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Levels of Processing and Organization: Additive Effects of Individual-Item and Relational Processing

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Two experiments were designed to investigate and integrate research from organizational and levels-of-processing perspectives. In the first experiment, subjects were given incidental learning instructions that directed attention either to relational aspects of items in a list or to the individual items themselves or to both. This processing was either semantic or nonsemantic in nature. The typical levels-of-processing effect was observed with the semantic and nonsemantic tasks for both relational and individual-item processing. Free-recall and recognition performance were found to be determined by the additive combination of relational processing and individual-item processing. Also, the two kinds of processing had functionally different effects on memory when clustering, recognition scores, and false alarms were examined. Relational processing apparently enhanced the formation of retrieval schemes, whereas individual-item processing seemed to facilitate discriminative processes. In the second experiment, the relative importance of relational and individual-item processing was shown to be dependent on the saliency of the structure of the learning materials. It is argued that the distinction between these two types of processing is a useful one and should be considered in relation to the structure of the learning material and to the type of memory task.

As recently as 1970, the study of memory was experiencing a revolution, with "the insurgents marching under the banner of cognitive organization" (Bower, 1970, p. 18). Organization, a process of grouping information into new and larger units, was considered to be absolutely necessary for optimal retention (Mandler, 1967). Indeed, a considerable amount of empirical support was generated for this position. In spite of the fervor and success, research on organizational processes dwindled rapidly, and concern with organization as a basic explanatory principle is now virtually nonexistent. This curious historical turn, also noted by Battig and Bellezza (1980), prevails despite complete acceptance of the importance of organizational factors for memory.

The demise of the study of organization may be due in large part to the development of the levels-of-processing framework (Craik & Lockhart, 1972). Although levels of processing and organization are not conceptually incompatible, experiments within each framework have focused on different aspects of the to-be-remembered material. The organizational approach tends to direct attention to relationships among list items, whereas the levels-of-processing approach requires the subject to focus on individual items. Thus the preoccupation with levels of processing results in experimental paradigms in which organization is unlikely to be of explanatory value.

It is conceivable, however, that informa-

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tion concerning both specific items and relational aspects of the list would be useful. Moreover, close examination of the two approaches reveals that both types of processes (processing) are required by either the organizational or the levels-of-processing analysis. For example, organization of a list logically requires processing of information concerning the individual items. Likewise, the recent addition of elaboration to the levels-of-processing approach (Craik & Tulving, 1975) requires a pronounced relational emphasis there as well. Although elaboration has typically been conceptualized to involve relationships in semantic memory, it is equally plausible that relationships among list items are also encoded through elaborative processing. Bearing these considerations in mind, it is not clear that organization and individual-item processing tasks would differentially affect performance and consequently that theoretical distinctions between the two are necessary.

Data are available, however, which indicate that the distinction between relational and individual-item processing may be useful. Bellezza, Cheesman, and Reddy (1977) have directly compared the effects of these two types of processing. Using lists of unrelated words, they had subjects create sentences for each item, but for half of the items, subjects were instructed to make their sentences part of a continuing story. Reliably higher recall occurred for the items that had been processed with story sentences. Organizational processing was therefore assumed to produce greater recall than elaborative processing. Furthermore, asking subjects to write a short definition of each item before creating a sentence for that item had no effect on recall for story or nonstory conditions. Their general conclusion was that semantic processing beyond the point of comprehension has little if any effect on increasing the probability of recall, unless that processing is organizational in nature.

Although these data are provocative, several fundamental questions remain unanswered. Perhaps most basic is whether the effects of organizational and individual-item processing are best described in terms of the same mediating mechanism. The results of Bellezza et al. (1977) certainly could be described in terms of a single mechanism to which organization and individual-item encoding contribute additively; for example, both processes could be described as semantic elaboration of the encoded information. That is, having subjects create sentences for items that are part of a continuing story may lead to greater elaboration of those items, relative to forming nonstory sentences for those items. Consistent with this interpretation is the failure of Bellezza et al. to find any reliable organizational differences in recall protocols between their story and nonstory processing conditions. Alternatively, arguments can be developed that specify different functions for relational and individual-item information. For example, relational information among list items might be crucial for the development of an effective retrieval scheme. However, once access is gained to the organized material, information concerning the individual items could serve a useful discriminative function.

