

The effects of natural language mediation on response recognition following paired-associate learning

PHILIP H. MARSHALL, DOUGLAS C. CHATFIELD, and ERWIN J. JANEK
Texas Tech University, Lubbock, Texas 79409

Two groups of subjects learned a list of 12 CVC pairs, and were then tested by either recognition or recall. Analyses were made of retention as a function of mediated or rote learning under each condition. Items that were learned with mediators had a greater probability of being correct than items learned by rote under both testing procedures. There is discussion concerning the complexities of the recognition process.

The purpose of this research was to provide an initial investigation of recognition as a function of a mediational process that has been shown in a number of studies (Adams & Montague, 1967; Adams, Marshall, & Bray, 1971a,b; Wearing, 1971) to benefit performance when recall is the measure. When the task is paired-associate learning, for example, subjects will bring to bear idiosyncratic associations between stimulus and response. Termed natural language mediators (NLMs), these associations increase the probability of recall of pairs that have been learned with their use. The question for this research was whether such a mediational process would improve performance when recognition is the retention measure. A simple perceptual matching of test stimulus to perceptual trace account of recognition would predict no difference between pairs learned by mediation or pairs learned by rote. However, if recognition of verbal materials is improved by the presence of mediators, human recognition must be perceived as a more complex process. Indeed, several authors have made such a proposal (for review see Mandler, 1972).

METHOD

Design

Two groups of students were presented with a list of 12 CVC pairs. After studying the list, one group was given a recall test and the other a recognition test. An analysis was made of retention as a function of whether a pair had been learned by rote or with the aid of an NLM.

Subjects

Forty-eight students fulfilling a requirement for an introductory psychology course at Texas Tech University served

This research was supported in part by funds from the Institute of Human Resources, Texas Tech University. The paper is sponsored by C. J. Halcomb, who takes full editorial responsibility. Requests for reprints should be addressed to Philip H. Marshall, Department of Psychology, Texas Tech University, Lubbock, Texas 79409. Erwin J. Janek is now at Henderson State University, Arkadelphia, Arkansas.

as subjects and were randomly assigned to either the recall or the recognition condition.

Materials

The 12 CVC pairs were chosen from the Montague and Keiss (1968) norms for associability (AS) which indicate the probability of an NLM being reported for a CVC pair. The pairs were chosen such that (1) no two stimuli began with the same letter; (2) no two responses began with the same letter; (3) for a given pair, the stimulus and response began with different letters, and (4) no CVC was used more than once in the entire list. The mean response association value as given by Montague and Keiss (1968) was 72.5, and mean AS was 52.5.

For the distractor item on the four-item multiple choice recognition test, three sets of CVCs were constructed. These sets were composed by changing the first, second, or third letter of the response member of each of the CVC pairs. Three forms of the recognition test were then made with each having four items with the first letter changed, four with the second letter changed, and four with the third letter changed. Changing of the letters was counterbalanced for a particular response CVC over the three forms. No distractor CVC was used more than once, and no distractor CVC was the same as any stimulus or response CVC. The position of the criterion item among the four possible choices was counterbalanced. The material was presented visually with exposure of the slides controlled by a Kodak Carousel 850-H projector.

Procedure

Subjects were randomly assigned to one of the two test conditions. They were read instructions that described what was meant by NLM usage, but were not pressured into using NLMs during acquisition. The list of 12 CVCs was presented once in a pseudorandom order for each subject with a 15-sec exposure time for each pair, during which time the subject reported an NLM if one became available to him. The NLM was immediately written down by the experimenter. If no NLM was reported, the pair was considered to be learned by rote.

Brief retention test instructions followed acquisition, and the subject was given either a recall or a recognition test. For recall, the subject was shown the stimulus term and had up to 15 sec to give the response. For recognition, the subject was shown the stimulus term and four possible response terms from which to choose the correct response within 15 sec. After the response retention test, the stimuli of the pairs that were learned with NLMs were presented and the subject was asked to give the NLM used during learning for NLM items. No differences in procedure existed between the two groups prior to testing.

