

Context effects in short-term memory: A complication

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A replication of one of Falkenberg's (1979) experiments on the reinstatement of context in short-term memory successfully reproduced those results. Having subjects perform the filler task both before and after memory input facilitated recall. However, facilitation was also obtained when a different task was performed prior to input.

It is a generally accepted principle of human memory that retrieval of memories is supported by reinstatement of environmental context. Although data illustrating this principle do exist (Godden & Baddeley, 1975; Smith, 1979; Smith, Glenberg, & Bjork, 1978), there are not an overwhelming number of demonstration experiments available.

Falkenberg (1972) reported the results of several experiments that appeared to document the role of contextual reinstatement in the Brown-Peterson paradigm. Falkenberg's basic procedure was to have people perform the distractor task immediately before the presentation of the memory item as well as during the retention interval. In all of his experiments, recall improved, presumably due to the fact that the context before input was similar to the context before recall. We wish to report the results of a simple extension of Falkenberg's paradigm that may affect the interpretation of Falkenberg's results. All of Falkenberg's comparisons were with a control condition in which no specific activity was carried out prior to item presentation. In our experiment, we used two different distractor tasks. Students were required either to perform the same task before and after item presentation or to perform different tasks. If performing the distractor task before input produces improved recall, we thought that performing a different task before input might produce interference when these conditions are compared with a condition that had no task before input.

METHOD

Each subject received nine Brown-Peterson trials. Stimulus presentation was visual: The items appeared on an 18-cm TV monitor controlled by a microprocessor. A trial began with a 2-sec presentation of seven asterisks. The memory item was a consonant trigram and appeared for 2 sec, followed by a 13-sec filled retention interval. The retention interval ended with the presentation of the word "recall," which lasted 4 sec. After a 1.5-sec blank interval, the next trial began.

There were six different conditions; each subject participated in only one condition. For the two control groups, the memory item appeared immediately after the presentation of the asterisks. For two other groups, the presentation of the asterisks was followed by a 13-sec interval in

This research was supported by a research grant from the Natural Sciences and Engineering Council of Canada to the senior author. The authors' mailing address is: Department of Psychology, University of Alberta, Edmonton, Alberta T6G 2E9, Canada.

which the subject performed the same task that was performed during the retention interval. For the other two groups, the subject performed a different task from that performed during the retention interval.

The two tasks were both classification tasks, one involving the classification of numbers as odd or even, and the other involving the classification of words as animals or not animals. The subject classified 10 items presented at a rate of 1.3 sec/item. A different 10 items was used on each trial, but when the items belonged to the same class, the same items were used before and after the presentation of the study item and appeared in the same order. On any given trial, half of the numbers were odd and half of the words were animals. The remaining words came from a variety of other categories.

The subjects were introductory psychology students, who participated as part of the laboratory requirement for the course. There were 20 students in each of the six conditions; the students were assigned according to a prearranged schedule that randomized the order of conditions within blocks containing each condition once.

RESULTS

The mean number of triads correctly recalled and the mean number of consonants correctly recalled in the correct position are presented in Table 1 for each condition. The conclusions are identical, regardless of which measure is considered. Although the results appear to differ for the two different classes of materials, analysis of variance failed to produce a significant effect either for correct triads [$F(1,114) = 1.68, p = .20$] or for correct letters [$F(1,114) = 2.31, p = .13$]. The interaction of materials with treatment conditions also failed to reach significance with either measure [$F < 1.00$ for correct triads, and $F(2,114) = 1.51, p = .23$, for correct letters]. In each case, however, the differences among the three main conditions were significant [$F(2,114) = 5.60$ for correct triads, and $F(2,114) = 6.43$ for correct letters]. Comparisons of same- and different-task conditions with the no-task control produced significant facilitation for the same-task groups ($p < .0005$), whereas the advantage of the different-task group fell just short of significance ($p = .08$). These comparisons produced identical results with both measures.

DISCUSSION

If only the same-task groups are considered, we have clearly replicated Falkenberg's (1972) results. Those students who performed the

Table 1
Mean Correct Triads Recalled and
Mean Correct Letters Recalled

Prior Task	Filler Task	Triads		Letters	
		Mean	SD	Mean	SD
None	Numbers	5.05	1.70	18.40	3.85
None	Words	4.10	2.44	16.15	5.89
Combined	(Control)	4.58		17.28	
Numbers	Numbers	6.05	1.96	20.70	4.86
Words	Words	6.15	1.81	21.75	4.51
Combined	(Same)	6.10		21.23	
Words	Numbers	5.85	2.27	20.45	5.15
Numbers	Words	5.00	1.95	18.15	5.05
Combined	(Different)	5.43		19.30	

same classification task before item presentation and during the retention interval remembered more than those who did not perform any specific activity prior to the memory task. The result we find interesting, however, is that students who performed a task different from the retention interval filler task also showed evidence of facilitation. Although the effect did not quite reach the normally acceptable levels of significance, there was no evidence at all that changing tasks interfered with recall.

We are left with two possible conclusions. One conclusion is that the facilitation of recall that is produced in this way has nothing to do with context effects. Just what might be involved if this is the case is somewhat of a mystery. Perhaps the distractor task imposed before item input results in the expenditure of greater cognitive effort during study (Tyler, Hertel, McCallum, & Ellis, 1979), or definite marking of the input at both ends increases the distinctiveness of the memory material. In any event, those theorists who have used the Falkenberg (1972) results to bolster the case for contextual facilitation of recall (Spear, 1978) would have to look elsewhere for the support they need.

The second possibility is that the two classification tasks are similar enough to cross-facilitate recall to some extent. It seems unlikely that there is enough "generalization" between numbers and words to mediate contextual facilitation, but for those theorists who emphasize mental operations as critical components of memorial tasks (Kolers, 1973), our results might suggest that a common component of context is provided by the operation of classification regardless of the materials classified or the attributes used.

Whichever way one chooses to look at these results, environmental context effects probably deserve a more careful theoretical and experimental examination than they have received to date.

REFERENCES

- Falkenberg, P. R. (1972). Recall improves in short-term memory the more recall context resembles learning context. *Journal of Experimental Psychology*, *95*, 39-47.
- GODDEN, D. R., & BADDELEY, A. D. (1975). Context dependent memory in two natural environments: On land and underwater. *British Journal of Psychology*, *66*, 325-332.
- KOLERS, P. A. (1973). Remembering operations. *Memory & Cognition*, *1*, 347-355.
- SMITH, S. M. (1979). Remembering in and out of context. *Journal of Experimental Psychology: Human Learning and Memory*, *5*, 460-471.
- SMITH, S. M., GLENBERG, A. M., & BJORK, R. A. (1978). Environmental context and human memory. *Memory & Cognition*, *6*, 342-353.
- SPEAR, N. E. (1978). *The processing of memories*. Hillsdale, NJ: Erlbaum.
- TYLER, S. W., HERTEL, P. T., MCCALLUM, M. C., & ELLIS, H. C. (1979). Cognitive effort and memory. *Journal of Experimental Psychology: Human Learning and Memory*, *5*, 607-617.

(Manuscript received for publication July 29, 1984.)