If such were the case, the two forms of information would combine to determine performance, and it is reasonable to assume that the weight of each process would vary depending on the task. For example, Begg (1978) has shown that related words are better remembered if the orienting task draws attention to differences among the words, whereas unrelated words are better remembered if similarity relations are processed. Begg suggests that the importance of search and decision varies with the relationships among the items and that the effects of a particular type of processing will depend on the difficulty of the search or decision component. This approach is similar to our argument for different functional roles for relational and individual-item information and is also pertinent to the generality of the interpretation of Bellezza et al. (1977).

Experiment 1

In the study by Bellezza et al. (1977), the words were unrelated. In the view presented here, such words would pose mini-

mal problems in decision but would require extensive processing in the development of an organized retrieval scheme. Hence, the overwhelming contribution of organizational processing is understandable. However, our reasoning suggests that individual-item processing would become more influential under circumstances in which discrimination among list items is more difficult. Thus in Experiment 1 conceptually related words were processed through an orthogonal combination of semantic and nonsemantic individual-item and organizational orienting tasks. The primary question is whether individual-item processing facilitates recall above the level of organizational processing. If the two orienting activities both contribute to performance, the theoretical description of these effects then becomes an interesting issue. To assess the value of separate descriptive mechanisms, several dependent measures were included in addition to recall. In particular, a recognition test and a clustering analysis served to provide additional information. If relational and individual-item processing serve different functions, performance on these measures may be differentially affected by the orienting activities, even though both facilitate recall.

Method

Subjects. The 162 subjects were introductory psychology students fulfilling a course requirement through their participation. One third of the 18 subjects in each condition were from Furman University, and the remaining subjects were from the University of North Carolina at Greensboro. All subjects were tested in groups of 2 to 5, and each session lasted approximately 25 min.

Design and materials. All subjects were presented with the same list of 36 concrete nouns. The items were chosen from the Battig and Montague (1969) norms, and the list was composed of six items from each of six taxonomic categories of intermediate potency ratings (6.19–9.03; animals, fruits, weather phenomena, occupations, metals, and kitchen utensils). Also, each of the six nouns within each category began with one of six first letters (l, c, s, b, m, t). Consequently, the list could be grouped into nonoverlapping categories either by taxonomic category or by first letter. Within the restrictions imposed by the structure of the learning materials, the items that were selected were generally frequent members of their categories (mean rank = 12.2–14.5).

The design of this experiment was a $2 \times 3 \times 3$ factorial, including the variables of student populations (Furman, Greensboro), individual-item processing (none, nonsemantic, semantic), and organizational processing (none, nonsemantic, semantic). Memory was evaluted by a free-recall test that was followed by a recognition test.

The described design resulted in nine groups that differed in terms of their processing requirements. For the individual-item tasks, subjects either rated the ease of forming a rhyme for that item (the nonsemantic task) or rated the pleasantness of that item (the semantic manipulation). For the organizational tasks, subjects either sorted the items into groups based on first letters (the nonsemantic task) or into groups based on taxonomic categories (the semantic task). Within this design there was one group that did no processing of either type—the intentional learning control group. The other eight groups of subjects were given incidental learning instructions, and four of these groups performed one orienting task, whereas the other four performed two orienting tasks (an individual-item task and an organizational task).

Procedure. To maintain an incidental learning situation for those subjects who performed orienting tasks, subjects were told that the purpose of the experiment was to investigate judgments of word characteristics. Subjects in the intentional condition were given standard free-recall instructions.

