Bulletin of the Psychonomic Society
1977, Vol. 10 (1), 73-75

Encoding specificity vs associative continuity

SLATER E. NEWMAN
North Carolina State University, Raleigh, North Carolina 27607

and

UTA FRITH
Developmental Psychology Research Unit, Medical Research Council, London, England

When target words were accompanied on the study trial by weakly associated cue words, recall was better when the same weak cues or strongly associated cue words were present on the recall test than when no cue words were present. The results for the comparison of the strong-cue and no-cue groups do not replicate those reported by Thomson and Tulving (1970, Experiment 2) and support an associative continuity rather than an encoding specificity position.

The present experiment was done to test a prediction, derivable from the encoding specificity principle (Tulving & Thomson, 1973) and originally tested in an experiment by Thomson and Tulving (1970, Experiment 2). In that experiment, subjects were given a single study trial on each of three word lists and were tested for recall of each list immediately after its study trial. For the first two lists, a weakly associated cue word accompanied each target word on the study trial; each of these cue words was also present on the recall test for that list. This was done to enhance the probability that, for the third list, each target word would be encoded in relation to the weakly associated cue word which accompanied it on the study trial. When subjects were tested for recall of the third list, the weakly associated cue words were again present for some subjects (weak-cue group); for others, however, a strong normative associate for each of the target words appeared on the test (strong-cue group); for the remaining subjects, no cues were present on the test (no-cue group).

Thomson and Tulving (1970) proposed that the encoding specificity principle predicts that the weak-cue group will recall more items than the other two groups, and that recall for the strong-cue and no-cue groups will not differ from one another. They contrasted this latter prediction with one derivable from an "associative continuity" position (Bahrick, 1969, 1970; Fox, Blick, & Bilodeau, 1964), which predicts that subjects in the strong-cue condition will perform substantially better than subjects in the no-cue condition. Thomson and Tulving reported results substantially in support of their predictions. Santa and Lamwers (1974) replicated their findings and showed also that, when subjects were instructed at recall about the relationship between the strong cues and the target words, their performance improved substantially compared with that of subjects not so informed or with subjects who were exposed to no cues on the test.

The counterintuitive (to us) nature of the strong-cue/no-cue findings stimulated us to attempt to replicate them with children and later with adults. To carry out the experiment with children, it seemed necessary to make certain modifications in Thomson and Tulving's procedure. We decided, then, that the testing session should last no longer than 20 min, that the children should read aloud the words as they were presented on the study trial so that we would know whether they had read them correctly, and that the list length should be shortened so as to give the same level of recall as in the studies with adults. We used only one set-establishing task in order to keep the testing session reasonably short. To enhance the probability that a set would be established, however, we gave instructions like those that are used for paired-associate training, thus making it explicit that each target word was to be encoded in relation to its cue word. We subsequently tested a group of young adults under the same conditions, with the exception that the list length was the same as in the experiment of Thomson and Tulving and, consequently, longer than for the children.

METHOD

Subjects

We tested 18 children, aged 11:10 to 12:7 years, from a London secondary school. Their reading age was between 10:3 and 11:0 years, which was exactly average for the school. We

We thank Marion Horton, Patricia Newman, and Jocelyn Robson, who assisted with the experiment and with the data analysis; the staff and children of Archbishop Temple's School, London, who cooperated with the testing; and Margaret Cooper, G. Alfred Forsyth, Donald Mershon, Kathryn Parker, and Eli Saltz, who commented on earlier versions of this paper. The support provided by the Department of Psychology, Birkbeck College, University of London, where the senior author was an Honorary Research Fellow, is also appreciated. A paper based on this study was presented at the meeting of the Psychonomic Society, Denver, November 1975. Requests for reprints should be sent to Slater E. Newman, Department of Psychology, North Carolina State University, Raleigh, North Carolina 27607.

also tested 18 adults, mostly students, between 20 and 30 years of age. Each of these two groups was randomly subdivided into three subgroups of six subjects each, which were given the three different treatments in the critical second stage of the experiment.

Materials

The word list for the children was derived from the list provided by Tulving and Thomson (1973). Adults were given the whole list (24 word pairs); children were given 13 word pairs selected from the lists, since this length was found to give a level of recall similar to that for adults. The 13 word pairs were chosen arbitrarily, but we had in mind the requirement that all the words used should be well known to the children. Two lists were used, List 1 and List 2, which were given in alternating order within treatments so as to control for list effects due to the selection of words.

