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A functional analysis of common and bizarre visual mediators

PHILIP H. MARSHALL, KATHY NAU, and CYNTHIA K. CHANDLER
Texas Tech University, Lubbock, Texas 79409

This study determined if the complexity level and type of common and bizarre visual mediators generated for paired associate items functionally related to performance on a recall task given 1 week later. Results indicated that while bizarre imagery yielded higher complexity scores and was associated with greater response recall, there was no difference between correctly and incorrectly recalled responses in terms of mediator complexity. The previously reported finding of greater variety in mediator formation for bizarre mediators was replicated. The discussion focused on differential effects of complexity of verbal and visual mediators.

In an initial study of the structural characteristics of visual mediators, Marshall, Nau, and Chandler (1979) investigated whether there are identifiable operations used to generate visual mediators for noun pairs and whether the images formed under common imagery instructions differ quantitatively and qualitatively from images formed under bizarre imagery instructions. The results of that study were that there were identifiable operations used to form the images and that variation in the instructions affected the number and types of operations used. The present study is a companion experiment, and it assessed how the different types of mediators and different levels of complexity (defined as the number of transformations used to generate the image) of transformation affected the recall performance under common and bizarre imagery instructions. This study is analogous to previous attempts to establish the relationship between verbal mediator complexity and recall performance (Prytulak, 1971).

METHOD

Subjects

The subjects were 84 undergraduate volunteers (roughly equal numbers of men and women) who participated to fulfill a course requirement.

Materials

The stimuli were 48 noun word pairs selected from the Wood (1967) list of relatively high-imagery concrete nouns. The word pairs were projected onto a screen with one word directly above the other.

Design and Procedure

Subjects were assigned randomly to one of the two instruction conditions (common or bizarre imagery) and were told that they would be participating in a learning experiment. One group was told to link the nouns via common interactions, and subjects in the other group were told to form bizarre interactions. Each noun pair was presented one time, and subjects were allowed 60 sec to generate the appropriate visual image, report the image by writing it down, and learn the pair. After all 48 pairs had been presented, subjects were asked to return 1 week later for the second part of the experiment. At that time, subjects were given a sheet of paper listing the nouns that appeared "on top" and were asked in each instance to give the noun that appeared "on the bottom." Ten minutes were allotted for this recall test.

Requests for reprints should be sent to Philip H. Marshall, Department of Psychology, Texas Tech University, Lubbock, Texas 79409.

Scoring

Two independent judges determined if subjects had followed instructions by deciding if the verbal description of the images could have been imagined visually. Those descriptions of the images that were judged as meeting this most basic criterion were then scored by the two judges according to a list of eight transformations that were developed as possible methods to be used to dimensionalize the visualized images. This system was developed in the previous study (Marshall et al., 1979) by having an independent sample of 10 subjects generate and describe common and bizarre images for 10 noun pairs similar to those used in the present study. From the descriptions, eight types of transformations used as the basis for the scoring system were determined. This classification, which ranged from a simple interaction such as "the canary landed on the buckle" to those involving human features such as "the mouse spit tobacco into the spitoon" are given in Table 1. Although not an exhaustive list of all possible combinations that might have been used, it is nevertheless representative of the majority of the transformations that were used. For an example, an image given for the noun pair TRAIN-SKULL, "the engineer drove the train down the tracks which went into the huge skull," was scored CCD because the subject added two objects (tracks and engineer) and changed the normal size of one of the objects (huge skull) in forming the image.

RESULTS

Only those images that were scored the same way by the two judges were used in the statistical analyses reported below. Of the images reported under the common imagery instructions, 84% were used, and 82% of the images reported under the bizarre imagery instructions were used.

The earlier reported pattern of bizarre images yielding a greater number of transformations than common imagery instructions was again obtained. Subjects in the

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Table 1
Categories of Operations (O)

O	Example	Definition	Example
A	canary, buckle	Simple interaction.	The canary landed on the buckle.
B	hailstone, barn	Animation (abnormal movement or interaction).	The hailstone crushed the barn when it fell.
C	whistle, snail	Addition of an object.	The boy dropped the whistle on the snail.
D	skull, train	Change in the size of one object.	The train went through the huge skull.
E	hairpin, lantern	Change in the function of one object.	The lantern was lit with the hairpin.
F	kitten, wheel	Incorporation of one object as the feature of the other.	The spokes of the wheel were kittens.
G	mouse, tobacco	Giving human or living features.	The mouse spit tobacco into the spitoon.
H	dime, brick	Convergence of the two objects into one.	The brick was made of dimes.

common imagery group used a mean of 1.06 transformations, and subjects in the bizarre imagery group used a mean of 1.31 transformations. Across both instruction conditions, the mean number of transformations used for recalled words was 1.28, and for nonrecalled words the mean was 1.41. In order to determine significance for these differences, an analysis of variance was conducted with instructions as a between-subjects variable and recall status of the item as a within-subjects variable. A significant difference was obtained for the instruction condition [$F(1,84) = 18.13$, $p < .01$], but neither the effect of recall status nor its interaction with instruction condition reached significance (ps $> .05$).

The mean number of responses recalled by the bizarre instruction group was 6.8, and the mean number recalled by the common instruction group was 4.52, a significant difference [$t(82) = 2.13$, $p < .05$]. The overall low numbers of correctly recalled words precludes, however, a meaningful statistical analysis of recall as a function of the types and numbers of transformations used. The following descriptive analysis is offered as an initial query into those effects.

