Language and memory: Redintegrative memory for shapes facilitated by naming

JOHN L. SANTA and HOWARD B. RANKEN, *Department of Psychology, Purdue University, Lafayette, Ind. 47907*

Redintegrative memory for novel shapes (remembering the whole shape when only a part is presented) was studied as a function of whether or not S had learned names for the shapes. Naming markedly facilitated short-term redintegrative recognition, but had no effect on simple recognition. The results support the hypothesis that naming facilitates the formation of an integrated representation in which information about the different contours of the shape is more closely linked than in a nonverbal representation.

Spiker (1956), Ranken (1963), and others have obtained facilitative effects of stimulus naming in a variety of memory tasks. Ss' comments during post-experimental questioning suggest that with unfamiliar shapes one effect of names is to provide stable, integrated representations of the shapes: Ss often report that the names give them "something concrete" to remember (Ranken, 1963). An integrated representation of a complex shape may be thought of as one in which the representations of the various parts or contours of the shape are closely linked, so that the occurrence of one tends to evoke the others. On this interpretation, the degree of integration of S's representation would be reflected in a redintegrative memory task, in which he is shown part of a shape and asked to remember the rest. In the present experiment, the hypothesis that naming facilitates the formation of integrated representations of unfamiliar shapes was tested by determining the effect of naming on performance in a redintegrative recognition task.

METHOD

Stimuli

The stimulus shapes (Fig. 1) had irregular top and bottom contours and straight sides. Thus each shape could be divided by a horizontal line into a top and bottom half, each half containing one of the two contours which defined the shape.

Fig. 1. Stimulus shapes, with names used in Named condition. Where top or bottom contours alone were to be presented, the shapes divided by a horizontal mid-line, and the top or bottom halves shown separately.

The shapes, 1 in. wide, were shown on a rear-projection screen at a viewing distance of about 20 in.

Design

Two training conditions, Named and Unnamed, and two test tasks, Redintegration and Recognition, were used in a 2 by 2 design. Two replications were run, approximately a month apart, with four Ss (introductory psychology students) in each cell in each replication.

During training, Ss in the Named condition learned names for the shapes, while Ss in the Unnamed condition had equal practice in discriminating both top and bottom contours of the shapes in a delayed matching-to-sample task, but were not given names. In the Redintegration test task, in essence, S was shown a top contour, followed by a bottom contour, and was asked to indicate whether the second contour came from the same shape as the first. The task may be thought of as a recognition test of redintegrative memory, in which S's ability to remember the correct bottom contour of a shape, given the top contour, is tested by his ability to recognize the presented bottom contour as correct or reject it as incorrect.

The Recognition test task served as a control for the effect of naming on memory for specific contours. In essence, S was shown a top contour, followed by another top contour, and was asked to indicate whether the second contour was the same as the first.

Procedure

The shapes were first presented singly for 5 sec each. Ss in both Named and Unnamed conditions were instructed that in a subsequent task they would be required to pay close attention to the whole shape, both top and bottom contours. In the Named condition S was also given a name for each shape, suggested by the outline of the shape (Fig. 1).

Training trials were then given, in which a complete test shape was shown for 2 sec, followed, after a 4-sec delay, by a set of four top or four bottom contours (halves), side by side, presented for 3 sec. One of the four alternatives always matched the corresponding part of the test shape, and S was instructed to designate that alternative by pointing to one of four squares on the table directly below the screen. Ss in the Named condition gave the name of the test shape when it was shown, with correction after 3 sec. The intertrial interval was 3 sec. The choice response, designating the matching contour, could be made at any time prior to the presentation of the next test stimulus, but was not corrected in either condition. A green jewel light, mounted 4 in. to the right of the screen, came on at the start of the intertrial interval and went off 1 sec before the next test stimulus was presented. Training continued for four randomly-ordered runs through the eight test shapes. Two of the trials with each test shape required matching the top contour, and two the bottom, in random order.

In the test task, each trial began with the presentation of four top contours, side by side, for 1 sec, followed by a 4-sec delay. In the Recognition task, another set of four top contours was then presented for 3 sec, and S was instructed to designate, by pointing to the corresponding square, each contour in the second set which was the same as the corresponding contour (the one which had appeared in the same position) in the first set. In the Redintegration task, the second set contained four bottom contours, and S designated

Fig. 2. Mean per cent correct responses in test stage as a function of Naming condition and Task (averaged over replications).

each contour in the second set which matched, i.e., came from the same shape as, the corresponding contour in the first set. The intertrial interval was 3 sec, and the jewel light signaled the start of the next trial as in training. Responses could be made at any time prior to the start of the next trial. No correction was given. Ss were told that the number of correct matches might be anything from 0 to 4. In fact, there were 0, 2, or 4 correct matches in any trial, each value appearing equally often. Ss in the Named condition were told that the names might help but that they need not say them aloud. Thirty test trials were run, consisting of two repetitions of a 15-trial series in which each top contour appeared with approximately equal frequency. There was a pause of about 3 min after the first 15 trials.

RESULTS

The mean number of incorrect choice responses in training was 7.2 for the Named condition and 8.8 for the Unnamed ($t = 0.54$, $p > .05$). There was no reliable difference between replications.

Figure 2 shows mean per cent correct choices for the second block of 15 test trials, as a function of naming and task. The main effect is reliable both for Naming [$F(1/24) = 22.07$, $p < .001$] and Task [$F(1/24) = 97.78$, $p < .001$]. The Naming by Task interaction is also reliable [$F(1/24) = 24.67$, $p < .001$]. The simple effect of Naming is reliable with the

Redintegration task [$F(1/24) = 46.7$, $p < .001$], but not with the Recognition task ($F < 1$). There was no reliable difference between replications.

Results obtained during the pilot work indicated that Ss in the Named condition showed a marked practice effect during the first few test trials on both tasks, apparently reflecting initial difficulty in naming four stimuli presented for only 1 sec. Analysis of the data for first and second blocks of test trials reflected this practice effect, in the form of a reliable interaction of Naming with Blocks [$F(1/24) = 7.15$, $p < .05$]. There was no other interaction with test-trial blocks, and the Naming, Task, and Naming by Task interaction effects found in the second block were also reliable for the two blocks combined.

DISCUSSION

The fact that naming had a marked facilitative effect on the redintegration task but not on the simple recognition task is evidence that the use of names aids redintegrative memory, as distinct from memory for specific contours. The interaction cannot plausibly be attributed to a ceiling effect in the recognition task, since Ss in the Named condition were still far from perfect performance on that task (74% correct, as compared with a chance value of 50%). An interpretation in terms of possible effects of naming on attention to the bottom contours is difficult to maintain in view of the nature of the training task, which was designed to require Ss in both Named and Unnamed conditions to attend equally to both top and bottom contours. The data are consistent with the hypothesis that in the Named condition a single contour evokes a representation of the corresponding shape in which information about all contours is equally available, while in the Unnamed condition the representation contains information primarily about the contour which evoked it.

The present results could be interpreted as due to the perceptual reorganization of the shapes induced by meaningful, relevant labels. The results of subsequent experiments, however, indicate that the effect on redintegrative memory is associated with verbalization per se, rather than perceptual changes: (1) the effect is stronger when S verbalizes overtly during the test phase; (2) the effect is obtained when paralogues, instead of words, are used as names.

REFERENCES

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