Each list item was typed in the center of a 3-in. × 5-in. (7.62-cm × 12.7-cm) index card, and subjects were given a stack of 36 cards (face down) at the start of the experiment. The list order was systematically randomized, with the restrictions that an equal number of words from each taxonomic and letter category appeared within each half of the deck and that no two words from the same taxonomic or letter category were ever adjacent. The list order was constant for all subjects. During the experiment, subjects selected the top card and performed the individual and/or organizational task before going on to the next item. For the individual-item tasks, subjects rated either the ease of forming a rhyme or the pleasantness of the items on a 5-point rating scale. Subjects who performed organizational processing had a large cardboard sheet in front of them with the six category labels that conformed to their particular condition (taxonomic categories or first letters) printed on the sheet. They were instructed to place each item, face down, under its appropriate category label. Subjects who performed two orienting tasks first performed the individual-item task and then the organizational task. Several examples were given to subjects prior to the experiment, and subjects were instructed to work at their own rate. These orienting tasks were followed immediately by a 5-min. free-recall test. Then subjects were given an untimed recognition test consisting of 144 concrete nouns chosen from the Battig and Montague (1969) norms. The recognition test contained the 36 target items plus 108 distractor items. The distractor list contained 36 items from each of the following three types: (a) items from the same taxonomic categories as the targets, (b) unrelated items from the same first-letter categories as the targets, and (c) items from the same taxonomic and first-letter categories as the targets. Within these require-

ments, distractors of highest frequency were selected for the recognition list. Two list orders were constructed, with the second order being the reverse of the first. Half of the subjects in each condition were presented with each recognition test order.

Results

The results are presented in relation to the major questions addressed by this study. First, the recall data are examined for evidence of contributions from the two types of processing. Then the data bearing on the functional similarity of the orienting tasks are provided. Preliminary analyses revealed that there were no interactions between experimenter and the other variables, and consequently the reported analyses are collapsed over the experimenter variable. Since the level of organization and individual-item processing cannot be assessed in the intentional condition, these data were not included in any of the following statistical analyses. To eliminate the influence of this control group, two major analyses were conducted: (a) a comparison of the semantic and nonsemantic levels of individual-item processing with the three levels of organizational processing and (b) a comparison of the semantic and nonsemantic levels of organizational processing with the three levels of individual-item processing.

The recall data are presented in Table 1 as a function of type of orienting task. As can be seen in Table 1, the levels of both categorization and individual-item processing influenced performance, $F(2, 102) = 38.61$, $MS_e = 19.14$; $F(2, 102) = 41.37$, $MS_e = 18.07$, respectively. (All significant comparisons attained at least the .05 level.)

Table 1
Number of Items Recalled as a Function of Level of Organizational and Individual-Item Processing

Individual-item processing	Organizational processing		
	Taxonomic	First letter	None
Pleasantness rating	26	19	19
Rhyme rating	19	10	10
None	19	9	20

Table 2
Taxonomic Clustering as a Function of Level of Organizational and Individual-Item Processing

Individual-item processing	Organizational processing		
	Taxonomic	First letter	None
Pleasantness rating	.84	.48	.53
Rhyme rating	.58	−.04	.06
None	.78	−.08	.51

In both cases, planned comparisons showed that semantic processing led to higher performance than nonsemantic or no processing, all $Fs(1, 102) \geq 77.21$, $MS_e s \leq 19.14$, and the latter two did not differ, all $Fs < 1$. Again, the none–none data are not included in these analyses. The similarity of the effects of these two types of variables can be seen clearly in the comparisons of pleasantness–none with rhyme–none and of category–none with first-letter–none. These comparisons show that recall following semantic and nonsemantic individual-item processing is virtually identical to that of semantic and nonsemantic organizational processing. Although the processes seem to have similar effects, the combination of semantic categorization and semantic individual-item processing produces a higher level of performance than either does alone. The pleasantness–category condition was reliably superior to all others, all $Fs(1, 102) \geq 9.60$, $MS_e s \leq 19.14$. Thus the data clearly demonstrate an additive effect of relational and individual-item processing.

