The Effect of a Dual Level Word List on Schizophrenic Free Recall

by John Lutz and Tom K. Marsh

Abstract

Three-category dual level, three-category single level, and six-category single level word lists were presented for single trial free recall to 18 normals and 18 schizophrenics in remission. Schizophrenic recall was significantly inferior to that of normals across all three lists. Normals produced more clustering than schizophrenics, but the difference was not significant. Across both groups, the three-category dual level list produced significantly more recall than the other two lists. The three-category dual level list and the three-category single level list produced significantly more clustering than the six-category single level list. The results were interpreted as indicating that the schizophrenic's memory structure is similar to that of normals. It is suggested that the schizophrenic's recall deficit is not due to a lack of structure, or an inappropriate structure, but rather to a lessened tendency to utilize such structure.

The presence of organization in human memory has been repeatedly demonstrated. The primary evidence originally came from studies of clustering and subjective organization in free recall, but data from studies of reconstruction in recognition (e.g., Bransford, Barclay, and Franks 1972) and from studies of organization imposed on material (e.g., Bower et al. 1969) demonstrate the facilitative effect of organizing on remembering. Whether organization provides benefits during the encoding or the retrieval of material has not been determined; most of the studies suggest, however, that organization provides either a "frame of reference" or greater "associative strength" for the subject to use. Although it has proved impossible to distinguish these two interpretations operationally (Wood 1972), the "frame of reference" interpretation will be used here.

One method that has been used to study the role of organization in memory is categorical clustering in free recall (Shuell 1969). Subjects presented with a randomly arranged list of semantically related groups of words usually recall them in a different order than that in which they were presented. This is taken to indicate that subjects have internally reorganized the list in order to facilitate recall, and it can usually be shown that their reorganization is consistent with the semantic relationships among the words.

The purpose of this article is to examine the organizational processes of schizophrenics in a single trial, noncued free recall task. Three kinds of lists were used: a three-category word list, a six-category word list, and a three-category dual level word list. It was anticipated that the dual level list would represent a hierarchical organization, which Bower and associates have suggested (Bower et al. 1969; Bower 1970) provides greater organization and better recall. Their stimulus materials were words that could be classed at a lower (or subcategory) level, as well as three successively higher and more inclusive levels. In the present experiment, the three-

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category dual level list used two rather than four levels of the categorical hierarchy.

A dual level list was first used in a free recall task by Cohen and Bousfield (1956). Following an associative theory of memory, they suggested that recall of an item would activate both its own lower level associates and its superordinate associates, thus producing more clustering and recall. Their results tended to confirm this idea.

A “frame of reference” interpretation would explain superior performance on a dual level list as being the result of the fact that a hierarchical organization provides greater structure for the subject to use in recall.

There have been very few studies done to test schizophrenic free recall of a precategorized word list of any kind. However, information on schizophrenic memory process is available from investigations using multi-trial free recall, cued recall, and paired associate and recognition tasks. Several investigators have shown recently that schizophrenics exhibit a deficit in recall memory, but that their recognition memory is intact when compared with normals (Bauman and Murray 1968; Nachmani and Cohen 1969; Koh and Kayton 1974). Using multi-trial free recall, Koh, Kayton, and Berry (1973) presented two lists to schizophrenics and normals, one unorganized and the other consisting of five conceptual categories. Recall and clustering covaried, with recall and clustering increasing over trials for both groups of subjects. Normals recalled and clustered more than schizophrenics on the series of trials. On the first trial, however, recall was equal for the two groups; clustering data were not presented for the first trial. Traupmann (1975) presented uncategorized and categorized lists for repeated free recall and recognition. The lists were presented to normals, process schizophrenics (those with an insidious, lifelong disturbance) and reactive schizophrenics (those disturbed due to more immediate conflicts). Over all of the trials, normals recalled significantly more than reactive schizophrenics who recalled more than process schizophrenics. However, Traupmann (1975) concluded that the differences between reactive schizophrenics and normals (all college graduates or graduate students) were due to differences in IQ, socioeconomic status, and other related factors rather than the schizophrenic pathology, because, even though the reactive schizophrenics recalled less, their recall, as was the case for normals, was a direct function of the amount of categorization shown. Again, neither clustering nor recall data were reported for the first trial. Barker (1977) used cued and free recall of lists containing 24 words with varying numbers of categories and category size. He found normals recalled significantly more words than schizophrenics under all situations except cued recall of the list with the fewest categories (six categories of four words apiece). Interpreting his results as indicating a deficit in original organization and a deficit at retrieval, he concluded that a deficit is present throughout the schizophrenic information processing system.

Barker (1977) also found no differences across the paranoid-nonparanoid or the process-reactive subtypes.

