Recall for Words as a Function of Semantic, Graphic, and Syntactic Orienting Tasks

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Two word lists were prepared for recall experiments. One consisted of moderately associated word pairs, the other of unrelated words. Each list was presented to 11 different groups of subjects (22 groups in all). The control group was simply instructed to remember the words; five groups performed orienting tasks but were not informed that they would have to recall the words; five groups performed the tasks and were informed about subsequent recall. Two orienting tasks required that subjects process the meaning of the words; two tasks required syntactic processing; and one task required processing the orthography of the word. Semantic tasks yielded much greater recall and greater organization of recall than the nonsemantic tasks. Intention to learn was important only with the associated list. Results were discussed in terms of processes involved in tasks rather than responses involved in tasks.

A natural way to study memory is one in which the subject is caught unprepared, so-to-speak, and asked to recall events he experienced at some point in time. Our distrust of such natural procedures usually stems from our concern with loss of control. We fear, on one hand, that the subject may have anticipated the experimenter's plan and invalidated the observation by learning the material when he was merely supposed to be experiencing it. On the other hand, we worry that the subject may not pay attention to the events that the experimenter has arranged and, thus, may not have had the experiences that the experimenter wants him to recall.

Out of this dilemma have grown the paradigms of incidental learning, or if one prefers, incidental memory. Since most natural memory is likely to be incidental, these designs may be viewed as furnishing rather important and realistic data concerning memory processes. The incidental learning paradigms, rather than being residuals of forgotten problems, may be especially appropriate to our revived interest in memory processes and their organization.

Hyde and Jenkins (1969), Johnston and Jenkins (1971), and Hyde (1973) recently studied the effects of a number of orienting tasks on the recall of lists of highly associated words. Their findings suggest that when a subject performs an orienting task which requires him to consider the meaning of the words in such a list (semantic task), his subsequent recall is as extensive and as highly structured as the recall of a subject who is instructed to learn the list without performing
any orienting task. On the other hand, a subject who performs an orienting task which does not require a consideration of word meaning (nonsemantic task) shows remarkably poor recall and very little associative structure. The results of these experiments seem to indicate that when a subject performs a semantic orienting task, the semantic relationships between the stimulus words are available for the organization of his recall. If, on the other hand, a subject performs a nonsemantic orienting task, the existing semantic relationships between the words are not available and he shows poor recall with little associative structure.

All of these previous experiments have utilized conditions in which the subject knew he was going to have to recall the words (standard free recall paradigm) as well as conditions in which the subject was not prewarmed about the recall task (standard incidental learning paradigm). The intention-to-learn dimension produced very little difference in either recall or associative structure, and the effects of the various semantic and nonsemantic tasks were relatively constant across the intentionality dimension. The results of the experiments, therefore, address themselves to both paradigms, the only difference being the prior instructions to learn the list.

While the results seem to be in reasonable accord with the accepted generalizations concerning studies of incidental learning (for example, Postman's review, 1964), our interpretation of the results departs from the traditional view in several important respects. For example, the traditional view has emphasized the relation between the orienting task and the criterion task that is used to assess learning. In doing so, it has focused attention on the responses made to the stimulus materials at the time of presentation as being important in determining whether appropriate learning takes place. Surely this emphasis on tasks is correct, but the generalization concerning responses is too limited to furnish guidance for the research worker because we do not know what constitutes a response in most tasks, nor do we know what kinds of responses are essential to different kinds of learning.

Traditional analysis works with a fairly literal notion of response. When the materials to be learned consist of nonsense syllables that are new to the subject, it seems reasonable to suppose, with Mechanic (1962a, b, 1964), that pronouncing responses constitute the minimal integrating activity that must take place if the subject is to reproduce these items. But when we are past this simple surface level, it is hard to describe responses in a convincing way and specify the relation of the hypothetical responses to the criterion behavior. Why, for example, should estimating the frequency with which one contacts a word (Postman, Adams, & Bohn, 1956) prove to be an effective orienting task with respect to organization of recall? And why should relating items to geometric figures be relatively efficient when one tries to recall adjectives, though the same task is obviously nonfacilitative when one tries to recall nonsense syllables (Postman & Adams, 1956)?

