More on "bizarre images in artificial memory"

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The present experiment attempted to determine if the directed use of imagery in sentences was necessary for the high recall level of Ss in a study by Briggs, Hawkins, & Crovitz (1970). Three groups of 20 Ss each were used: I (same as Crovitz's group), S (heard the same sentences without reference to using pictures/images), and R (heard the critical word twice). No significant advantage accrued to the I condition in recall relative to S. Moreover, S was more like R than I both in terms of the reported usage of imagery and the number of words recalled correctly for which an image was reported. These similarities and differences suggest that the extent to which I and S use the same coding process, e.g., visual imagery, does differ.

Crovitz has recently attempted to determine whether it is necessary, as some mnemonists have implied (e.g., Yates, 1966), for the S to use a memory map and bizarre images which are *self-produced* rather than being supplied by the system itself or by the E. In his first study, Crovitz (1969) supplied his Ss with a memory map. The map, drawn on a blackboard, consisted of 20 fictitious locations along an artificial "map of Gorky Street." Examples of locations used by Crovitz were ELECTRIC COMPANY, GAS STATION, OCULIST, etc. A set of 40 words (a mixture of nouns, both concrete and abstract, verbs, and adjectives) were read aloud by the E at a rate of about 8 sec/word. The Ss were instructed to try to make "bizarre images" connecting the locations with the words. Thus, with 20 locations and 40 words, there was a second "walk" with two items at each location. After a delay of 60 sec, Ss began writing the words in the order in which they had been presented. Because the average recall of the 12 Ss was 34.25 or 85.6%, Crovitz concluded that self-produced memory maps are *not* a necessary part of the artificial memory process.

In a second study (Briggs, Hawkins, & Crovitz, 1970), the same Gorky Street map was used. However, it was not necessary for Ss to generate the "bizarre images" themselves, as these were supplied by the E. A set of specially constructed sentences was used as bizarre images. For example, the following was read to the Ss: "(1) ELECTRIC COMPANY. Picture a plow cutting an underground cable. The word is PLOW." The list was read aloud, with no pauses between successive sentences. Immediately after hearing the last sentence, Ss attempted written recall in correct order. The average recall for 50 Ss was 17.32, or 86.6%. In this case, Crovitz concluded that self-produced bizarre images are not a necessary part of the artificial memory process.

Although there is no reason to doubt the unusually high recall level of Ss in Crovitz's studies, there is reason to doubt his conclusions, since in both studies only a single group representing but a single condition was run. First, there is increasing evidence which suggests that "bizarre" as contrasted to usual or "normal" images are not a necessary part of mnemonic devices (e.g., Bower, 1970; Delin, 1969). Secondly, despite the increasing acceptance by psychologists of imagery as a mediating device, there always remains in a given experiment the possibility that the results could be attributed to a verbal symbolic system as well as, or even instead of, an imagery system.

This latter point applies particularly to Crovitz's second study (Briggs et al, 1970). On the basis of the performance of his single group, there is no compelling reason to attribute this to the use by the Ss of "sentences corresponding to 'bizarre' mediators between the locations and the English nouns [Briggs et al, 1970, p. 353]." Each of their sentences contained the critical word, which was repeated. Their sentences contained other words as well, either referring to the location or associatively related to the location or the critical word. For example, "GAS STATION. Picture the attendant angrily driving a nail into your tire. The word is NAIL." The average recall of the 50 Ss for the word NAIL was 94% (Briggs et al, 1970). In this example, what factor(s) is (are) responsible for the high recall—repetition of the critical word, the sentence per se plus repetition, or the sentence instructing the use of an image plus repetition? Crovitz seems to accept the latter alternative as the mediator. The present experiment attempted to rule out repetition and/or sentence as contributing factors.

METHOD

The materials and procedure were those used by Briggs et al (1970). The "map of Gorky Street" was drawn on the blackboard and used by all Ss in each of three independent groups. One group (designated as I) corresponded to the condition in the Briggs et al (1970) study. A second group (designated as S) was read the same sentences, modified slightly, with no reference to using pictures or images. A third group (designated as R) was read the location and the critical word, which was then repeated. An example will make these differences clear: (1) ELECTRIC COMPANY. Group R—"PLOW. The word is PLOW." Group S—"A plow cut an underground cable. The word is PLOW." Group I—"Picture a plow cutting an underground cable. The word is PLOW." The instructions and lists were read aloud by E in a normal rate of reading.

After written recall was completed, E made a postexperimental inquiry concerning the use of images. The same instructions were given to all three groups. They were told that people sometimes say that they use images to help them remember things, an example being given. They were asked to indicate opposite each of the 20 "locations" on their recall sheets whether or not they had used images, or pictures, in their minds when the list was presented. They were asked to be honest and told that "not using images does not count against you."

