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Recall for Words as a Function of Semantic, Graphic, and Syntactic Orienting Tasks[1]

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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

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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 prewarned 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, & Bohm, 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 followed 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 predictic some of which are contrary to the traditic point of view. From the writers' current v we must predict that the groups perform the semantic orienting tasks will perfc about as well as control groups in both amo and organization of recall and that the gro assigned to all types of nonsemantic tasks perform poorly in both recall and organ tion. We must further predict that the dif ences between groups performing the sema and nonsemantic tasks will be greater for semantically related list (the easier list) t for the unrelated words.

Method

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

Subjects

The subjects were undergraduate students enr in Introductory Laboratory Psychology at the Ur sity of Minnesota and in General Psychology at Western Reserve University. All experimental c sions were conducted in the classroom, each sep section making up one group. Assignment of stu to sections is not made on any systematic basis sections were taken to represent essentially rar samples of students enrolled in these classes. E mental conditions were assigned to classes on a rar basis except that all the incidental conditions wer first.[3] The number of subjects per group ranged 19 to 33.

[3] The writers acknowledge the methodolc inelegance involved in the random assignme classes rather than subjects. The procedure followed in this experiment for reasons of eco and convenience. Prior studies involving hundre subjects performing these tasks on similar and ide materials show no differences between compa groups formed from laboratory sections and g formed by random assignment of subjects. See and Jenkins (1969) and Hyde (1973) for compa tasks and lists.

aterials

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

The list of unassociated words was chosen from the ilermo and Jenkins norms and D. G. Doren's ıpublished norms for associations to the Palermo ıd Jenkins response words. Twenty-four words were lected which had no appreciable associative relation-ip to each other (less than .2%). This list was also reened by the investigators to eliminate any obvious lationships that might have survived the associative reening test. The words in the unassociated list were ɔmparable to the words in the list of associates in rms of length, letter frequency, and frequency of sage. The words were randomly ordered in the list.

Four unassociated filler words were added to each st, two at the beginning and two at the end to minimize rimacy and recency effects. The filler words were not ıcluded in any of the data analysis.

asks

The five orienting tasks employed were:

Pleasant–unpleasant rating. This task involved rating ıe words as to their pleasantness or unpleasantness on simple five-point rating scale. The task was essen-ially the same as the semantic task used by Hyde and enkins (1969).

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

E–G checking. This task consisted of detecting the ccurrence of the letters "E" and "G" in the spelling f the stimulus words. Subjects were instructed to nake a check on their rating sheet if either or both of hese letters occurred in the word. This task was essen-ially the same as that used by Hyde and Jenkins (1969).

Parts of speech. On this task subjects were asked to ecord whether the words were nouns, verbs, adjectives, r "some other" part of speech. They were provided vith a check sheet that had these categories labeled for ach item. The subjects were told that if they were not ertain about the particular part of speech, they were o guess, or put down whatever they thought best. Also, many of the words were ambiguous, in that they ould 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 recall 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 *N*s 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, $F(4, 513) = 9.30$.

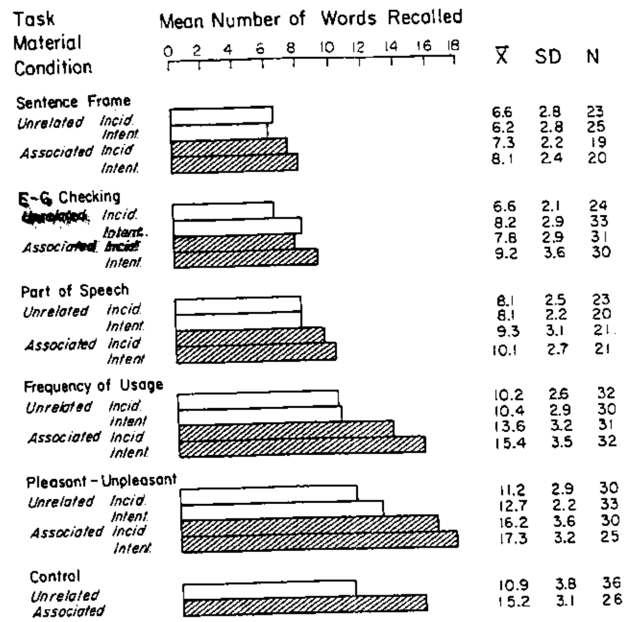

FIG. 1. Number of words recalled by subjects performing each task under both conditions of intentionality for unrelated and associated word lists.