The usual escape clause for such anomalous findings has been a generalization with which we must argue. The traditional view has been that differences between orienting tasks (and between intentionality conditions) are minimal when stimulus materials are either very easy or very difficult to learn. Conversely, it is argued that stimulus material differences are minimal when the tasks are either very facilitative or very antagonistic to learning (Postman, 1964; Deese, 1964). While both of these contentions are psychometrically reasonable at the extremes, due to floor and ceiling effects, the generalizations are sometimes applied in ad hoc fashion to explain any outcome that is observed. The role of learning ease and difficulty in incidental learning is the least well-defined and most poorly defended portion of the traditional analysis. Indeed, if one takes seriously the traditional statements concerning
the interaction of orienting tasks, criterion tasks, and the nature of the learning required by different kinds of materials, it is apparent that a task per se has no particular level of facilitation or inhibition independent of materials and criterion measures. Similarly, ease or difficulty of materials cannot be specified independently of other variables. If one had a better theory of tasks, materials, and interaction, the generalizations dealing with ease of learning could be dispensed with.

The writers want to suggest that the phenomena of memory, whether in a free recall or an incidental learning paradigm, can be approached from a process point of view. We will argue such a view can replace both the notion of hypothetical response and the discussion of difficulty of learning materials found in the incidental learning literature. What is suggested is that the nature of the orienting task be described in terms of processes rather than responses, and that the processes engaged by the orienting task be related to those necessary for the recall and reproduction of the particular stimulus materials used.

Postman and his colleagues consider only three kinds of responses: naming or labeling, responses elicited by stimulus generalization, and responses which establish associative links among the items to be remembered. We think this treatment tends to focus attention on the superficial aspects of behavior. If the subject is asked whether table is pleasant or unpleasant, or whether table has an "e" in it, his observable response may be the same, a checkmark on a two-valued scale in front of him. We do not know what his hypothetical responses are, but, certainly, we can say what processes must be necessarily involved. In the first case he must access his knowledge of what the word table means and evaluate that knowledge against the pleasant-unpleasant dimension. In the second case he must recall the spelling of the word and evaluate that knowledge against the question. The first task activates the semantics of table; the second task need not. To the extent that recall processes normally depend on semantics and to the extent that the organization present in the materials is semantic, the first task will be superior to the second in producing recall in either an intentional or incidental learning paradigm.

E. J. Gibson (1971) discussed our first study (Hyde & Jenkins, 1969) in an even more general fashion. She argued that similar distinctive features of words (features of one type) are processed in parallel, while features of different sorts must be encoded sequentially. If this view is correct, then any semantic task allows for the encoding of semantic features of the stimulus words, even semantic features not involved in the task. If some semantic grouping strategy is required by subjects during recall, a subject who had performed a semantic task would have a set of semantic features available for such organizing. If this process is relatively automatic, prior knowledge of the recall task would be of little importance. If, however, the subject performed an orienting task that required him to utilize some other class of distinctive features (for example, graphic, phonetic, or syntactic features), then the semantic information would not be encoded at the same time and would not be available for organization during recall, regardless of the intention to learn.

The present study was designed for two purposes: First, to broaden the range of tasks we have examined in earlier studies, and second, to bring the processing point of view into contrast with some aspects of the traditional view of incidental learning. The contrast with the tradition is twofold. First, and most importantly, we wanted to show that different tasks, having little in common except a requirement for the subject to think about the meaning of the word, would produce very similar results in recall. Second, we wanted to show that processes and list structure, considered together, yield reasonable predictions about recall effects without the use of a dubious concept such as ease of learning.

In broadening the range of tasks we fol-
ollowed the hint from Gibson's (1971) analysis and devised two syntactic tasks to contrast with the semantic and graphic tasks that we had used previously. The syntactic tasks have the virtue that the word is considered as a whole and that a judgment is executed concerning it. Thus, superficially, the task is very similar to semantic rating tasks and quite unlike the graphic tasks that we have used (detecting particular letters and estimating the word length). Yet, if our hypotheses are correct, the syntactic tasks should produce little recall and poor organization, that is, they should function more like the graphic tasks than like the semantic tasks. Two different syntactic tasks were devised; one required a simple judgment as to the part of speech of the word, while the other asked which of two sentence frames each word would fit.

