TWO MORE INCIDENTAL TASKS THAT DIFFERENTIALLY AFFECT ASSOCIATIVE CLUSTERING IN RECALL

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A word list comprised of pairs of highly associated words was presented in the same random order to each of five groups. Groups 1 and 2 were told to write a rhyming word. Groups 3 and 4 wrote proper modifiers or nouns. Group 5 (control) simply "took dictation." Groups 2, 4, and 5 were prewarned of the recall task; Groups 1 and 3 were not. All groups were required to recall the stimulus words immediately after the list presentation. Both associative clustering and amount of recall were significantly greater for Groups 3, 4, and 5 than for either rhyming group. The rhyming task was construed as inhibiting the assignment of meaning to words by S's, thereby reducing the amount of clustering and recall.

Hyde and Jenkins (1969) studied the effects of three different orienting (incidental) tasks on associative clustering in recall. Their S's performed one of these tasks during the presentation of a tape-recorded, randomly mixed list of 24 words consisting of 12 highly associated pairs. Recall of the list was required after the presentation was completed, and the amount of associative clustering was measured. The three orienting tasks involved: (a) judging the pleasantness of each stimulus word, (b) deciding whether each word in the list contained the letter "e," and (c) estimating the number of letters in each word.

The pleasantness-judging task resulted in a significantly greater amount of associative clustering and recall than either the "e" task or the number-of-letters task and was not different from a control group that was only instructed to try to remember the list. This was attributed to the fact that S's were required to treat each word as a meaningful unit in order to judge its pleasantness, whereas in the other two tasks, S's could view the word as an object in itself. Two alternatives may be proposed to explain the reduced associative clustering with the "e" task and the number-of-letters task: (a) it was a result of requiring S's to break the word down into its component letters and view it as a group of elements; or (b) it was a result of treating the word as an object without considering its semantic characteristics (or meaning).

In an attempt to decide between the above alternatives, the present study used rhyming as an orienting task. While rhyming does not require S to comprehend the meaning of each word, it does require responding to the word as a whole unit. An adjective-noun task, which requires S's to treat with the meaning of the stimulus words, was chosen as a counterpart. Like rhyming, this task requires S to produce and write down a word other than the stimulus word. Superficially this task appears to be at least as taxing and effortful as the rhyming task.

METHOD

The procedures of this experiment follow those used by Hyde and Jenkins (1969). The list of stimulus items contained a total of 28 words. The first word and the last 3 words in the list were fillers which had less than .63 association strengths with each other or with any other word in the list. Fillers were included at the ends of the list to help counteract serial position effects. The remaining 24 words consisted of 12 highly associated pairs of words. The range of intrapair association for college students was from .36 to .59 (Palmero & Jenkins 1964) with the exception of strategies less than .59.

The order of presentation of the task was randomized to ensure that the recall task was the same for all groups. The words were selected to ensure that none of the rhyming words in the list, there were 12 English language that rhyme each word was either a noun or a

The list was recorded with one every 5 sec. The S's were instructed to begin with the psychology laboratory course at the University of Minnesota. Five experimental groups were used: Group 1 (n = 29) merely wrote down the word as it was presented. These S's before the presentation began that to recall as many of the words as they could. The remaining four groups, termed the rhyming task and the adjective-noun task during the stimulus presentation. The rhyming task S's were given a rhyming word for each word in the list. One of the rhyming groups, the Rh group (n = 31), was instructed with the that they would have to recall if asked of the words in the stimulus list at other group, the Rhyming group not informed of the recall task unless completion.

The adjective-noun S's were reminded to appropriate adjective to modify the word if the stimulus was a noun or proper noun if the stimulus was an adjective. Noun + Recall group (n = 31) formed the stimulus lists presented. The adjective-noun group (n = 33) was the recall task until the list presentation. During the stimulus presentation each group responded to a separate page of response booklet.

The S's in the four incidental to recall at the beginning of the experiment was part of a larger group of persons could think of rhymers (rhyming groups) or a noun based on the adjective-noun groups) for each word list. This was done to keep groups from guessing the subsequent recall. It was also intended to encourage the

1 Preparation of this paper was supported in part by grants to the University of Minnesota, Center for Research in Human Learning, from the National Science Foundation (GB 17590), the National Institute of Child Health and Human Development (HD 01136), and the Graduate School of the University of Minnesota. Further support was received from the National Institute of Mental Health in the form of a fellowship (1-F01-MH-43, 804) to the primary author.