Several aspects of the data, however, suggest that the additive effect was mediated through different mechanisms. Consider first the clustering analysis of the recall scores that is presented in Table 2. The measure used for category clustering was Roenker, Thompson, and Brown's (1971) adjusted ratio of clustering (ARC) score, and as is evident from Table 2, the amount of clustering varied systematically with the type and level of orienting activity. Nonsemantic tasks produced chance groupings in terms of taxonomic categories, whereas

Table 3
Corrected Recognition Scores for Organizational and Individual-Item Processing

Individual-item processing	Organizational processing		
	Taxonomic	First letter	None
Pleasantness rating	34 (1.33)	30 (2.61)	29 (2.00)
Rhyme rating	28 (2.56)	22 (3.56)	22 (3.61)
None	20 (6.78)	10 (8.06)	24 (3.00)

Note. Mean number of false alarms are in parentheses.

semantic processing of either type led to significant clustering scores, all Fs(1, 102) $\geq$ 20.31, MS_es $\leq$ .10. Planned comparisons revealed that the category orienting task produced reliably greater clustering than did the pleasantness-rating task, $F(1, 68) = 4.53$, $MS_e = .13$, even though recall performance did not differ between these two conditions. Furthermore, pleasantness–category orientation did not reliably increase clustering, compared with category orientation alone, $F < 1$. Consequently, the difference in recall between these two groups cannot be attributed to differences in clustering. These two comparisons suggest that organizational and individual-item effects on recall may be mediated by different mechanisms.

This speculation is also consistent with the effects of the two types of processing in recognition, as compared with recall. The corrected recognition scores (hits minus false alarms) are presented in Table 3 as a function of orienting activity. As with the recall results, the organization of items by taxonomic categories led to higher recognition performance relative to nonsemantic and no organizational processing, $F(1, 102) = 20.33$, $MS_e = 32.02$, whereas the latter two did not differ, $F < 1$. (As with all previous analyses, the data from the none–none condition were excluded from the recognition analyses.) Therefore, only semantic organizational processing facilitated recognition performance relative to no organizational processing. Unlike the effects of the organizational variable, the individual-item manipulation had different effects on recall and recognition. Semantic processing produced higher recognition performance than did nonsemantic processing, $F(1, 102) = 25.32$, $MS_e = 33.73$, which in turn was superior to no individual-item processing, $F(1, 102) = 51.60$, $MS_e = 33.73$. This latter result indicates that nonsemantic individual-item processing, which does not aid recall relative to no individual-item processing (excluding the none–none condition), is useful for recognition decisions.

To examine more fully the different effects of individual-item and organizational processing on recognition, comparisons were made of the four single processing conditions. As mentioned previously, when the recall data for these four groups were analyzed, comparable scores were obtained for individual-item and organizational processing, with the semantic nature of the task determining the level of recall performance. However, as can be seen in Table 3, both the type and level of processing had reliable effects on recognition performance. Semantic processing produced higher recognition than nonsemantic processing, $F(1, 68) = 37.05$, $MS_e = 33.96$, and subjects correctly recognized more items following individual-item processing (pleasantness–none and rhyme–none) than relational processing (category–none and first-letter–none), $F(1, 68) = 58.74$, $MS_e = 33.96$. In short, individual-item processing was not different from organizational processing for free-recall performance but was superior when memory was tested with recognition.

In spite of the differential effectiveness of these two types of processing on recognition memory, recognition performance was also determined by the additive influence of organizational and individual-item processing. Optimal recognition performance resulted when subjects engaged in both semantic organizational and individual-item processing, all Fs(1, 102) $\geq$ 4.04, MS_es $\leq$ 33.73.

To evaluate further any functional distinctions between the processes of organizational and individual-item elaboration, recognition false alarms were analyzed for the different conditions, and the results