Most (Bauman and Murray 1968; Bauman 1971a, 1971b; Koh, Kayton, and Berry 1973; Russel, Bannatyne, and Smith 1975) of the investigators cited attribute the recall deficit of schizophrenics to faulty encoding procedures. Although there is some conflicting evidence for a recall deficit in schizophrenics (Russel, Bannatyne, and Smith 1975), the bulk of the evidence is in agreement on this issue.

Both Koh, Kayton, and Berry (1973) and Larsen and Fromholt (1976) advance the two-process theory of Kintsch (1970) to explain the schizophrenic recall deficit but lack of a corresponding recognition deficit. This theory states that items to be recalled are first retrieved from long-term memory store by a process guided by organizational schemes effected during encoding. These are then tested by recognition processes. In recognition tasks, the item is subjected to recognition testing without prior search through memory store. Therefore, deficient initial organization should affect recall but not recognition.

According to Larsen and Fromholt’s (1976) interpretation of Kintsch’s theory, three factors may account for a recall deficit. The first is encoding, and several investigators suggest that it is in this area that schizophrenics are lacking. The second is conceptual or associational structure. Koh, Kayton, and Schwarz (1974) used a word-sorting task and found no significant differences between schizophrenics and normals in conceptual grouping. Russel and Beekhuis (1976) exposed schizophrenics and normals to a card-sorting task involving categorized word lists with subsequent recall.
They found a schizophrenic recall deficit, but differences in sorting (organizational schemes or time to sort) were not significant. Larsen and Fromholt (1976) conducted a sorting task involving 25 unrelated words. Subjects were to sort the words into categories of their own. Sorting was considered finished when two trials in a row were alike. Although schizophrenics took more trials to achieve identical sorts, their organizational patterns were similar to those of normals. The third possible area of error is that of retrieval. In Larsen and Fromholt's (1976) experiment, subjects were asked to recall the words after they achieved two identical sorts. Recall was equal for the normal and schizophrenic groups. The number of trials taken to sort was not correlated with the amount of recall. What was important was that two identical sorts were produced. Larsen and Fromholt (1976) interpreted these results as indicating schizophrenics do not have deficient retrieval systems. They suggest an organizational deficiency at encoding is responsible for the recall deficit.

Only three of the previously mentioned experiments (Koh, Kayton, and Berry 1973; Traupmann 1975; Barker 1977) used a categorical clustering format. Koh, Kayton, and Berry (1973) and Barker (1977) presented recall data for the first trial, but initial trial clustering data were not mentioned by any of these investigators. Because all three experiments essentially involved a subjective organization procedure, it is unclear whether the schizophrenic possesses an organization that is idiosyncratic or whether he possesses an organization that corresponds to the "frame of reference" which the majority of people recognize. It is also unclear whether such organization influences his recall.

In this experiment, a list based on the dual category idea proposed by Cohen and Bousfield (1956) was presented to normals and schizophrenics. However, this list differed from Cohen and Bousfield's in that the subcategory divisions represented not abstract taxonomic or geographic differences, but rather differences more basic to everyday experience, such as male versus female names or meat versus vegetable foods. It was hypothesized that this list would be better recalled and would result in a higher degree of clustering than lists with only one level of organization. Although it was hypothesized that normals would recall more and cluster more than schizophrenics, it was also hypothesized that the dual level list would enhance recall and clustering for schizophrenics as well as normal subjects, indicating that schizophrenics are aware of the consensus "frame of reference."

Method

Subjects. The experimental group consisted of 18 patients who were being seen at the Lenoir County Mental Health Center and had been diagnosed as schizophrenic in staffings presided over by a psychiatrist. Nine of these patients had paranoid schizo- phrenia and the other nine were non-paranoids. Some had been hospitalized at one time, but all were in remission and functioning at home. Seventeen of the subjects were receiving maintenance phenothiazines; the eighteenth subject was not on medication at the time of the experiment. Many studies have shown that phenothiazines do not have an adverse effect on memory or verbal performance (Gardiner et al. 1955; Daston 1959; Mason-Brown and Borthwick 1957; Vestre 1961; Kelly et al. 1958a, 1958b).

The control or normal subjects were drawn from introductory psychology and sociology classes at Lenoir Community College. The control group was approximately equated with the experimental group on the basis of age, race, and a gross measure of intelligence, the information subtest on the Wechsler Adult Intelligence Scale (WAIS), and was comparable in educational level. According to Cohen (1952, 1957, 1959) the information subtest is the second best subtest for measuring general intelligence.