2 Requests for reprints should be sent to James J. Jenkins, Center for Research in Human Learning, 400 Ford Hall, University of Minnesota, Minneapolis, Minnesota 55455.

3 Also taken from D. G. Dorer norms using Palmero-Jenkins test responses as stimulus words, 1963.
Differentially in Recall

ENKINS

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The order of presentation of the words was random-ized with the restriction that no member of an associative pair was presented immediately adjacent to the other. The words were selected to meet three criteria: (a) none of them rhymed with any other word in the list, (b) there were common words in the English language that rhyme with them, and (c) each word was either a noun or an adjective.

The list was recorded with one word presented every 5 sec. The Ss were students in an introductory psychology laboratory course at the University of Minnesota.

Five experimental groups were used. The Control group (n = 29) merely wrote down each stimulus word as it was presented. These Ss were instructed before the presentation began that they would have to recall as many of the stimulus words as possible following the presentation. They were told, as were all of the groups at some point prior to the recall task, that the order of recall was not important.

Of the remaining four groups, two of them performed the rhyming task and two of them the adjective-noun task during the stimulus-list presentation. The rhyming-task Ss were required to write a rhyming word for each word in the stimulus list. One of the rhyming groups, the Rhyming + Recall group (n = 31), was instructed before the presentation that they would later have to recall as many of the words in the stimulus list as possible. The other group, the Rhyming group (n = 28), was not informed of the recall task until the list presentation was completed.

The adjective-noun Ss were required to write an appropriate adjective to modify the stimulus word if the stimulus was a noun or to write an appropriate noun that could be modified by the stimulus word if the stimulus was an adjective. The Adjective-Noun + Recall group (n = 37) was informed of the subsequent recall task prior to the stimulus list presentation. The other group, the Adjective-Noun group (n = 33), was not told of the recall task until the list presentation was finished. During the stimulus presentation, each S wrote one response on a separate page of an individual response booklet.

The Ss in the four incidental task groups were told at the beginning of the experiment that this experiment was part of a larger study for which they needed to know the relative ease with which persons could think of a rhyming word (for the rhyming groups) or a noun or adjective (for the adjective-noun groups) for each word in the stimulus list. This was done to keep the uninform- ed groups from suspecting the subsequent recall task. It was also intended to encourage the two Incidental

* Also taken from D. G. Doren's unpublished norms using Palmero-Jenkins associative norm responses as stimulus words, 1968.

Tasks Differentially Affecting Clustering

RESULTS

Virtually no responses were recorded by any of the Ss during the last minutes of the 5-min. recall period, indicating that Ss had sufficient time to record all of the words they could recall.

Data were analyzed for the total number of associative pairs (clusters) that occurred in recall, for the number of associative pair members recalled (regardless of whether only one or both members of a given pair were recalled), and for the number of intrusions. The clustering index (or percentage clustering if the index is multiplied by 100) was the fraction obtained by dividing the number of associative pairs that occurred during recall by the number of “opportunities for clustering.” An opportunity for clustering, which is synonymous with the term “category” used in Table 1, is defined by the occurrence of one of the members of an associative pair during recall. The subsequent appearance of the other member of the pair was not counted as an additional opportunity for clustering due to the S’s set not to repeat a response that had been given previously.

In computing the number of words recalled, only members (associative words) of the associative pairs were included. The items per category were calculated by dividing the number of associative words recalled by the number of categories (opportunities for clustering).

The means and standard deviations of the clustering and recall indexes are given in Table 1. It can be seen that the Control group exhibited much greater clustering and recall than either of the rhyming groups but only slightly more than the adjective-noun groups.