Study of Figure 1 reveals the source of the List × 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–G 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 ight be worth pursuing, one finds that the mantic tasks and the *Control* group form ıe cluster of conditions that seems homoneous with only marginal exceptions. With e associated list, the *Frequency of usage* oup was different from the *Pleasant–pleasant* group at the .05 level for both tentional and Incidental conditions and it ıs different from the *Control* group at the 5 level for the Incidental condition. For the ırelated list the three tasks are nowhere ıtistically different. In all experimental nditions, however, these semantic tasks ere found to be different from the nonmantic tasks beyond the .001 level.

Similarly, the nonsemantic tasks tend to rm a homogeneous block, with minor ceptions. In the conditions using the assoated list, the *Parts of speech* and *Sentence ame* groups were different from each other the .05 level of significance. With the ırelated word list in the Intentional condition ıe *Sentence frame* group was different from ıe *Parts of speech* and the *E–G checking* oups at the .05 level. Otherwise, these groups ere not significantly different from each her, but were always different from the mantic and *Control* groups at the .001 vel.

Since such minute comparisons leave true gnificance levels in doubt, it was decided to st the Task differences with the Bonferroni t ocedure (Miller, 1966). This procedure, hich is a very conservative one in this case, as applied to the Task analysis, with the ıta pooled across all other experimental nditions. The comparisons chosen for test ere those which dictated the original choice f tasks, that is, the control, the semantic, and ıe nonsemantic conditions. All Bonferroni are based on 513 *df* and three comparisons. he semantic tasks were not different from ıe control tasks ($t = .18$, n.s.); while the onsemantic tasks were reliably different $= 3.01$, $p < .01$). As expected, the semantic ısks were significantly different from the onsemantic tasks ($t = 3.07$, $p < .01$).

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

	Conditions			
	Incidental		Intentional	
Tasks	Mean	SD	Mean	SD
Sentence frames	25.2	21.4	21.6	17.1
E–G checking	12.8	15.3	21.0	19.1
Part of speech	30.8	21.5	36.8	24.0
Frequency of usage	61.3	24.7	72.0	21.1
Pleasant–unpleasant	63.6	21.9	60.2	21.3
Control	—	—	63.3	27.1

semantic task or the control learning task show high proportions of clustering. These groups performing graphic or syntactic tasks show very low proportions of clustering.

Analysis of variance revealed no significant effect with respect to differences in clustering across the Intentionality conditions, but a highly significant effect with respect to the Task variable, $F(1, 250) = 58.2$, $p < .001$. The interaction of Intentionality and Task was not statistically significant.

Again, if one examines all comparisons under the Incidental and Intentional conditions, minor variations from the two major blocks of tasks (semantic and nonsemantic) can be detected. The *E–G checking* task was marginally different from the *Part of speech* task at the .01 level under both Intentional and Incidental conditions. The *Sentence frames* task was different at the .05 level from the *Parts of speech* task under the Intentional condition. Likewise the *Frequency of usage* task yielded more clustering than the *Pleasant–unpleasant* task under the Intentional condition, $p < .05$. However, the major differences, as before, were the contrasts between the semantic tasks and the *Control* condition on the one hand and the nonsemantic tasks on the other. All such contrasts are significant beyond the .001 level.

General Discussion

The data reported here support the guidin hypothesis that tasks which call for th processing of semantic features of words wi make these features available during recal and that the subject can use this informatio to organize his recall in a semantic fashion. The present study has broadened the rang of tasks that have been examined in exploring the effect of different kinds of orienting tasks on the amount and structure of recal 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 ratings, finding nouns for adjectives and adjectives for nouns, estimating frequency of usage of th words, and active–passive ratings (see Hyde & Jenkins, 1969; Johnston & Jenkins, 1971; Postman, Adams, & Bohm, 1956; Hyde, in press, respectively). Tasks which requir processing of the graphic or acoustic form of the stimulus words result in poor recall and little associative structure. Such tasks includ letter checking, word length, rhyming, numbe of syllables, and voice of the speaker (se Hyde & Jenkins, 1969; Johnston & Jenkin 1971; Walsh & Jenkins, 1973). The prese study has added two new tasks to the lis namely, the assigning of parts of speech an fitting words into sentence frames. These tas are especially important because they a unrelated to the acoustic or graphic form the words. They force us then to consid semantic processing versus all kinds nonsemantic processing, rather than restric ing ourselves to meaning versus form of t stimulus, as we did in our earlier studies.

It is clear from the foregoing that tas which have the same effects need not invol similar responses at any simple level of analy and, conversely, that tasks which appear involve identical superficial responses (sa checkmarks on a scale) may have radica different effects on subsequent performan In short, these findings argue that a processi 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 for 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.

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