A minimum scaled score of 8 on the information subtest was required. Also, subjects recalling fewer than 27 words on the three experimental lists were dropped from the sample and replaced. Three schizophrenic subjects who earned appropriate WAIS scores were eliminated for recalling fewer than 27 words. Two normals were dropped for the same reason. The average WAIS information score was 10.27 for schizophrenics and 10.33 for normals. The average age was 30.55 (range 17–46) for schizophrenics and 29.77 (range 18–56) for normals. Seven of the schizophrenics had never attended college, while all the normals had; however, only one normal subject had a college degree, while two schizophrenics had college degrees.

Material. Three different word lists were used. List 1 was com-
posed of three major categories, each with two subcategories of five words each—for example, 10 names of which 5 were male and 5 female. List 2 was composed of three unrelated categories of 10 words each. List 3 was composed of six unrelated categories of five words each. The word lists were constructed by listing as many words from eight different categories as possible. Lists of these items were presented to groups of introductory psychology students, and the least frequently recalled words and groups eliminated. The average frequency of occurrence of the words in each subcategory and category was approximately the same. Word pairs that were high-frequency associates to each other such as cat and dog were avoided. Only words containing at least two syllables were used. Within each list, the words were arranged in random order, with the exception that words from the same category or subcategory that occurred together randomly were separated. Six different random orders were prepared for each list. The three different lists were presented to the subjects in a prearranged order so that each list occurred in each presentation position (first, second, or third) an equal number of times.

**Procedure.** All subjects were tested individually. Before the first trial was administered, each subject was asked a few questions about demographic characteristics and administered the information subtest of the WAIS. The directions for the recall task were then read. Before each presentation of the different lists, the instructions were repeated:

I am conducting an experiment on memory. I will read a list of 30 words to you. I will read them slowly with about 2 seconds between each word. You are to listen carefully to the words and try to remember them. Do not write any words down until I have read the entire list. It is not likely that you will remember all of the words. Just do the best that you can. Do not worry about spelling. Immediately after I read the list, I will say “begin,” and you are to write down as many words as you can remember in the order in which you remember them. In other words, they do not have to be in the same order that I read them to you. Just write down as many words as you can remember. There is no time limit. Do you understand? Are there any questions? Here are the words. Listen carefully.

The experimenter then read the word list, timing himself with a stopwatch.

**Results**

The literature suggests that schizophrenics will exhibit a recall deficit compared to normals, and this trend is reflected in the data (see table 1). Number of words recalled was analyzed by a 2 x 3 analysis of variance with subjects (normal, schizophrenic) as a between-subjects factor and list type (dual, three-category, six-category) as a within-subjects factor. Normals recalled significantly more words than schizophrenics ($F = 4.33$, $df = 1.34$, $p < .05$). A significant effect was also found for type of list ($F = 5.77$, $df = 2.68$, $p < .01$). A Newman-Keuls comparison test revealed that the dual level list resulted in significantly greater recall than the other two lists ($p < .05$). As seen in table 1, the mean number of recalled words for the two single-category lists was exactly the same. Conflicting data had been reported as to whether recall covaried positively with the number of categories (e.g., Shuell 1969). These data do not support that idea.

There was no significant interaction between subject types and list types ($F = 0.65$, $df = 2.68$, NS). Normals produced a total of 53 intrusions and schizophrenics, 38. About half of the intrusions (24 for normals, 19 for schizophrenics) occurred on the six-category list. Only seven of the intrusions could be classed as irrelevant, when relevant was defined as a word clearly from a category represented on the list.

The amount of clustering by each subject was measured according to the modified ratio of repetition (MRR) suggested by Bower, Lesgold, and Tieman (1969). Roenker, Thompson, and Brown (1971), in evaluating several measures of clustering, suggest that

<table>
<thead>
<tr>
<th>Table 1. Mean number of words recalled on each word list</th>
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<tbody>
<tr>
<td><strong>Subjects</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Normals</td>
</tr>
<tr>
<td>Schizophrenics</td>
</tr>
<tr>
<td>All subjects</td>
</tr>
</tbody>
</table>
this measure is acceptable unless a comparison against chance occurrence is being attempted, or there are widely differing numbers of categories recalled. MRR is equal to R/Max R where R is equal to the number of repetitions or pairs of words from the same category recalled consecutively, and Max R is equal to the number of word pairs recalled minus the number of categories in the recall protocol. The mean MRR score produced by each group on the three different lists is presented in table 2. Although normals displayed a higher degree of clustering than schizophrenics, this difference was not significant (F = 1.289, df = 1.34, NS) when examined using a two-way analysis of variance with repeated measures. The lists factor resulted in significant differences (F = 5.372, df = 2.64, p < .01). A Newman-Keuls test revealed that the dual level list and the three-category single level list each produced significantly more clustering than the six-category single level list (p < .05). However, this difference may be due to the limitation of MRR when different numbers of categories are recalled (Roenker, Thompson, and Brown 1971). There was no significant difference between the three-category dual level list and the three-category single level list. The interaction was not significant (F = .46, df = 2.68, NS).