Data for all five groups for each of the five indexes listed in Table 1 were compared by analysis of variance. Intergroup variation for each index proved to be significant far beyond the .001 level, except for the number of intrusions which showed no significant difference.
TABLE 1
CLUSTERING AND RECALL INDEXES

<table>
<thead>
<tr>
<th>Groups</th>
<th>Index (%)</th>
<th>Associative words recalled</th>
<th>Categories</th>
<th>Items per category</th>
<th>Intrusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>$SD$</td>
<td>$\bar{X}$</td>
<td>$SD$</td>
<td>$\bar{X}$</td>
</tr>
<tr>
<td>Rhyming</td>
<td>26.8</td>
<td>21.4</td>
<td>7.7</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Rhyming + Recall</td>
<td>26.5</td>
<td>25.9</td>
<td>8.3</td>
<td>2.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Adj.-Noun</td>
<td>57.9</td>
<td>20.0</td>
<td>14.1</td>
<td>3.7</td>
<td>8.1</td>
</tr>
<tr>
<td>Adj.-Noun + Recall</td>
<td>55.5</td>
<td>22.8</td>
<td>14.1</td>
<td>3.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Control</td>
<td>63.3</td>
<td>28.7</td>
<td>16.9</td>
<td>3.1</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Scheffé contrasts were run on each of the four indexes that yielded a significant $F$ value in analysis of variance. For each index, Scheffé contrasts were made: (a) between the Control group and each of the orienting-task groups, (b) between the two rhyming groups, (c) between the two adjective-noun groups, (d) between the two orienting-task groups that were informed of the recall task before stimulus presentation, and (e) between the orienting task groups that were not told about the recall task until the presentation was completed.

The Scheffé contrasts were uniformly significant beyond the .01 level for each of the four indexes for the Control group versus each of the rhyming groups and for Contrasts $d$ and $e$ stated in the preceding paragraph. The Scheffé contrasts were uniformly nonsignificant across all four indexes for the remaining pairs of groups with the exception of a marginal significance ($p < .025$) obtained in the contrast between the Control group and each of the adjective-noun groups for number of associative pair members recalled.

It should be pointed out that the differences among the various groups with respect to the number of associative pair members recalled does not distort the comparison provided by the indexes of clustering since each clustering index reflects a percentage of the words recalled by a given $S$ rather than the number of words recalled.

DISCUSSION

Two explanations were suggested for the reduced clustering observed in the Hyde and Jenkins (1969) experiments. Either the orienting tasks reduced the clustering by stripping the stimulus words of meaning, or they did so by causing $S$s to break down the words into component letters. The rhyming task used in this study did not require $S$s to break down the words into component letters, but it did present the stimulus words in such a way that $S$s were not required to attach meaning to them. Therefore, the reduced clustering resulting from the rhyming task is taken as evidence in support of the interpretation that reduced associative clustering is a direct function of the decreased assignment of meaning to the stimulus word.

Further supporting evidence is provided by the results from the adjective-noun groups. Even though these $S$s were required to expend a considerable amount of "mental effort" on the orienting task during the test presentation, they exhibited significantly more clustering and recall than the rhyming groups. In addition, there was no significant difference between the clustering indexes of the adjective-noun groups and the Control group. In accord with the original hypothesis, this difference in clustering indexes between the rhyming groups and the adjective-noun groups is believed to be due to the assignment of meaning to the stimulus words by the adjective-noun groups, while little meaning was attached by the rhyming groups.
**TASKS DIFFERENTIALLY AFFECTING CLUSTERING**

<table>
<thead>
<tr>
<th>Items per category</th>
<th>Intrusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1.5</td>
<td>.3</td>
</tr>
<tr>
<td>1.5</td>
<td>.2</td>
</tr>
<tr>
<td>1.7</td>
<td>.2</td>
</tr>
<tr>
<td>1.7</td>
<td>.2</td>
</tr>
<tr>
<td>1.8</td>
<td>.2</td>
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... does not distort the con-... by the indexes of cluster-... clustering index reflects a... words recalled by a given S... number of words recalled.

**DISCUSSION**

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...orting evidence is provided by... on the adjective-noun groups... these Ss were required to expend... amount of "mental effort" on... task during the list presentation. If... significantly more clustering... the rhyming groups. In... was no significant difference... clustering indexes of the adjective-... and the Control group. In ac-... the original hypothesis, this... clustering indexes between the... the adjective-noun groups... to be due to the assignment of... the stimulus words by the adja...