For an additional semantic task we turned to the Postman, Adams, and Bohm (1956) study. These writers found that an orienting task that required rating words for frequency of usage produced minimal differences between incidental and intentional learning for a list of associated words. They attributed the minimal effect to the materials themselves, arguing that the interconnections among the words were so strong and readily detectable that neither the intentionality nor task variables could have much effect. Our interpretation is that the frequency judgment task is essentially semantic: The subject must ask, “What does this mean and how often do I encounter whatever it means?” The orienting task thus automatically led to the encoding of the semantic features of the stimulus words.

The experiment calls for two types of material to be learned: A list of associated words and a list of semantically unrelated words. It calls for different orienting tasks varying in their abstract nature (semantic, graphic, and syntactic). Finally, to meet the traditional concerns of the field, it calls for intentional and incidental groups who perform each of the different orienting tasks, and two control groups who are asked only to recall the lists.

At this point we can hazard predictions, some of which are contrary to the traditional point of view. From the writers' current viewpoint we must predict that the groups performing the semantic orienting tasks will perform about as well as control groups in both imm and organization of recall and that the groups assigned to all types of nonscientific tasks perform poorly in both recall and organization. We must further predict that the differences between groups performing the same and nonscientific tasks will be greater for semantically related list (the easier list) than for the unrelated words.

**Method**

The experiment consists of two complete experiments differing only in the stimulus list. Five different orienting tasks were employed. For one task, there was one group of subjects who were informed as to the subsequent recall and one group of subjects who were not. In addition, for each subexperiment there was a control group that was simply instructed to listen to the material and attempt to recall it. The design can be described as 2 (List) × 5 (Orienting Task) × 2 (Intentionality) design, plus the two controls. The total experiment involved 22 groups.

**Subjects**

The subjects were undergraduate students enrolled in Introductory Laboratory Psychology at the University of Minnesota and in General Psychology at Western Reserve University. All experimental sessions were conducted in the classroom, each section making up one group. Assignment of students to sections was not made on any systematic basis; sections were taken to represent essentially random samples of students enrolled in these classes. Experimental conditions were assigned to classes on a random basis except that all the incidental conditions were first.3 The number of subjects per group ranged from 19 to 33.

3 The writers acknowledge the methodology involved in the random assignment of subjects rather than classes. The procedure followed in this experiment was for reasons of economy and convenience. Prior studies involving hundreds of subjects performing these tasks on similar and identical materials show no differences between control groups formed from laboratory sections and groups formed by random assignment of subjects. See Hyde and Jenkins (1969) and Hyde (1973) for complete tasks and lists.
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Materials

The list of associated words consisted of 12 pairs of
imary associates selected from the Palermo and
kins (1964) association norms for university
ents. Pairs were selected to represent medium-
length primary associates, with an average intrapair
ociation strength of 43.5% (range, 34.5–57.6).
pair associations were held to a minimum (less
an 1%). The words were randomly ordered with
the constraint that associates could not be adjacent in the
list.

The list of unassociated words was chosen from the
Palermo and Jenkins norms and D. G. Doran’s
published norms for associations to the Palermo
and Jenkins response words. Twenty-four words were
selected which had no appreciable associative relation-
dship to each other (less than 2%). This list was also
screened by the investigators to eliminate any obvious
relationships that might have survived the associative
screening test. The words in the unassociated list were
randomly ordered in the list.

Four unassociated filler words were added to each
list, two at the beginning and two at the end to minimize
dimacy and recency effects. The filler words were not
included in any of the data analyses.