For the study trial, each word pair (weak-associate cue and target word) was typed on a card, the cue being to the left in small letters, the target to the right in capital letters. For the recall trial, a sheet was prepared containing the appropriate cues (weak associates in one condition, strong associates in another) and an adjoining dotted line on which the target word was to be written. For the recall condition without any cues, dotted lines only were presented in a similar layout, that is, vertically.

Procedure

The subjects were tested individually using a short pretraining procedure with three word pairs. In this example and for the two study trials, paired-associate instructions were used. The cards were presented at a speed of one every 3-4 sec and the subject pronounced each pair aloud as it appeared. Each subject was first given a study trial and a test trial with weakly associated list cues. This served as a set-establishing procedure, and also provided a baseline measure of recall. This was followed by another study trial with a new list of word pairs. In rotating order, the subjects were then tested for recall with either weak cues, no cues, or strong cues. This recall trial provided the critical comparison. In addition, to provide an estimate of how much the same subject would have recalled under each of the three conditions, we gave each subject the remaining two recall conditions. Thus, the second list of word pairs was tested three times consecutively in the orders listed on the right side of Table 1.

RESULTS

For the two cued recall conditions, both stringent and lenient scoring methods were applied. Stringent scoring means that a score was given only when a subject recalled the target word in response to the appropriate cue, whereas lenient scoring includes responses both to appropriate and to inappropriate cues. We transformed each subject's scores into percentages to make comparable the scores for children and adults. These results are shown in Table 1. There is little difference between the strict and lenient scores; there is little difference also among the three groups in performance on the first or baseline task.

An analysis of variance for stringent scores on the critical trial showed only one significant effect. Thus, the effect for type of cues present at retrieval was significant [$F(2,30) = 7.45$, $p < .01$]. Subsequent comparisons showed that the strong- and weak-cue groups performed equivalently ($p > .05$) and that both performed substantially better ($p < .01$) than the no-cue group. There was no difference between the two subject groups, nor was there a list effect.

Since each subject had all three conditions, it was possible to compare them using each subject as his own control, though the comparisons with the weak-cue conditions, particularly, are somewhat confounded. Nevertheless, all comparisons were found to be entirely consistent with the results obtained from the analysis between subjects. Performance with no cues was significantly ($p < .001$) poorer than performance with cues, whether strong or weak, and again the two cued recall conditions did not differ from one another.

The pattern of errors was pretty much the same in each treatment and between subject groups. The main difference was that there were substantially more omissions in the no-cue group than in the other two groups. This was true both for children and for adults.

DISCUSSION

In discussing these results, our concern is mainly with the difference in performance between the strong-cue and no-cue conditions. Comparisons both between subjects and within subjects show that more target words were recalled when the strong cues were present on the test than when no cues were present. These results, which we have recently replicated with a substantially larger sample of adults (Cooper, Newman, Womack,

Table 1
Percentage Correct Recall Using Stringent (S) and Lenient (L) Scoring Criteria

First List			Second List								
			Test 1			Test 2			Test 3		
Treatment	S	L	Treatment	S	L	Treatment	S	L	Treatment	S	L
					Children						
Weak Cue	67	69	Strong Cue	65	65	No Cue	28	28	Weak Cue	39	39
Weak Cue	51	60	No Cue	29	29	Strong Cue	54	55	Weak Cue	42	44
Weak Cue	60	63	Weak Cue	64	68	No Cue	24	24	Strong Cue	64	64
					Adults						
Weak Cue	60	62	Strong Cue	43	47	No Cue	25	25	Weak Cue	39	46
Weak Cue	64	67	No Cue	26	26	Strong Cue	51	54	Weak Cue	51	53
Weak Cue	66	68	Weak Cue	62	64	No Cue	40	40	Strong Cue	61	63

& Routten, Note 1) replicate neither the findings of Thomson and Tulving (1970) nor those of Santa and Lamwers (1974). Furthermore, these results do not accord with the prediction from the encoding specificity principle. Rather, the results seem to accord more with what Thomson and Tulving have characterized as the "associative continuity" position.