are presented in Table 3. These analyses showed that individual-item processing is much more effective in reducing false alarms, when compared with organizational processing. Performing an organizational task in addition to an individual-item task had little effect on reducing false alarms. This can be seen by comparing the rhyme–none condition with the rhyme–category and rhyme–first-letter conditions and by comparing the pleasantness–none group with the pleasantness–category and pleasantness–first-letter condition (all Fs < 1). Although the taxonomic category orienting task tended to reduce false alarms relative to the nonsemantic and no organization conditions, this difference was not reliable, $F(1, 102) = 2.38$, $MS_e = 10.07$. Individual-item processing, however, significantly reduced false alarms, with both pleasantness rating and rhyme rating producing a lower false alarm rate than no individual-item processing, $F(1, 102) = 31.32$, $MS_e = 18.42$. The different false alarm rate following semantic and nonsemantic individual processing was also reliable, $F(1, 102) = 4.25$, $MS_e = 10.07$. These recognition measures are not consistent with the assumption that processing tasks affect the decision criterion. The false alarm rate was not correlated with hit rate across processing conditions. For example, subjects in the pleasantness–none and category–none conditions produced an identical number of old responses, but the false alarm rate was much higher in the category–none condition.

The false alarms were further analyzed as a function of type of distractor. The primary result of this analysis demonstrated that organizational processing alone led to high false positives on distractors from the same category as the target ($M = 6.61$). However, the addition of an individual-item task, pleasantness, or rhyme, significantly reduced the false alarm rate to these categorical distractors ($M = 1.33$ for pleasantness–category and 2.27 for rhyme–category). That individual-item processing is effective for rejecting same category distractors is also apparent from the low false alarm rate to these types of distractors in the pleasantness–none ($M = 1.67$) and rhyme–none ($M = 2.28$) conditions.

As can be seen in Tables 1–3, performance across the various dependent measures by subjects in the intentional control condition was most similar to the performance of subjects performing one semantic individual-item orienting task.

Discussion

Two basic questions were posed by this experiment: Do organizational and individual-item orienting tasks affect retention additively? And if so, are these effects best described in terms of different mechanisms? The results suggest affirmative answers to both questions. The combination of taxonomic organization and pleasantness rating produced performance superior to that of either task alone. Both types of orientation are important to recall, but the effects appear to be functionally different. Although the two processes facilitated recall, taxonomic clustering was much greater following categorization than following pleasantness rating. This result is important in suggesting that individual-item and relational processing produce different types of information, and the fact that clustering and recall relationships are correlational is irrelevant to this point. Individual-item processing had a greater effect on recognition than did relational processing. False alarms were substantially reduced by individual-item tasks but were relatively unaffected by organizational activities. These results suggest different functional roles for the two types of processing.

A reasonable conceptualization of these differences begins with the assumption that the processes direct attention to different types of information. Taxonomic organization activates relational information shared by list items, whereas pleasantness ratings activate information specific to each individual item. We are not claiming that the semantic individual-item task is less elaborative than the organizational task. Rather, the organizational activity produces information common to list items, whereas the individual-item task leads to item-specific information. Thus the distinction

between relational and individual-item information is based on the extent to which the same information is encoded for all items, not on the degree of assumed elaboration of each item. Moreover, the amount of either type of information activated by a particular orienting task is a matter of degree. The significant clustering in the pleasantness-rating task, although less than that following organization, suggests the activation of shared information. Individual-item information will include features shared by related words, and logically taxonomic categorization must require some determination of the individual-item characteristics. With these qualifications, the distinction between relational and individual-item information appears to be useful for understanding the functional differences between the orienting tasks at the time of retrieval.

Along with organizational theorists (e.g., Tulving, 1964), we assume that relational information facilitates the development of a retrieval plan. The retrieval plan allows initial generation or reconstruction of to-be-remembered material. The individual-item information serves a discriminative function of editing generated or reconstructed information according to the individual's criterion for acceptability. This view of retrieval is consistent with the reemergence of the two-stage model of retrieval (e.g., Begg, 1978; Norman & Bobrow, 1979) and provides a useful framework for understanding the role of relational and individual-item information.

As applied to our results, the additive effect of organizational and individual-item processing reflects the operation of generative and discriminative components of retrieval in recall. The recognition data differ, but this is understandable, if recognition is assumed to be more dependent on discriminative processes than on generative retrieval plans. Thus the effect of organization on recognition is reduced relative to recall, whereas the individual-item tasks have a considerable effect on recognition. Considering the false alarms, individual-item tasks, including the nonsemantic task, are influential in discriminating between old and highly similar new items. These data are compatible with the view that individual-item processing adds distinctive information to organized material.