Sixty introductory psychology students served as Ss. All were volunteers and received credit toward their final grades. Three groups of 20 Ss were tested in a group, and the order of running the three conditions was determined randomly.

RESULTS AND DISCUSSION

The mean number of words recalled was R = 13.10, S = 14.90, and I = 16.65. An analysis showed a significant effect due to the instructional variable [$F(2,57) = 5.12$, $p < .01$]. Duncan's tests indicated that the recall scores between I and S and those between S and R did not differ from each other ($p > .05$), whereas those between I and R did differ significantly from each other ($p < .01$). Thus, in the present study, no significant advantage accrued to the I condition relative to the S condition. It should be noted, however, that the recall performance of Group I is somewhat lower than that of the Briggs et al (1970) study (17.32 or 86.6%). Moreover, whereas Crovitz reported that 17 of the 50 Ss of his I condition had perfect recall, only 1 of the 20 Ss in Group I in the present study had perfect recall.

In scoring the protocols, it was noticed that Ss would sometimes recall a word from the sentence other than the correct word, e.g., CABLE instead

of PLOW. Or they would recall a word associatively related to the correct word, e.g., POT instead of OVEN. The protocols of Ss in Groups S and I were rescored, counting these two types of words as correct also. Recall under this scheme of scoring was S = 15.50 and I = 17.40. However, these differences were not significantly different.

What is the justification for assuming that the results of the Briggs et al (1970) study should be attributed to visual imagery? In a real sense, this was the question being addressed by the present study. Perhaps Ss after all are merely using elaborate but nonetheless implicit verbal coding processes; or perhaps the Ss were using imagery even though not instructed to. The postexperimental inquiry attempted to determine the tendency to use imagery when not instructed to use it (Groups R and S) as well as the extent to which the Ss of Group I used images. These data consist of three scores: (1) number of images reported (Y), (2) number of words recalled correctly for which an image was reported (Y + C), and (3) number of words recalled correctly but for which S reported that an image was not used (N + C). The means for these scores are shown in Table 1.

Table 1
Means for Y, Y + C, and N + C*

Condition	Scores		
	Y	Y + C	N + C
R	8.50	8.00	5.10
S	9.90	8.75	6.15
I	13.25	12.55	4.10

*Y = number of images reported, Y + C = number of words recalled correctly for which an image was reported, N + C = number of words recalled correctly but for which S reported that an image was not used.

Three separate analyses were done on the columns of Table 1. Significant differences were shown for both the Y and Y + C scores, but not for the N + C scores. The corresponding significance values for these scores were, respectively: $F(2,57) = 4.91$, $p < .05$; $F(2,57) = 5.48$, $p < .01$; and $F = 1.38$, $p > .05$. Duncan's tests revealed that I was greater than S on both Y and Y + C scores ($p < .05$) and greater than R on both Y and Y + C scores ($p < .01$). Thus, Group S is more like Group R than it is like Group I both in terms of the reported usage of imagery and the number of words recalled correctly for which an image was reported. Apparently the equivalence in total correct recall between Groups S and I cannot be attributed to the usage of imagery by Group S in a manner similar to its use by Ss in Group I. These results suggest that the coding processes used under S and I are different processes, however, which produce or result in essentially the same performance.

Two additional measures suggest a similar conclusion. (1) Of all items checked as having been imaged during presentation, what proportion were correct? These proportions are: R = .941, S = .884, and I = .947. (2) Of all items recalled correctly, what proportion were reported to have been imaged during presentation? These proportions are: R = .597, S = .587, and I = .754. Thus, for all three conditions, if an item is checked as imaged, there is a very high probability of that item being correct. This would indicate a high correlation between correctness of recall of a word and imagery of that word. Another interpretation of these high and essentially equivalent probabilities is that they represent something in the way of a confidence judgment by S in the correctness of his recall. On the other hand, of the items which are correct, there is considerably less probability that the item was reported as imaged, at least for Groups R and S, where the probability is little more than .50.

Implicit in many imagery studies is the notion that visual imagery as a coding process is superior in terms of achievement to other coding processes, e.g., implicit verbalization. The results of the present study have shown, however, that a nonimagery-instructed condition can be equivalent in performance to an imagery-instructed group. More important perhaps were additional results which indicated that the nonimagery group was more like a simple repetition condition than it was like the imagery group. These similarities and differences suggest that the extent to which these two conditions use the same coding process, e.g., visual imagery, apparently does differ. The generally high level of performance under Group S suggests that material presented as a sentence frame may be sufficient, independently of instructions to picture bizarre images, perhaps even independently of bizarre images. It is not apparent that there is any special advantage to the use of bizarre sentences as used by Crovitz as a means of inducing visual imagery.

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