Table 1
Proportion of Items Correct in Recognition and Recall as
a Function of Mediated or Rote in Learning

| Recognition | | Recall | |
|-------------|----------|----------|----------|
| Rote | Mediated | Rote | Mediated |
| 82% | 95% | 26% | 43% |
| (174*/212†) | (72/76) | (42/161) | (55/127) |

*Number correct

†Number of observations

RESULTS

Of the 288 items available for recall, 161 (56%) were reported learned with the aid of an NLM, and of the 288 total items available for recognition, 212 (73%) were learned with NLMs. Since recall and recognition groups were treated identically prior to retention testing, the greater number of mediated items supplied for the recognition condition was treated as a chance occurrence. Table 1 shows what proportion of rote and NLM items were correct for recognition and recall. Chi-square analyses, corrected for continuity, found significant effects for recall [$\chi^2(1) = 8.67, p < .01$]; and for recognition, despite the apparent ceiling effect, [$\chi^2(1) = 6.22, p < .05$]. For both recognition and recall there were higher proportions of correct responses for those pairs learned with the aid of an NLM.

Previous research (Adams et al., 1971b) has found that correct recall is dependent on correct NLM recall. The same was found in this experiment, with the conditional probabilities of response correct given NLM correct being .57, and response correct given NLM correct being .06.¹ A similar inspection of the recognition performance was less informative due to a ceiling effect on mediated recognition but, for the record, the conditional probabilities were .94 and 1.00, respectively.

DISCUSSION

The purpose of this experiment was to observe the effects of natural language mediation on recognition performance. The data show that the recognition of verbal material may be subject to the influence of a mediational process and may at times not be simply the comparison of test stimulus to stored representation. The facilitation found for recall has been explained elsewhere (Adams & Bray, 1970).

One tentative explanation for NLM facilitation on recognition is that in a recognition test of the type used in this study the stimulus activates the NLM for that particular item. It is the NLM that guides the subject in his selection of the correct CVC from among the four alternatives. In one sense, the NLM acts as a verifier of the subject's choice. That response term which best fits the stimulus-NLM-response complex will be chosen as the criterion response. Items learned by rote lack this additional verification process, and selection of the appropriate response term may be analogous to simple stimulus recognition, in that it is devoid of associative processes that are embodied in the use of NLMs.

The verification role of NLMs has been postulated for recall (Adams & Bray, 1970), and now it seems a process likely to be happening during response recognition as well.

REFERENCES

- Adams, J. A., & Bray, N. W. A closed-loop theory of paired-associate verbal learning. *Psychological Review*, 1970, 77, 385-405.
- Adams, J. A., Marshall, P. H., & Bray, N. W. Interference and retrieval. *Journal of Verbal Learning and Verbal Behavior*, 1971a, 10, 548-555.
- Adams, J. A., Marshall, P. H., & Bray, N. W. Closed-loop theory and long-term retention. *Journal of Experimental Psychology*, 1971b, 90, 242-250.
- Adams, J. A., & Montague, E. E. Retroactive inhibition and natural learning mediation. *Journal of Verbal Learning and Verbal Behavior*, 1967, 6, 528-535.
- Mandler, G. Organization and recognition. In E. Tulving and W. Donaldson (Eds.) *Organization of memory*. New York: Academic Press, 1972.
- Montague, W. E., & Keiss, H. O. The associability of CVC pairs. *Journal of Experimental Psychology*, 1968, 78, (2, Pt. 2).
- Wearing, A. J. On the Adams-Bray retrieval model. *Journal of Experimental Psychology*, 1971, 89, 96-101.

NOTE

1. The interjudge reliability in determining the correctness of NLM recall has in the past been consistently high ($r_s > .95$). Therefore, only one judge was used in the experiment.

(Received for publication February 6, 1975.)