It is true, however, that all dependent measures showed the typical robust effects of semantic processing. Nonsemantic processing, with both organizational and individual-item tasks, produced poor performance in recall and recognition. Of the metaphors used to describe the general superiority of semantic processing, we prefer distinctiveness (e.g., Hunt & Elliott, 1980; Hunt & Mitchell, 1978). With either organizational or individual-item processing, the more abstract, conceptually based information resulting from semantic orientation provides greater specification of the words required by our tests. For example, a retrieval strategy based on the memory that some of the words were names of different animals would be more useful in delineating the search set than a strategy based on memory that some of the words began with the letter *S*. Within the particular set specified by the relational information, distinctive information that represents a particular item allows for finer discriminations among response alternatives.

The concept of distinctiveness, however, is clearly relative. As Morris, Bransford, and Franks (1977) have shown, the relative effectiveness of semantic and nonsemantic tasks depends on the information required at testing. The same consideration applies to the distinction between relational and individual-item information. In our view, the relative importance of each type of information will depend on the relative difficulty of generation and discrimination. This difficulty will depend in part on the nature of the material as well as on the type of test. For example, similarity among weakly related items may not be noticed without explicit organizational processing, but discrimination among these items would not be difficult. Bellezza et al. (1977) used unrelated words, and their finding that organizational processing was more important than individual-item processing can be understood in terms of the requirements posed by such materials. Similar findings have been reported by Begg (1978) and Epstein, Phillips, and Johnson (1975).

These latter studies also report that highly related words are better retained following processing that emphasizes the difference between the words. Thus the relative effect of relational and individual-item information will depend on the relative difficulty of developing general retrieval strategies and discriminating among generated words, problems determined in part by the nature of the material.

Experiment 2

The second experiment was designed to apply these ideas to lists of words that varied in the saliency of their interrelationships. Organizational processing and individual-item processing were imposed on either highly related, taxonomically categorized words or words whose relationships were more obscure. Under these circumstances, our ideas concerning organizational and individual-item processing predict better performance on lists of related words following individual-item processing, but organizational processing should produce better performance on lists of words whose relationship is obscure. Furthermore, the conceptualization derived from the first experiment has direct implications for the correlations between clustering and recall in the second experiment. On the assumption that optimal recall results from a combination of relational and item-specific information, the correlation between clustering (our index of relational information) and recall should be highest when both types of information are encoded. The most favorable conditions for the encoding of both types of information occur with organizational processing of lists of unrelated words and individual-item processing of lists of related words. The saliency of word relationships in the categorized list and the imposition of organizational processing on the lists of unrelated words should produce relational encoding in both cases, leading to high levels of clustering. The addition of individual-item processing to the already salient relational information of the categorized list and the saliency of individual-item information in lists of unrelated words, even when processed categorically, should facilitate recall. Thus the correlation between clustering and recall should be highest in the two combinations of list structure and processing task that encourage both relational and item-specific encoding.

Method

The 48 subjects were introductory psychology students fulfilling a course requirement through their participation. All subjects were tested individually, and each session lasted approximately 20 min.

Four groups of 12 subjects were used to form a complete 2 × 2 factorial design in which the variables of list structure (related words, unrelated words) and type of processing (relational processing, individual-item processing) were manipulated.

All subjects were required to perform either relational or individual-item processing on one of two 30-item lists of nouns that differed in terms of their taxonomic organization. Related words were chosen from the Battig and Montague (1969) norms and included 5 items from each of six taxonomic categories (animals, parts of the body, articles of clothing, musical instruments, insects, and fruits). The items were familiar words and were frequent members of their categories (mean rank = 8.2–8.6). The list of unrelated words contained familiar nouns, and these were generated by the experimenters. Although this list did not have a salient taxonomic structure, it contained 5 items from each of six broad categories (*things that are green, liquids, things that make noise*, things made of wood, things that fly, and things women wear). Through pilot work it was found that subjects did not normally recognize these general categories and essentially perceived the words as unrelated.

