour delay interval. These tests were administered on days 4 and 5, respectively. No delayed recall test was given for names presented during the no mnemonic study trials, because this test was used solely to determine the initial comparability of the treatment groups.

Although there were various testing sessions administered throughout the experiment, all followed the same general procedure. Participants were presented with the face of each person seen earlier during a set of study trials. These were presented sequentially for 1 minute each and in a random order different from that used for the corresponding set of study trials. Participants were told that for each face they should try to recall the name of the person and write it down on an answer sheet. Correct answers were reviewed after each immediate memory test.

This same testing procedure was followed for each of the five recall tests. However, for the delayed recall test of material learned during the experimenter mnemonic study trials, the testing session actually contained three consecutive tests of name recall. The first session was procedurally identical to the immediate recall test given 48 hours earlier; that is, only the faces were presented to participants as cues for recalling the names. Immediately after this test, however, the same 12 faces were seen again, but this time the experimenter mentioned the prominent feature that had been selected for each face during the study trials. Participants were asked to try again to recall the name of each person given the additional cue. Finally, on a third cycle through these pictures, participants were told the image association for each face. Thus, there were three recall tests with the same faces, but progressively more powerful cues were provided each time. Although persons in the no image group had not been provided originally with the image associations nor instructed as to their role, these participants were nevertheless expected to benefit from the provision of these cues. This was because each image association contained a name transformation presented during the study trials.

Thus, in summary, there were five testing sessions in total, including an immediate test of recall for each set of study trials in which the faces alone were presented as cues; a delayed recall test for the

self-mnemonic study trials in which, again, only the faces were presented; and, finally, a delayed recall test for the experimenter mnemonic study trials that employed three consecutive cueing conditions.

RESULTS

Because different sets of face-name pairs were used during each of the study trials, separate analyses were conducted for the no mnemonic, experimenter mnemonic, and self-mnemonic study conditions. Separate analyses were performed also for the face cue and multiple cue recall tests. In each of these analyses the proportion of names correctly recalled served as the dependent variable. These scores were subjected to an arcsin transformation before analysis in order to stabilize the variances.

No mnemonic. — In order to verify that the groups were equivalent initially in face-name learning, scores on the immediate recall test of the no mnemonic study condition were subjected to a one-way analysis of variance. This analysis revealed no significant difference due to group membership, $F(2,57) < 1$. The mean percentage of surnames correctly recalled by each group appear in Table 1.

Experimenter mnemonic: Face cue only. — The percentage of surnames correctly recalled in the experimenter mnemonic condition also are shown in Table 1. In analyzing these scores, a repeated-measures analysis of variance was used in which group (no image, image, image + judgment) served as a between-subjects factor and test (immediate, delayed) served as a within-subjects factor. A significant main effect was found for test, $F(1,53) = 51.62$, $p < .001$, $\omega^2 = .13$, indicating that some names initially recalled were forgotten over the 48-hour interval. Of greater interest, though, was the finding of a reliable group main effect, $F(2,53) = 13.27$, $p < .001$, $\omega^2 = .22$. As seen in Table 1, and as verified through a Newman-Keuls analysis on the relevant marginal means, recall was better in the image than in the no image group, and best of all in the image + judgment group. The interaction was not significant, $F(2,53) < 1$.

Table 1. Percentage of Names Correctly Recalled as a Function of Group, Type of Study Trial, and Type of Test

		Group			
Study	Test	No image	Image	Image + judgment	*M*
No mnemonic	Immediate	17.7	19.1	18.5	18.4
Experimenter mnemonic	Immediate	16.7	38.5	48.8	34.6
	Delayed	4.6	15.1	31.6	16.7
	M	10.6[a]	26.8[b]	40.2[c]	
Self-mnemonic	Immediate	20.1[a]	36.3[b]	48.5[b]	35.1
	Delayed	16.7[a]	24.6[a]	55.9[b]	31.8
	M	18.4[a]	30.5[b]	52.2[c]	

Note. Means within a row having different superscripts differ at the .05 level by Newman-Keuls analysis.

Self mnemonic: Face cue only. — The bottom section of Table 1 gives the mean percentage of recall for the self-mnemonic condition. A comparable analysis of variance revealed a significant effect for group, $F(2,52) = 15.17$, $p < .001$, $\omega^2 = .27$, and a Newman-Keuls analysis verified that each of the group marginal means differed at the .05 level. Although there was, surprisingly, no reliable main effect associated with the length of the delay interval, $F(1,52) < 1$, there was a significant group by test interaction, $F(2,52) = 3.42$, $p < .05$, $\omega^2 = .02$. The nature of this effect was examined by conducting separate Newman-Keuls analyses for the immediate and delayed recall tests. These analyses revealed no significant difference between the image and image + judgment groups on the immediate test, though both outperformed the no image group. On the delayed test, participants in the image + judgment group actually recalled more names than they did on the immediate recall test and outperformed both the image and no image groups; in contrast, name recall in the image group declined and was no longer significantly greater than that of the no image group at this point in time. Thus, the superiority of the image, relative to the no image, group appears to exist only initially, whereas that of the image + judgment group is maintained even after a 48-hour delay.

Experimenter mnemonic: Multiple cues. — A final analysis was performed on the multiple administrations of the delayed test given in the experimenter mnemonic condition. In this case, the recall scores of participants under each of the cueing conditions were utilized. The mean recall scores for each of these conditions appear in Table 2, the first row of which repeats part of Table 1.