Successful recall for both instruction conditions was limited mostly to pairs for which only one transformation had been used (see Table 2). That is, 88% of the 189 words recalled under common instructions and 74% of the words recalled under bizarre instructions used only one transformation. However, this finding may merely reflect the predominant use of a single transformation more than an inherent superior efficiency when only using a single transformation. When one considers the efficiency ratings of different numbers of transformations (i.e., the probability of correct recall given N transformations used), the pattern given in Table 3 emerges. For an example of these relationships, a single transformation under common imagery accounted for more than 88% of the words recalled, but the percent of correct recall associated with the use of only a single transformation was 11%. The data in Table 3 also suggest that a bizarre image may withstand a greater degree of transformation complexity before a reduction in recall efficiency is noted.

The finding of no difference in the number of operations used for recalled vs. nonrecalled items in conjunction with the finding of a significant effect for the instruction conditions suggests that some aspect of the images other than complexity may be the locus of the superiority of bizarre images in facilitating delayed recall. It may be instructive to review briefly the data at hand with respect to qualitative differences between the types of transformations used under the two instruction conditions. Table 4 presents efficiency ratings for representative combinations of transformations resulting from the two conditions. An efficiency rating for a transformation combination is the probability of successful recall, given that the transformation was used. The pattern that emerges from inspection of Table 4 is that Transformations A and F result in the best recall for common imagery, whereas Transformation Combination E-F (which by its absence from the "common" column indicates that it was virtually never used under common instructions) leads to the best recall for the bizarre instruction group. Transformation Type A holds fourth place for the bizarre group, but with the same relative efficiency as that found with common instructions. Moreover, more different combinations are used under bizarre imagery instructions.

Table 2
Total Times Used (T) and Percentage Among Total Number of Correctly Recalled Items (P) for Mediators of Up to Six Transformations

Common			Bizarre		
N	T	P	N	T	P
1	1525	88.36	1	1204	74.39
2	149	11.11	2	365	21.11
3	22	.01	3	71	3.80
4	6	.00	4	13	.01
5	0	*	5	1	*
6	0	*	6	1	*

*Note–N = number of transformations. *Percentage not used since small denominator or denominator of 0 qualifies meaning.*

Table 3
Efficiency Ratings for Up to Six Transformations for Common and Bizarre Mediators

N	Common	Bizarre
1	10.95	17.86
2	14.10	16.71
3	4.34	18.50
4	.00	8.30
5	*	.00
6	*	.00

*Note–N = number of transformations. *Efficiency rating not computed, given no instances of this transformation level.*

Table 4
Efficiency Ratings (R) for Transformations (T) Used at Least 10 Times

Common			Bizarre		
T	R	D	T	R	D
C	6.96	776	C	16.67	114
E	12.20	41	E	15.27	131
F	23.68	38	F	18.28	290
A	26.92	364	A	23.84	323
C-E	18.60	129	C-E	8.70	23
C-C	14.42	104	B	21.88	64
			D	23.64	55
			G	32.08	53
			H	13.91	151
			E-F	63.33	30
			B-F	12.50	16
			D-E	27.27	11
			C-G	14.29	14
			B-D	10.00	10
			B-D-G	27.21	11

Note–D = denominator used to compute efficiency index and refers to number of times that transformation was used.

DISCUSSION

The recall data, overall, indicated a superiority for bizarre imagery instructions. A similar effect has been reported several times in the literature (Andreoff & Yarmey, 1976; Delin, 1968; Webber & Marshall, 1978). This superiority has not been obtained in other studies (e.g., Senter & Hoffman, 1976; Wollen, Weber, & Lowry, 1972), and one crucial factor seems to be the duration of the retention interval. The Webber and Marshall (1978) study found the bizarreness superiority after only a 1-week retention interval. Webber and Marshall suggested that bizarre images may be less susceptible to potential interference effects.

In trying to localize the effect of bizarreness, the present study obtained measures of both a qualitative and a quantitative nature. For verbal mediation (Prytulak, 1971), an increase in complexity leads to a decrease in correct recall probability. The present study provided several opportunities to find a similar effect for visual mediation. In our earlier study (Marshall et al., 1979), we noted a significantly greater number of transformations associated with bizarre imagery instructions. The same result was obtained here, yet the bizarre images were also associated with greater recall. If complexity has a ubiquitous effect of reducing recall performance, then we should have noted less recall under bizarre instructions. Another potential result for showing an effect of decreasing recall with increasing complexity would have been for the incorrectly recalled items to have had a greater complexity score than the correctly recalled items. The data gave no support for that prediction. Finally, inspection of Table 2 indicates (at least for those instances in which usage was frequent enough to make an efficiency rating somewhat reliable) no substantial decrements in recall from one to two transformations for the common imagery condition or from one to three transformations for the bizarre imagery condition. We have no evidence to suggest that recall of items is affected by the assigned complexity value of either common or bizarre visual mediators.

The discrepancy between this finding and that obtained by Prytulak (1971) for verbal mediators is undoubtedly associated with the nature of verbal and visual mediational processes. The successful recall from a verbal mediator for a CVC (as in Prytulak's study) may very well involve the sequential decoding of components of the mediator into the letters of the particular CVC. These decoding rules, if too complex, would result in an increased chance for error and, hence, incorrect recall. Successful recall from an available visual mediator for object nouns as used in this study may require merely the availability of the image generated in acquisition. The decoding rule would not be needed, since the image most likely would contain all the components of the original pair, even if the objects were changed in size, anthropomorphized, and so on. Complexity, then, becomes a nonfunctional dimension for successful recall.

If, as we suggest, quantitative factors do not influence recall, given visual mediators, what then is the source of the superiority for bizarre images? The data presently available suggest that under bizarre imagery instructions subjects use many more different types and combinations of transformations, and the relative uniqueness of those mediators may insulate them from potentially damaging interference effects.

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