Each list item was typed in the center of a 3-in. × 5-in. (7.62-cm × 12.7-cm) index card, and subjects were given the appropriate stack of 30 cards (face down) at the start of the experiment. The constant word order for each list was systematically randomized, with the restrictions that an item from each taxonomic category appeared within each fifth of the list and that no two words from the same category were ever adjacent.

To maintain an incidental learning situation, subjects were told that the purpose of the experiment was to investigate judgments of word characteristics. During the experiment, subjects selected the top card and performed the individual-item or organizational-orienting task before going on to the next item. For the individual-item task, subjects rated the pleasantness of the items on a 5-point scale. Subjects who performed relational processing had a large cardboard sheet in front of them with the six category labels that conformed to their particular list printed on the sheet. They were instructed to place each item face down under its appropriate category label. An example was given to subjects prior to the experiment, and subjects were instructed to work at their own rate. When subjects were finished, all materials were removed, and they were given math problems to work on for 1 min. This was followed immediately by a 5-min. free-recall test.

Table 4
Number of Words Recalled as a Function of List Structure and Type of Processing

List structure	Type of processing: Individual item	Type of processing: Relational
Related	19.58 (.526)	16.17 (.641)
Unrelated	15.75 (.091)	18.58 (.475)

Note. Clustering scores are in parentheses.

Results

The mean number of words recalled and clustering scores are presented in Table 4, the rejection level for the analyses was set at .05. There were no main effects of either the type of list of the type of processing on free recall (Fs < 1). However, as was predicted, there was a reliable interaction between these two factors, $F(1, 44) = 10.44$, $MS_e = 11.22$. This interaction indicated that the effectiveness of relational and individual-item processing for free recall depended on the structure of the learning materials. Individual-item processing was superior to relational processing with a list of related words, $F(1, 44) = 6.24$, $MS_e = 11.22$, whereas relational processing yielded higher recall than did individual-item processing with a list of unrelated words, $F(1, 44) = 4.29$, $MS_e = 11.22$. Subsequent analyses indicated that this interaction was due to differences in the number of items per category recalled.

To determine subjects' perception of the structure in the list of unrelated words and any organizational differences between the different conditions, category clustering scores were calculated. Due to experimenter error, four subjects were dropped from the present analyses. We used Roenker et al.'s (1971) ARC score, and as can be seen in Table 4, both the type of processing, $F(1, 40) = 14.53$, $MS_e = .05$, and list structure, $F(1, 40) = 21.05$, $MS_e = .05$, affected clustering. Predictably, relational processing led to greater clustering than did individual-item processing, and clustering was greater for the list of related words relative to the list of unrelated words. However, a significant interaction, $F(1, 40) = 4.17$, $MS_e = .05$, indicated that relational processing increased clustering to a greater extent with a list of unrelated words than with a list of related words. Further analyses revealed that all groups exhibited significant clustering, all Fs$(1, 40) \geq 49.64$, $MS_e = .05$, except for the pleasantness–unrelated list condition, $F(1, 40) = 1.82$, $MS_e = .05$. This latter result indicates that the list of unrelated words was generally perceived not to be related unless subjects were specifically made aware of its taxonomic organization.

Correlational analyses between clustering and recall scores were also performed for each of the groups. As predicted, there were positive correlations in the pleasantness–related list condition, $r(9) = .62$, $p < .05$, and in the category–unrelated list group, $r(9) = .43$, $p > .05$. This latter correlation, although not significant because of the small degrees of freedom, is nonetheless suggestive. There were no reliable correlations between clustering and recall in either the category–related list group, $r(9) = -.18$, or in the pleasantness–unrelated list condition, $r(9) = -.11$.

Discussion

The results of the second experiment provide more evidence that relational information and item-specific information are important to memory. Recall was highest following organizational processing of lists of unrelated words and individual-item processing of lists of related words. The inter-item relationships in the lists of related and unrelated words presumably obligate the encoding of relational and item-specific information, respectively. Thus requiring organizational processing of lists of related words and individual-item processing of lists of unrelated words is superfluous. The addition, however, of organizational processing to lists of unrelated words and individual-item processing to lists of related words encourages encoding of information that is not processed obligatorily due to list structure.