Analysis of these data revealed a significant main effect for group, $F(2,53) = 21.85$, $p < .001$, $\omega^2 = .13$, and for type of cue, $F(2,106) = 295.85$, $p < .001$, $\omega^2 = .59$, but no significant interaction, $F(4,106) = 1.05$. Newman-Keuls analyses indicated that the image + judgment group recalled more names than the image group and that both of

Table 2. Percentage of Names Correctly Recalled as a Function of Group and Type of Cue Provided at Recall (Experimenter Mnemonic)

	Group			
Type of cue	No image	Image	Image + judgment	*M*
Face cue only	4.6	15.1	31.6	16.7[a]
Prominent feature	6.9	26.2	45.1	25.7[b]
Image association	66.0	82.3	89.7	79.3[c]
M	25.8[a]	41.2[b]	55.5[c]	

Note. Marginals means having different superscripts differ at the .05 level by Newman-Keuls analysis.

these groups showed higher recall than the no image control group. Similarly, each of the marginal means associated with the different types of cue conditions differed at the .05 level.

Discussion

The present experiment replicates and extends the findings of previous research on face-name mnemonics (McCarty, 1980). When people incorporated both the name and a facial feature of each person into a single unified image, name recall was better than when the name and face were encoded separately. This finding replicates that of McCarty (1980) but with elderly adults. Although the results appear modest, approximately 50% correct in the best condition, persons in the image + judgment group recalled more than twice as many names after learning the mnemonic than they did initially, and several individuals achieved perfect scores. Thus, this mnemonic technique may prove to be of benefit in cognitive retraining programs for aged persons.

It is of particular interest that the image group generally performed more poorly than the image + judgment group and did not perform better on delayed testing than the controls. The superior performance of the image + judgment group was expected. Research has clearly demonstrated that by inducing greater elaboration of a stimulus at encoding, recall is enhanced (Craik & Tulving, 1975; Klein & Saltz, 1976). By having participants make affective judgments, it was thought that elaboration of the mnemonic's image association would be facilitated, and thus, recall enhanced. The present findings support this idea and suggest that additional elaboration of visual image associations may retard forgetting of one's specific mnemonic over time.

This finding of better recall with an elaborative judgment task also extends earlier research utilizing different orienting tasks as a primary experimental manipulation. Prior studies typically have presented individual words (Craik & Tulving, 1975) or nonverbal stimuli, such as faces (Bower & Karlin,1974; Smith & Winograd, 1978), for participants to encode. The present study, in contrast, examined the effect of a semantic orienting task on the recall of associations formed between two distinct elements, faces and names. The fact that the orienting task facilitated recall in this study suggests that stimulus elaboration may also promote memory for more complex stimuli such as the visual image associations formed by participants in this study.

There are explanations for these findings other than that of differences in elaboration of the image associations. One might argue that in making affective judgments, people in the image + judgment group may have held the images in working memory for a longer period of time. This additional time may also have reduced potential interference caused by other encodings spontaneously generated for the face-name pairs. Both of these explanations focus on the role rehearsal plays in transferring information to long-term memory. Unfortunately, the effect of rehearsal on long-term retention remains controversial, and although it may enhance recognition memory, rote rehearsal appears to have no effect on recall (Woodward et al., 1973). Its possible effects in the present study are difficult to assess, because in this case a cued recall test was used. However, the judgment task was a short one, taking no more than a few seconds; any additional rehearsal performed during this interval seems unlikely to account for the superior performance of the image + judgment group.

Another explanation for the superior performance of this group is that making an affective judgment helped to structure the task and remind participants to use the mnemonic taught to them. This latter interpretation would be consistent with findings of Robertson-Tchabo et al. (1976) that elderly adults often need explicit instruction to use mnemonics even after being taught them in similar circumstances. However, because participants were told explicitly to apply the mnemonic techniques each time they were tested, the present findings seem best explained in terms of qualitative changes in the memory trace rather than the role of judgments as a structural support for the task or reminder to use specific mnemonics. It nevertheless remains to be determined whether elderly adults will employ spontaneously the techniques taught here in the course of their daily activities.

The present research is also consistent with McCarty's finding (1980) that the most difficult step in the mnemonic is in retrieving the image association. Performance improved on a delayed recall task when participants were given the image association they had been provided earlier while learning the face-name pairs. Although recall also improved when the prominent feature of the face was mentioned at testing, the gain from this feature cue was substantially smaller than with the image association as a cue. Thus, the primary obstacle to recall for our participants was probably retrieval of the image association. The fact that persons in the no image group also improved when prompted with the image association is not unexpected; the image association contained the name transformation they had learned earlier. These data unfortunately cannot distinguish whether participants remembered their associations when so prompted or just used the information provided with the association when prompted with it. Conditional probabilities, as used by McCarty, might be more informative. Nonetheless, the importance of having the information contained within the association is supported by the current results.

In replicating the findings of McCarty (1980), one's confidence in the effectiveness of this standard face-name mnemonic is increased. But caution should be exercised in making direct comparisons between the present study and this earlier one. McCarty (1980) presented a larger number of face-name pairs and provided shorter inspection and anticipation intervals during the study and test sessions. Thus, in addition to differences in samples, there were a number of procedural differences across the two studies. For this reason, comparisons of recall levels are extremely difficult, and conclusions regarding age comparisons unwarranted. The present study was not meant to provide a developmental study of memory, but rather an investigation of alternative mnemonics, the processes underlying them, and their potential effectiveness in cognitive training programs for elderly adults.

In conclusion, the present research demonstrates the effectiveness of the standard face-name mnemonic used by McCarty (1980) in an elderly sample and also indicates that it is possible to improve upon its effectiveness. Participants benefited from this mnemonic even when they applied the method on their own. Thus, these findings provide evidence of the generalizability of McCarty's findings. However, there was also evidence obtained that gains achieved using this mnemonic may not persist over time. An alternative technique, requiring a judgment, builds on McCarty's while inducing additional elaboration. It appears to be more powerful and result in better retention.

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