Tasks

The five orienting tasks employed were:

Plausibility Rating. This task involved rating
words as to their plausibility or unpleasanness on
simple five-point rating scale. The task was essen-
tially the same as the semantic task used by Hyde and

Estimating the frequency of usage. This task involved
rating the frequency with which the words are used
in the English language. Each word was rated on a
tive-point rating scale, from very infrequent to very
requent. This task was adapted from Peisman, Adams,
and Bohm (1956).

E-G checking. This task consisted of detecting the
occurrence of the letters “E” and “G” in the spelling
of the stimulus words. Subjects were instructed to
ake a check on their rating sheet if either or both of
these letters occurred in the word. This task was essen-
tially the same as that used by Hyde and Jenkins (1969).

Parts of speech. On this task subjects were asked to
cord whether the words were nouns, verbs, adjectives,
or “some other” part of speech. They were provided
with a check sheet that had these categories labeled for
each item. The subjects were told that if they were not
certain about the particular part of speech, they were
t to guess, or put down whatever they thought best.
Also, many of the words were ambiguous, in that they
would be more than one part of speech. In this case
subjects were instructed to put down whatever came
to mind first.

Sentence frames. In this final orienting task subjects
were presented with two sentence frames and a “does
not fit” category. The two sentence frames were
printed at the top of the rating sheet and were numbered
“1” and “2.” The third category was labeled “does not
fit.” The sentence frames contained no words with
semantic reference. They were, “It is ————,” and
“It is the ————.” All mass nouns and adjectives
fit into the first sentence and all count nouns fit into
the second. Many of the words could be either mass
nouns or count nouns and could, therefore, fit into
either sentence. The subjects were told that if a word
seemed to fit into both sentences they were to pick
whichever seemed best.

Procedure

The words were recorded at a 3-sec interval. Each
subject in a given list condition heard the same recording
of the list. The list was presented only once to each
group.

Each subject heard the instructions specific to his
task. The list was played and he performed his task
for each item as it occurred. Following the presentation,
his task materials were removed and he was given
instructions for the free recall task. All subjects were
given 5 min for recall.

Results

Mean Recall

Mean recall scores for all 22 groups are
given in Figure 1. It is apparent that the list
of associated words (shaded bars) is more
readily recalled than the list of unrelated words
(unshaded bars). It is also apparent that the
semantic orienting tasks yield much more
call than the nonsemantic tasks and, in fact,
compare favorably with the recall of the
intentional control groups who had no
orienting task to perform.

Analysis of variance for unequal Ns was
conducted on the recall scores of the 20 groups
that performed orienting tasks. The main
effects were all significant beyond the .001
level: Intentionality, F(1, 513) = 11.7; Lists,
F(1, 513) = 102; and Tasks, F(4, 513) = 117.
None of the interactions were significant
except the interaction of Lists and Tasks
which was significant beyond the .01 level,
F(4, 513) = 9.30.
Study of Figure 1 reveals the source of the List x Task interaction. The effects of the different orienting tasks on recall of the list of unrelated words are moderate, the semantic tasks being followed by good recall while the nonsemantic tasks were not. For the list of associated words, however, the task effects were appreciably enhanced; the semantic tasks enjoyed a greater advantage over the nonsemantic tasks than they did on the unrelated word list. Roughly speaking, the nonsemantic tasks allowed about the same level of recall for the two lists. The semantic tasks increased recall for both lists but to a much greater extent in the list of associates. With the list of associates the semantic tasks increase recall an average of 83% over recall produced by nonsemantic tasks, while there was only a 42% increase in the unrelated word list. Thus, as expected, the easier (semantically structured) list provided a situation where the relevant task differences were magnified.

The results with respect to the types of orienting tasks are remarkably clear. Across both Lists and conditions of Intentionality the ordering of the tasks in terms of amount recalled is virtually identical. The task yielding the least recall is the Sentence frame task, the next poorest recall is associated with E-C checking, and the next poorest follows the Parts of speech task. Estimating frequency of usage produced recall that was just about the level of the Control group that performed no orienting task, and Pleasant-unpleasant produced the highest recall, superior to the Control group in every case. There is an obvious discontinuity in amount of recall that separates the tasks we have called syntactic and graphic from tasks we have called semantic.