The clustering measures are consistent with inferences concerning the encoding of

relational information. Organizational processing of lists of both related and unrelated words led to high levels of clustering, as did individual-item processing of lists of related words. This latter result indicates that the processes of encoding relational information are facilitated by either organizational instructions or salient relational list structures. Neither the to-be-remembered materials nor the orienting task was conducive to relational processing when lists of unrelated words were processed through individual-item tasks.

Although the clustering scores were highest under conditions encouraging relational processing, the pattern of correlations between clustering and recall clearly suggests that relational information is not sufficient for optimal recall. The highest clustering–recall correlations occurred under conditions that encouraged both individual-item and relational processing. Organizational processing of lists of unrelated words and individual-item processing of lists of related words provide for the encoding of both relational and item-specific information. In our previous argument, these are the optimal conditions for recall, and given significant clustering in these conditions, high correlations between clustering and recall are to be expected. Thus the patterns of recall, clustering, and correlations between clustering and recall are highly consistant with the assumption that organizational and individual-item processing are mediated by different retrieval mechanisms, both of which are important to recall.

General Discussion

Our conceptualization of the differential effect of the two types of processing assumes that relational and individual-item information affects access and discrimination or decoding, respectively. That is, organizational processing encourages the abstraction of similarities among to-be-remembered events. The encoding of information concerning the general relationships abstracted from the instances presented at input may serve as a useful retrieval strategy during output. However, the abstract information must not only be accessed but also decoded to specific instances. Item-specific information serves this decoding process in that general, abstract information is supplemented by distinctive information concerning each instance.

At a more general level, the relative nature of these effects should be reexamined. The guiding framework for this research involves consideration of encoding process, stimulus structure, and test task. Thus the interpretation emphasizes the interaction between process and structure at encoding (Hunt, Elliott, & Spence, 1979). The structural representations of relational and individual-item information are available in semantic memory, and the information activated as the representation of a particular event is determined by the encoding process. Both process and structure are necessary considerations. The subsequent effectiveness of the product of this interaction will hinge on the test requirement.

The distinction between relational and individual-item information may prove to be a useful framework for a variety of questions. The distinction has been helpful in considering the differential effects of organizational tasks and of tasks directed to individual items. Further research on this question is obviously needed, given the importance of both tasks to retention. Perhaps even the central question from the levels-of-processing literature, how best to characterize the differential effectiveness of semantic and nonsemantic tasks, may be approached as a matter of differential activation of functional relational information. This suggestion is subtly different from Craik and Tulving's (1975) concept of elaboration in that relational information is considered here to involve intralist relations. Nonsemantic tasks may be devoid of relational information that is useful for recall. Keeping in mind the relative nature of the distinction, consideration of relational versus individual-item information may be useful for a variety of other problems. For example, the distinction might be helpful in the analysis of cue effectiveness. The concept of cue overload (Watkins & Watkins, 1975) and the data from Fisher and Craik

(1977) on cue–target distinctiveness emphasize the importance of distinct cue–target relations. Yet shared cues, such as category superordinates, are known to be effective in retrieval under certain conditions. A more detailed understanding of cuing phenomena might be provided by considering the importance of relational versus individual-item information. It is also possible that relational and individual-item information may prove to be useful in analyzing forgetting. For example, McDaniel and Masson (1977) found better long-term retention following intentional rather than incidental semantic processing and a higher level of clustering associated with intentional memory. Perhaps relational information remains useful for longer periods of time than individual-item information; if so, the mechanisms mediating these effects are important.

Thus the distinction between relational and individual-item information appears to be useful not only in describing our data but also in application to other phenomena. The results generating this distinction suggest that organizational and individual-item processing are both important to memory and may be mediated by different mechanisms. This demonstration adds a new and important dimension to research concerning encoding processes, and we suggest that close consideration of this issue might provide some insight into other existing questions.

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