

Subjective rating scales and the control of encoding in incidental learning

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Shaughnessy (1976) suggested that displaced rehearsals may occur in incidental learning when orienting tasks that involve subjective rating scales are used. In the present experiment, evidence supporting this hypothesis was obtained by extending the strategy Wood and Underwood (1967) developed for tracking rehearsals in intentional learning. The study list consisted of the blocked presentation of eight instances of each of five color sense-impression categories. A pronounced within-category primacy effect was found in recall when the orienting task required rating each item's association to the appropriate color, but not when a different concept was used for rating each item. When orienting tasks are to be used to control the encoding of individual items, investigators should avoid using the same subjective rating scale for several items.

One problem facing memory researchers is controlling the nature of the information subjects encode while processing material for a subsequent memory test. Increased control over encoding allows for more definitive conclusions concerning the impact of various types of information on memory test performance. One common method for bringing encoding processes more directly under experimenter control is the manipulation of orienting tasks in the incidental learning paradigm. The logic is straightforward: Because subjects do not anticipate a memory test, they presumably process each item solely in terms of the information required by the orienting task. Thus, differences in memory test performance as a function of orienting task differences are presumed to reflect the relative effectiveness of the various types of information required by the orienting tasks. Unfortunately, as the present research will indicate, the application of this logic is not always straightforward.

Hyde and Jenkins (1969, 1973) introduced what has become a very frequently used set of orienting tasks. Their research showed that orienting tasks that required subjects to rate each item on subjective scales such as the pleasantness of the word's meaning led to consistently higher recall performance than did orienting tasks that required more objective judgments for each

item, such as the number of letters in each word. They argued that the former tasks were more effective because they required semantic processing, whereas the latter tasks required nonsemantic processing. Shaughnessy (1976) has previously argued, however, that the two types of orienting tasks differ on another dimension as well. In order to use the subjective rating scales reliably, subjects probably compare each item to be rated with other previously rated items. Such comparisons would be comparable to the displaced rehearsals that occur under intentional learning instructions, and these rehearsals may be partially responsible for the superior recall found with semantic rating scales.

Postman and Kruesi (1977) have recently obtained indirect evidence favoring the displaced rehearsal hypothesis. They compared two semantic rating scales, frequency of usage and pleasantness of meaning, which were assumed to differ in the extent to which they called upon subjective judgments. The frequency ratings were assumed to be less subjective. Therefore, they should elicit the comparison process less often and should lead to lower recall. This is exactly what was found. Assuming that intentional learning instructions encourage displaced rehearsals, Postman and Kruesi went on to argue that these instructions should enhance recall more when combined with the frequency-judgment orienting task, which is presumed to encourage "rehearsals" less than is the pleasantness task. This prediction was confirmed, but only in the recall of nonrecency items. Finally, incidental recall of nonrecency items following a nonsemantic orienting task that encouraged the comparison process (i.e., rating the pleasantness of the sounds of words) was as good as recall following the semantic task of rating word frequency.

In the present experiment, more direct evidence was sought supporting the validity of displaced rehearsals

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as a component of incidental learning when subjective rating scales are used for orienting tasks. The research strategy involved an application of procedures developed by Wood and Underwood (1967). They were interested in the effects of conceptual similarity on free recall of words when direct associations among the to-be-remembered words were held constant by using study list items drawn from the sense-impression norms of Underwood and Richardson (1956). The conceptual relatedness of words along sense-impression dimensions is noted by subjects only when they are cued to process the items along these dimensions. For example, the words derby, coal, and coffee are all associated with the color sense impression of black; but subjects are unlikely to notice this relationship unless the presentation of each word is accompanied by a color cue.

Taking advantage of this unusual characteristic of sense-impression items, Wood and Underwood (1967) presented the same list of 40 words to two different groups of subjects. One group was given an appropriate sense-impression color cue along with each item, and for this group, the list functionally consisted of eight instances of each of five categories. The categories were blocked, that is, the instances of each category were presented in successive list positions. The second group was given the same list in the same order, but without the cues, and thus without the conceptual structure present in the cued condition. The free recall results showed strong primacy effects in the within-list category blocks for the cued condition. No such within-category primacy effects were found in the uncued condition. Wood and Underwood argued that the primacy effects in the cued condition were the result of a cumulative rehearsal strategy within each block whereby items presented early in the block received more displaced rehearsal than did items presented later in the category.

In the present research, within-category serial position effects were used to track displaced rehearsals in incidental learning tasks. The sense-impression lists used by Wood and Underwood (1967) were again used. In fact, the experiment included a replication of their cued vs. noncued manipulation under intentional learning conditions. More importantly, however, incidental learning counterparts for each of these conditions were developed. One group of incidental learners was asked to rate each item in terms of how strongly it was associated to the color cue that was presented along with the word. If this rating task does require the comparison process described earlier, then there should be a within-category primacy effect in this condition comparable to that found in the cued intentional learning condition. A second group of incidental learners was asked to rate each word as to how strongly it was associated to the concept presented along with it, but in this group a different concept accompanied each item. Thus, the comparison process should not be activated, and the within-category primacy effect should be absent for this group.