It is not clear to us why our results differ from those of Thomson and Tulving. Perhaps the most reasonable place to look is at our use of paired-associate instructions, since this differs most from what Thomson and Tulving did. It was our expectation that the use of paired-associate instructions would enhance the probability that the target word would be encoded in relation to its cue word. This would, we believed, when combined with one set-establishing list, make it even less likely than in the Thomson and Tulving experiment that performance in the strong-cue group would exceed that of the no-cue group, and thus more likely that the prediction derivable from the encoding specificity principle would be supported. Instead, we obtained a difference where no difference was expected under conditions which we believed were favorable to support of the encoding specificity principle.

It seems likely that in both the Thomson and Tulving (1970) experiment and in ours, a longer interval elapsed in the strong-cue than in the no-cue condition between the end of the study trial and that moment on the recall test at which the subject began to write the first response. This may have occurred since (1) the instructions prior to the recall test were shorter for the no-cue than for the strong-cue group and (2) strong-cue subjects, faced with a list of words that had not previously occurred in the experiment, might, before writing the first response, spend more time examining the test sheet than would no-cue subjects, for whom the test sheet contained only a number of blank spaces. Even if this interval were longer, however, for the strong-cue condition, it is not clear what, if any, relationship exists between recall and the length of the interval separating the end of the study trial and the beginning of responding on the recall test. This relationship is currently under study in our laboratory for all three treatment conditions (Bowers, Parker, & Newman, Note 2; Cooper, Newman, Pettit, & Sidden, Note 3; Parker, Note 4).

The results from the comparison of the weak-cue and no-cue groups appear to have implication for research on paired-associate learning. The better performance of the weak-cue group replicates the results of a number of experiments (Hall, 1972; Newman & Logan, 1972; Saltz & Youssef, 1964) and emphasizes that unaided recall of the response terms may not always reflect accurately the degree to which response learning has occurred.

REFERENCE NOTES

1. Cooper, M. H., Newman, S. E., Womack, S. E., & Routten, C. E. *Recall as a function of encoding instructions and retrieval cues.* Paper presented at the meeting of the Southeastern Psychological Association, New Orleans, April 1976.

2. Bowers, J. N., Parker, K. C., & Newman, S. E. *Effectiveness of extralist retrieval cues.* Paper presented at the meeting of the Southeastern Psychological Association, Hollywood, Florida, May 1977.

3. Cooper, M. H., Newman, S. E., Pettit, M. H., & Sidden, J. A. *Test of the encoding specificity principle: A possible artifact.* Paper presented at the meeting of the Southeastern Psychological Association, Hollywood, Florida, May 1977.

4. Parker, K. C. *Extralist cueing: Effects of retention interval.* Unpublished manuscript, North Carolina State University, 1977.

REFERENCES

Bahrick, H. P. Measurement of memory by prompted recall. *Journal of Experimental Psychology*, 1969, **79**, 213-219.

Bahrick, H. P. A two-phase model for prompted recall. *Psychological Review*, 1970, **77**, 215-222.

Fox, P. W., Blick, K. A., & Bilodeau, E. A. Stimulation and prediction of verbal recall and misrecall. *Journal of Experimental Psychology*, 1964, **68**, 321-322.

Hall, J. F. Associative strength and word frequency as related to stages of paired-associate learning. *Canadian Journal of Psychology*, 1972, **26**, 252-258.

Newman, S. E., & Logan, G. W. Aided and unaided recall of B-terms following A-B training. In C. P. Duncan, L. Sechrest, & A. W. Melton (Eds.), *Human memory: Festschrift for Benton J. Underwood.* New York: Appleton-Century-Crofts, 1972. Pp. 149-150.

Saltz, E., & Youssef, Z. I. Role of response differentiation in forgetting. *Journal of Experimental Psychology*, 1964, **68**, 307-311.

Santa, J. L., & Lamwers, L. L. Encoding specificity: Fact or artifact? *Journal of Verbal Learning and Verbal Behavior*, 1974, **13**, 412-423.

Thomson, D. M., & Tulving, E. Associative encoding and retrieval: Weak and strong cues. *Journal of Experimental Psychology*, 1970, **86**, 255-262.

Tulving, E., & Thomson, D. M. Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 1973, **80**, 352-373.

(Received for publication March 10, 1977.)