There are a variety of ways in which one may examine the data statistically. If one examines the contrasts between Tasks in each experimental condition separately in an attempt to detect all possible differences that

<table>
<thead>
<tr>
<th>Task Material Condition</th>
<th>Mean Number of Words Recalled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Sentence Frame</td>
<td></td>
</tr>
<tr>
<td>Unrelated</td>
<td>6.2</td>
</tr>
<tr>
<td>Associated</td>
<td></td>
</tr>
<tr>
<td>Incongruent</td>
<td>6.2</td>
</tr>
<tr>
<td>Checking</td>
<td></td>
</tr>
<tr>
<td>Unrelated</td>
<td>8.1</td>
</tr>
<tr>
<td>Associated</td>
<td></td>
</tr>
<tr>
<td>Incongruent</td>
<td>10.6</td>
</tr>
<tr>
<td>Part of Speech</td>
<td></td>
</tr>
<tr>
<td>Unrelated</td>
<td>12.7</td>
</tr>
<tr>
<td>Associated</td>
<td></td>
</tr>
<tr>
<td>Incongruent</td>
<td>15.2</td>
</tr>
</tbody>
</table>

Fig. 1. Number of words recalled by subjects performing each task under both conditions of Intentionality for unrelated and associated word lists.
Thus, statistical procedures at both extremes, individual comparisons within conditions, and very conservative multiple comparisons across groups of conditions yield the same general picture; the semantic orienting tasks produce as much recall as the control conditions which had no task to perform, and the nonsemantic tasks were reliably inferior in recall to both the semantic tasks and the Control groups.

A final interesting finding emerges when the Intentionality effect is examined within each list. For the unrelated words, there is no main effect of Intention, $F(1, 263) = 3.20, p > .05$, but there is a significant Task effect, $F(4, 263) = 38.4, p < .001$. For the easier (more structured) list of associated words, there is both an Intention effect, $F(1, 250) = 8.51, p < .01$, and a Task effect, $F(4, 250) = 77.3, p < .001$. Thus, we have the interesting case in which a list of comparatively easy materials (as judged by Postman, Adams, & Bohm, 1956) enhanced the differences between intentional and incidental learners over those observed on a list of unstructured materials of moderate difficulty.

**Associative Clustering**

For the groups using the associated list, it was possible to analyze the recall protocols for associative clustering as a function of orienting task. Clustering was scored as the percentage of clustering per opportunity (Jenkins, Mink, & Russell, 1958). This index consists of the number of associated pairs that occurred together in recall divided by the number of opportunities for clustering (multiplied by 100). An opportunity for clustering was simply the appearance of one member of the pair occurring in recall; if the second member of the pair occurred later in the list, it was not counted as another opportunity for clustering. The values, reported in Table 1 are the mean values for the subjects in each group.

As can be seen in Table 1 the data for clustering look very much like the data for mean recall. The groups performing a
TABLE 1

MEANS AND STANDARD DEVIATIONS FOR THE CLUSTERING INDEX FOR EACH GROUP USING THE ASSOCIATED LIST

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Incidental</th>
<th></th>
<th>Intentional</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Sentence frames</td>
<td>25.2</td>
<td>21.4</td>
<td>21.6</td>
<td>17.1</td>
</tr>
<tr>
<td>E-G checking</td>
<td>12.8</td>
<td>15.3</td>
<td>21.0</td>
<td>19.1</td>
</tr>
<tr>
<td>Part of speech</td>
<td>30.8</td>
<td>21.5</td>
<td>36.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Frequency of usage</td>
<td>61.3</td>
<td>24.7</td>
<td>72.0</td>
<td>21.1</td>
</tr>
<tr>
<td>Pleasant-unpleasant</td>
<td>63.6</td>
<td>21.9</td>
<td>60.2</td>
<td>21.3</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td>63.3</td>
<td>27.1</td>
</tr>
</tbody>
</table>