METHOD

Lists

The basic study list was the same as the 40-item list used by Wood and Underwood (1967). The list consisted of eight instances of each of five color sense-impression categories. List presentation was always blocked such that the instances of a given category occurred in successive list positions. Eight forms of the study list were prepared. The order of the categories was randomized across lists with the restriction that each category held the positions of first through fifth at least once but not more than twice. In addition, the eight instances within each category were systematically rotated across forms so that each instance appeared in each of the eight within-category positions exactly once.

Design and Subjects

There were four major groups in the experiment defined by the factorial combination of two independent variables, intent to learn and cuing condition. Half of the subjects were given intentional learning instructions prior to list presentation, and no orienting tasks were used. Of these subjects, half were given an appropriate color cue along with the presentation of each item and half were not given this cue. The other half of the subjects participated in one of two incidental learning groups. The incidental condition that corresponded to the cued intentional condition involved the rating of each item in terms of its strength of association to the appropriate color cue. The other incidental learning condition required rating each item in terms of a different category label.

Sixteen undergraduate students were assigned to each of the four groups according to a block randomized schedule. Each of the eight forms of the study list was used for two subjects in each group. Approximately half of the subjects participated in the experiment to earn extra credit in an introductory psychology course. Four additional subjects, two in each of the incidental learning conditions, were run but were replaced because they were unable to complete the paced rating task successfully.

Procedure

All subjects participated individually. Those in the intentional learning conditions were given a deck of 40 index cards with one word typed in the center of each card. The subjects were instructed to study the word on each card until they were given a signal to turn to the next card. The turning of the cards was paced by the sound of the changing of a Carousel projector set at a 5-sec rate. All subjects were given a practice deck of five blank cards prior to list presentation to insure that they were accustomed to the pacing. In the cued condition, a color swatch from the appropriate color category appeared next to each word and the subjects were told that their performance would be facilitated if they thought of the word in terms of that color. Following the presentation of the last item, subjects were given brief instructions for a math exercise, which involved a series of problems of the form $A \times B + C$ (A, B, and C being single digits from 1 to 9). The series included 12 problems presented for 5 sec each, and the subjects were told to call out their answers before the next problem appeared. After this task, subjects were given instructions for the anticipated free recall test and they were given not more than 5 min to recall as many study list items as they could.

In the incidental conditions, the experiment was introduced as a scaling study. In the cued condition subjects were given the deck of cards that contained the color swatches, and they were told to rate each item on a 7-point scale indicating the degree of association between the presented word and the accompanying color. Subjects were told to call out their ratings before the signal was given to turn to the next card. In the noncued condition, each card contained a different concept label above the to-be-rated word, and subjects were to rate

the degree of association between the word and the concept. For example, the to-be-rated words "derby" and "coal" were rated in terms of the concept "black" in the cued condition and the concepts "type of hat" and "type of fuel" in the noncued condition. After the last word was rated, subjects were given the math exercise as in the intentional conditions and then they were given the unanticipated free recall test. All subjects in the incidental conditions were asked following the free recall test whether they had anticipated being given any type of memory test; all subjects responded that they had not.

RESULTS

Subjects' recall protocols were scored in terms of the number of words recalled from each of the eight within-category serial positions summing across the five sense-impression categories. In order to obtain more stable serial position curves, however, recall scores for successive within-category positions were combined. For example, the data for the first combined level of the serial position variable included the recall of words from List Positions 1, 2, 9, 10, 17, 18, 25, 26, 33, and 34. The mean number of words recalled at each of these four newly defined within-category positions for each of the four major groups is presented in Figure 1. The more neutral label of blocks rather than categories is used in the figure because the sense-impression categories were specifically defined only in the cued conditions. Needless to say, the most notable aspect of the figure is the marked primacy effect in both the intentional and incidental cued conditions and the absence of a primacy effect in the two noncued conditions. This is precisely the pattern of results expected on the basis of the displaced rehearsal hypothesis.

Summing over the serial position variable, the mean

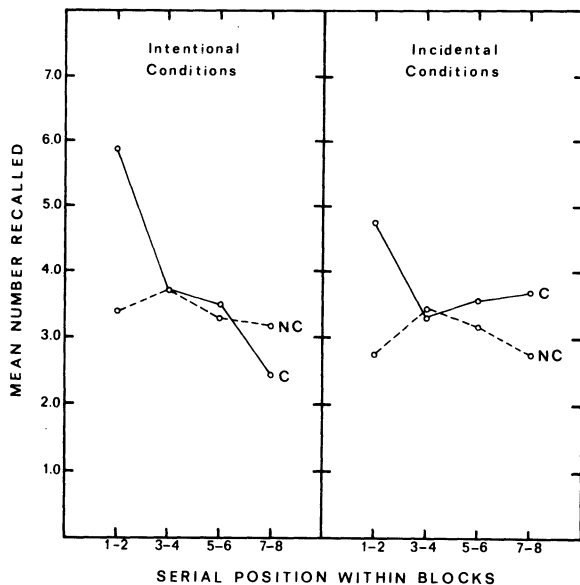


Figure 1. Mean number of words recalled (of a possible 10) as a function of serial position within blocks and instructional condition (C = cued and NC = noncued).

