VERBAL BEHAVIOR IN SCHIZOPHRENICS AND SOME COMMENTS TOWARD A THEORY OF SCHIZOPHRENIA*

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If it is fair to describe the verbal behavior of the schizophrenic patient as following the law of least effort, then we can perhaps best describe the research concerning schizophrenic language as following the laws of least data and most theory.

Over its recognized course of existence, schizophrenia has changed in many respects. It has changed its symptomatology; it has accepted new types of treatment; it has even taken on a new name. Through it all, clinicians have retained the interview as a means for diagnosis, prognosis, determination of type of treatment, and assessment of outcome of treatment.

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Yet, despite the central importance accorded to the verbal behavior of the schizophrenic patient, very little has been done to study that behavior in an objective, quantitative manner in a situation free of contaminating and interacting variables. Our earlier work concentrated on showing that the interviewer influences the verbal output of the schizophrenic patient and does so in a lawful way—that is, in a way to be predicted from our knowledge of behavior theory. We were able to show furthermore that the speed with which the interviewer influence wears off (extinction) is greater for a schizophrenic than for a normal individual. Finally, the rate of conditioning of schizophrenic patients (that is, the degree to which the patient becomes influenced by the interviewer) appears to be a prognostic indicator, with a significantly larger number of high conditioners than low conditioners out of the hospital at the end of a 180-day follow-up period.

Having investigated some of the important parameters of the situation in which the verbal behavior of the schizophrenic patient is typically emitted, we turned our attention to the nature of that behavior itself. The literature describing the language of schizophrenia is large but contains little more than labels, such as paralogical, paleological, concrete, pseudoconcrete, abstract, overinclusive, and egocentric. Quantitative study and objective examination have both constituted the nonpreferred methods of study. To this date the method of choice is that of citing dramatic examples with "interesting" interpretations.

Most recently, perhaps, Maria Lorenz suggested "criticism, a technique more familiar in the arts than in the sciences," for the study of schizophrenic speech. Much earlier, we have von Domarus' principle concerning paralogical thinking, and more recently Arieti's idea of paleological thinking, but there has been no attempt to identify the frequency of occurrence of such thinking, whether it refers to incidence within a given patient or incidence in a group of patients. In addition, review of schizophrenic speech samples provides rather little evidence for the universality of such reasoning among schizophrenic patients.

While we have no time to review the literature on schizophrenic language thoroughly, it seems not unfair to summarize it by saying that schizophrenic speech can best be characterized as noncommunicative or hard to understand. In a paper describing one of the few attempts to analyze schizophrenic language by quantitative techniques, this point is made: namely, that the schizophrenic patient has a tendency to maximize his own convenience by minimizing the effort
expended to make himself understood. Perhaps the most extreme example of a failure in communication appeared in a recently cited case of "opposite speech,"\textsuperscript{18} where the patient regularly exchanged "yes" for "no," "right" for "wrong" and "do" for "don't" in his speech. Ferreira recently called attention to the fact that the schizophrenic patient uses a private language and that he "does so not to communicate his thoughts for, in fact, he much fears to be understood"\textsuperscript{10} (p. 134). Other evidence for a defect in communication on the part of the schizophrenic patient comes from the area of sorting tests.\textsuperscript{28} Although the classical interpretation has been that schizophrenic failure to sort correctly is due to concrete thinking, a more detailed analysis of a sorting task\textsuperscript{21} has shown that it is primarily the privacy of the criteria for sorting which results in normal-schizophrenic differences, and thus there is no deficit in abstract ability but rather a loss in social communication.

It is these considerations which give rise to our idea that it would be useful to assess the degree to which a schizophrenic patient communicates with other individuals. It is certainly no accident that the clinician relies on the patient's verbal behavior to learn something about him. Verbal behavior is what most of us engage in most of the time, and thus it is often verbal behavior which brings to the attention of relatives, friends, or legal authorities the fact that the schizophrenic is actually disturbed. Since the impact of the patient's verbal behavior can be assumed at least to contribute to his hospitalization, it seemed to us to be most important to assess the effect of the speech of schizophrenic patients on other people. The effect we decided to study was the degree of communicability.