The data reported here support the guiding hypothesis that tasks which call for the processing of semantic features of words will make these features available during recall and that the subject can use this information to organize his recall in a semantic fashion. The present study has broadened the range of tasks that have been examined in exploring the effect of different kinds of orienting tasks on the amount and structure of recall of meaningful word lists. In general, semantic tasks are conducive to high levels of recall and high degrees of organization. Such tasks include pleasant-unpleasant rating, finding nouns for adjectives and adverbs for nouns, estimating frequency of usage of the words, and active-passive ratings (see Hyde & Jenkins, 1969; Johnston & Jenkins, 1971; Postman, Adams, & Bohm, 1956; Hyde, in press, respectively). Tasks which require processing of the graphic or acoustic form of the stimulus words result in poor recall at little associative structure. Such tasks include letter checking, word length, rhyming, number of syllables, and voice of the speaker (in Hyde & Jenkins, 1969; Johnston & Jenkins, 1971; Walsh & Jenkins, 1973). The present study has added two new tasks to the list, namely, the assigning of parts of speech and fitting words into sentence frames. These tasks are especially important because they are unrelated to the acoustic or graphic form of the words. They force us then to consider semantic processing versus all kinds of nonsemantic processing, rather than restricting ourselves to meaning versus form of the stimulus, as we did in our earlier studies.

It is clear from the foregoing that tasks which have the same effects need not invoke similar responses at any simple level of analysis and, conversely, that tasks which appear to involve identical superficial responses (e.g., checkmarks on a scale) may have radically different effects on subsequent performance. In short, these findings argue that a process
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approach may be more adequate than a response approach in describing the nature of the tasks that result in good and poor recall of meaningful words.

If, as Gibson (1971) has argued, similar distinctive features of a word are processed in a parallel fashion, then an orienting task that focuses subjects on some semantic aspect of the words may allow for the processing of a general range of semantic characteristics of the stimuli. If semantics is essential to long-term memory or if some semantic strategy aids subjects in organizing their recall, then subjects who have performed semantic tasks of any sort will be in a favorable position. It is tempting to believe that other classes of orienting tasks may lead to the encoding of other classes of information which might be useful in different subsequent tasks or with different materials, but clearly, such tasks do not furnish an adequate preparation for the free recall of meaningful materials. The degree of failure of these tasks is all the more dramatic as the materials offer more possibilities of semantic organization.

Detailed examination of the results of the two lists clearly supports the claim that for the tasks that reduced recall and organization (nonsemantic tasks), there was about the same amount of recall for both the associated and unassociated lists. Across both the Incidental and Intentional conditions, these tasks produced recall of about seven words, regardless of the nature of the stimulus list. When subjects performed a task that required the processing of semantic information, there was greater recall for both the associated and unassociated lists. The associated words, however, showed a much greater increase in recall than the list of unassociated words. It would seem that the encoding of semantic information facilitates recall for any type of meaningful material, but the increases are much greater if there are obvious experimenter-imposed semantic relationships that can aid the subjects in organizing their recall.

If we read the older literature properly, it seems to us that it predicts that easy materials in themselves can eliminate task differences. This experiment serves as a demonstration that the effects of Task variables and Intentionality variables may actually be enhanced by the choice of appropriate materials that interact favorably with the processes involved in one set of tasks and unfavorably with the processes involved in others.

As the result of this and other experiments, we suggest that the traditional view of incidental learning be revised in two respects. First we urge that processes rather than responses be studied as the variables that exercise major control over the learning that we see evidenced in the criterion task. Of course, we do not pretend to understand processes better than responses nor do we argue that processes are more objective or more scientific. Indeed, we probably know as little about processes as we do about hypothetical responses. We do argue, however, that the notion of processes involved in a task offers more adequate, productive, and interesting experimental ideas than the relatively constricted (and equally hypothetical) notion of responses.

Second, we suggest that the "escape route" of ease or difficulty of learning as an explanation of unpredicted experimental effects be abandoned. While the inherent difficulty of materials may eventually be seen to play some role, in and of itself, it appears to us that the major part of the variance observed in the criterion task will be accounted for by the interaction of the materials with the processes required in the orienting and criterion tasks. Until we have explored these major contributions to variance we should not use difficulty to explain away our anomalous findings.

REFERENCES


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