The correlations between recall and clustering revealed striking differences between normal and schizophrenic subjects. In normal subjects, the Pearson product-moment correlation for the dual level list was r = .43 (p < .05), for the three-category list was r = .38 (p < .10), and for the six-category list was r = .17 (NS). In schizophrenics, the corresponding values were r = .01, r = .02, r = .11, respectively; none of these correlations approached significance.

The number of words recalled in each category of each list across categories was generally the same for normals and schizophrenics, with normals' production typically greater. The category of names was recalled best by both groups in all lists. The schizophrenic performance in this category was closer to that of normals than for any other category.

In the dual level list, the percentages of repetitions that were subcategory members (e.g., Susan, Barbara as opposed to Susan, William) was almost identical for normals and schizophrenics. There seemed to be no consistent differences between categories or subcategories which might be greater than simple chance variation.

Among the schizophrenic subjects, nine were classified as paranoid, and the other nine received diagnoses of acute schizophrenic episode, chronic schizophrenia, and latent schizophrenia. Recall for these two groups was compared with a t-test using the recall data from all three of the different lists. The results were not significant (t = .90, df = 52, NS).

A t-test comparison was also done between these two groups using the total repetition ratios across all three lists. Again, the results were not significant (t = .63, df = 52, NS). Therefore, there were no significant differences between paranoid and nonparanoid groups on either amount of recall or clustering.

**Table 2. Mean MRR for each word list**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Three-category dual level</th>
<th>Six-category single level</th>
<th>Three-category single level</th>
<th>All lists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normals</td>
<td>.563</td>
<td>.477</td>
<td>.559</td>
<td>.533</td>
</tr>
<tr>
<td>Schizophrenics</td>
<td>.527</td>
<td>.366</td>
<td>.509</td>
<td>.467</td>
</tr>
<tr>
<td>All subjects</td>
<td>.545</td>
<td>.421</td>
<td>.534</td>
<td>—</td>
</tr>
</tbody>
</table>

**Discussion**

The schizophrenic memory process was impaired in this recall task when compared with that of normals. Schizophrenics recalled significantly fewer words than normals. They also displayed less clustering, although not significantly less. Further, their clustering on the dual level list was consistent with normals' in proportion of subcategory versus superordinate category pairs, and category differences were the same for both groups (e.g., the names category resulted in the best performance both for normals and schizophrenics). Thus, it seems reasonable to conclude that the type of organizational strategy displayed is similar for the two groups. It does not seem likely that the semantic memory structure of chronic schizophrenics is radically different from the structure present in normals. The memory process of schizophrenics does seem to involve the same organizational "frame of reference" as that of normals; as Post-
man (1972, p. 35) has suggested, the degree that the subjects' output replicates the experimenter's designation of categories indicates the degree to which "the subject brings to the experimental situation an associative or categorical structure that can be specified normatively." Therefore the recall deficits of schizophrenics are more likely to be due to lesser ability to use, or profit from, such organization; this is suggested by the low correlations between clustering and recall for the schizophrenic subjects.

The normal subjects' performance differed slightly from that found by Cohen and Bousfield (1956) for dual level lists. These differences were probably due to more easily perceived sub-categories than those used by Cohen and Bousfield. Among the schizophrenic subjects, nine were classed as paranoid and nine nonparanoid. Chronic schizophrenics, supposedly the most seriously disturbed group, made up over half of the nonparanoid group. Even this group (nonparanoids) did not differ significantly from the others in the organizational properties they displayed. Asarnow and MacCrimmon (1978) have suggested that studying patients in remission eliminates the effects of hospitalization such as confusion due to a novel environment and reduced social interaction, and therefore provides a clearer look at "pure" schizophrenia. This further strengthens the notion that the "pure" schizophrenic operates from the same semantic "frame of reference" as the rest of us. These conclusions are consistent with the findings in sorting tasks of Koh, Kayton, and Schwarz (1974), Rus- sel and Beekhuis (1976), and Larsen and Fromholt (1976) with hospitalized schizophrenics.

Three of the classic symptoms of schizophrenia—autistic thinking, loose associations, and ambivalence—are not readily recognizable in the data. In fact, the schizophrenics produced fewer intrusions or loose associations than the normals. Throughout the experiments studying schizophrenic memory, the similarity of their associative structure or "frame of reference" to that of normals is evident.

References
Kelly, E.L.; Miller, J.G.; Marquis, D.G.; Gerard, R.W.; and Uhr, L. Continued meprobamate and


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