number of words recalled in the intentional cued condition was 15.6; that in the incidental cued condition was 15.3. Similarly, the mean total recall for the noncued conditions was 13.6 and 12.1 for the intentional and incidental groups. An analysis of variance of these total recall scores was performed, and this analysis included the forms of the study list as a variable. Using the .05 level of significance for this and for all other analyses to be reported, the only statistically significant source of variation was the cuing variable [$F(1,32) = 9.06$, $MSe = 11.59$]. The significantly higher total recall in the cued conditions can be attributed primarily to the strong primacy effects in these two conditions.

Given the critical role primacy effects play in the hypothesis under test in the present investigation, the principal analysis of the data presented in Figure 1 included only the first two levels of the serial position variable. The most important findings in the overall analysis were a statistically significant interaction between the cuing variable and the serial position variable [$F(1,32) = 17.44$, $MSe = 2.45$] and a nonsignificant triple interaction of these two variables with the intent-to-learn variable [$F(1,32) < 1$]. Although the pattern of results in Figure 1 is very clear in showing primacy effects in the two cued conditions and none in the noncued conditions, separate analyses were done to insure the reliability of this pattern within the intentional and incidental conditions. An analysis of the data for the first two serial positions in the left panel of the figure revealed a statistically significant Cuing by Serial Position interaction [$F(1,16) = 9.76$, $MSe = 2.56$]. Similarly, an analysis of the two incidental conditions shown in the right panel of the figure showed a comparable Cuing by Serial Position interaction [$F(1,16) = 7.71$, $MSe = 2.34$]. Finally, an analysis of the primacy effect within the cued incidental condition resulted in a statistically significant effect of the serial position variable [$F(1,8) = 6.22$, $MSe = 2.66$], but the corresponding analysis of the slight increase over the first two positions in the noncued incidental condition resulted in a nonsignificant effect [$F(1,8) = 1.16$, $MSe = 2.03$].

DISCUSSION

The present results in the noncued conditions are consistent with other incidental learning research in showing that orienting tasks requiring semantic processing lead to approximately the same level of recall as do intentional learning instructions (e.g., Craik & Tulving, 1975). This comparable recall level was achieved even when the orienting task presumably excluded the possibility of displaced rehearsals. Although displaced rehearsals were not directly monitored, the recall results in the cued conditions, however, provide strong support for the hypothesis that displaced rehearsals occur in incidental learning situations in which the orienting task requires the rating of several items on the same subjective scale. Subjects who rated sets of eight items from the same sense-impression category in terms of the color defining that category showed a clear within-category primacy effect. This outcome is consistent with the

notion that the subjects "rehearsed" items presented early in the category in trying to decide on ratings for the items presented later in the category. No evidence of such a primacy effect was found when a different scale was used for the rating of each item. In fact, the results for the incidental learning conditions were quite comparable to those obtained in the intentional learning conditions, which represented a replication of the results previously obtained by Wood and Underwood (1967).

When combined with the evidence previously reported by Postman and Kruesi (1977), the present evidence suggests that investigators who wish to use the incidental learning paradigm as a vehicle for controlling the encoding of individual items should avoid the use of orienting tasks requiring the rating of more than one item on the same subjective scale. The problem of displaced rehearsals can be avoided through the use of the query method introduced by Craik and Tulving (1975) or the use of orienting tasks such as the one used in the noncued condition of the present experiment.

REFERENCES

- CRAIK, F. I. M., & TULVING, E. Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General*, 1975, **104**, 268-294.
- HYDE, T. S., & JENKINS, J. J. Differential effects of incidental tasks on the organization of recall of a list of highly associated words. *Journal of Experimental Psychology*, 1969, **82**, 472-481.
- HYDE, T. S., & JENKINS, J. J. Recall for words as a function of semantic, graphic, and syntactic orienting tasks. *Journal of Verbal Learning and Verbal Behavior*, 1973, **12**, 471-480.
- POSTMAN, L., & KRUESI, E. The influence of orienting tasks on the encoding and recall of words. *Journal of Verbal Learning and Verbal Behavior*, 1977, **16**, 353-369.
- SHAUGHNESSY, J. J. Persistence of the spacing effect in free recall under varying incidental learning conditions. *Memory & Cognition*, 1976, **4**, 369-377.
- UNDERWOOD, B. J., & RICHARDSON, J. Some verbal materials for the study of concept formation. *Psychological Bulletin*, 1956, **53**, 84-95.
- WOOD, G., & UNDERWOOD, B. J. Implicit responses and conceptual similarity. *Journal of Verbal Learning and Verbal Behavior*, 1967, **6**, 1-10.

CRAIK, F. I. M., & TULVING, E. Depth of processing and the

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