The idea of assessing looseness of association, or, put even more simply, whether the patient "makes sense" when he talks, is, of course, used by the clinician. In a recent paper\textsuperscript{22} an attempt was made to deal directly with the problem of looseness of association. Using the speech samples obtained from schizophrenic patients, the investigators first divided the material into "units of thought" and then observed the number of times an "abnormal shift" appeared between any two units of thought. They defined abnormal shift "as a break in the stream of associations which the scorer judged would not occur in nonpsychotic subjects" (p. 31). We will use indirect techniques for the measurement of breaks in the stream of associations. Rather than ask our scorers whether they can detect abnormal shifts in association—i.e., to make subjective judgments—we have required the
scorers to respond to aspects of the speech in such a way that the structure of the speech itself must determine the response, and the complex response of judging degree of disorganization is not necessary. It might be in order here to say a few words about the relative advantages of using speech to understand better the disease of schizophrenia. Perhaps the most persistent problem faced by the investigator of schizophrenia is that which has gone under the various names of attitude, motivation, cooperation, or involvement in the task set for him, and which can perhaps best be described experimentally as the amount of stimulus control required by the task. Shakow reported how apparent differences between schizophrenics and normals were reduced or even completely eliminated when cooperation level was taken into account. It is obvious, for example, that a subject instructed to report the presence or absence of a light stimulus must at the very least be looking in the direction of the light—that is, at a fixation point—in order for the experimenter to make a valid statement about the subject’s dark-adaptation curve. Thus, if the subject views the fixation point part of the time only, then the resulting “dark adaptation” curve will be some complex function of the extent to which the subject “cooperates” in viewing the fixation point and the state of the photochemical receptors in the eye. The fact is that many of the differences found between schizophrenics and normals can be ascribed to differences in stimulus control rather than to differences in psychophysical thresholds, learning ability, thought disorder, shallowness of affect, or whatever the investigator is interested in. As a result, many investigators have chosen to train both patients and normals until their behavior has stabilized. Yet what these investigators have overlooked has been the fact that the adult schizophrenic is an individual who has been reinforced for talking for decades and that therefore his verbal behavior has reached a stability unlike that of any new behavior which the experimenter typically has time to introduce by his training methods. Furthermore, a long training procedure may interfere with ongoing projected therapeutic programs or may be interfered with by the patient’s changing accessibility to training. Thus we are going to suggest in this paper that the relative stability of verbal behavior makes it ideal for use in studying schizophrenia. It might be noted, by the way, that it is this great stability which has been so useful for shedding light on cases of disputed authorship as early as 1887 and as recently as 1963.
In giving these arguments for the use of verbal behavior to provide information on schizophrenia, it is important to point out that these arguments hold only for the case where language is studied as behavior rather than as a report on what the subject "feels" or does. It is to be noted that the experimental psychologist, as well as the clinician, has contributed to the false notion that language must be accepted as information about something else rather than as raw data subject itself to the usual objective techniques of analysis. The psychopathologist interested in the study of complex behavior which he takes great pains to teach his patient (by way of a sorting test, for example) would do much better to study the already present complex behavior called language. By studying it as behavior rather than as report, he also gets around any problem of simulation, where the patient's response is controlled by variables extraneous to the experimental situation and likely to obscure relationships of his pathology.

Another advantage which can be ascribed to the study of verbal behavior in schizophrenic patients stems from the fact that the entire area of verbal behavior has recently undergone great improvement in techniques of study. Perhaps the best evidence for the potential usefulness of our present understanding of verbal behavior in general for gaining insights into pathological processes lies in a recent report of a conference which applied the many different techniques for the study of verbal behavior to the problem of aphasia.

Finally, it is worthwhile to discuss the relative merits of examining production versus perception of speech in schizophrenics. While there have been some interesting studies of perception of speech, it seemed to us again that it would require less cooperation from our patients simply to have them speak than to have them respond in a way that would signify the extent to which they understood a message.

It is for the reasons listed above that we decided to make use of speech samples obtained under conditions requiring only that the subject talk. In one study we compared the rate of repetition of words in schizophrenic and normal speech samples and found that schizophrenic patients tended to use the same words more frequently than normals for passages 900 words in length. This finding can, of course, be viewed as evidence for lower communicability if we follow Whitehorn and Zipf's interpretation. In another study we used the cloze procedure to compare schizophrenic and normal speech samples in ability to communicate and found that normals communicate better than schizophrenics. The cloze procedure is based on the
assumption that language is redundant—that is, that successive elements in a sentence contain overlapping bits of information. Thus a person listening to another individual over the telephone can generally understand him even if there are interruptions or disturbances over the line; in other words, he can fill in gaps of information. The cloze procedure, which originated as a measure of readability, involves the following: A given passage of verbal material is mutilated by deleting words systematically and is then given to a group of subjects who are asked to guess these deleted words. Each passage can then be described in terms of the number of words guessed correctly. Taylor suggested this technique to determine which passages are more readable, assuming that those passages whose gaps can be most easily filled are more readable. Since then this technique has been used to investigate statistical approximations to English, the effect of drugs on speech, differences between suicide notes and control letters, the effect of psychotherapeutic interaction on predicting the speech of patients, and finally the nature of aphasic speech.

Two studies so far have employed the cloze technique to test pathology in perception of speech. Honigfeld compared the relative ability of schizophrenic patients to understand normal, psychotic, and pseudo-psychotic speech (i.e., speech under the influence of psilocybin), and Taylor is developing a cloze procedure variant to determine the speed with which schizophrenic patients can fill in the missing words in very simple short sentences.

We added two other techniques for assessing the communicability of schizophrenic speech in an effort to evaluate contingencies between longer units of speech (see ref. 31 for an extended discussion of the problem of unit size) than the cloze procedure is sensitive to. The first of these is what we have called the method of reconstruction and was suggested to us by a study by Becker, Bavelas, and Braden, in which the investigators used subjects' ability to agree on reconstructing a series of sentences presented in random order as a criterion for validating an index of sentence contingency. In view of the fact that our material is oral rather than written, and since there are a number of different ways to divide it into sentences, in some cases only with the help of unusual punctuation, we decided to break the material up into equally long speech segments without any punctuation. As for reconstructability, we have measured both the amount of agreement among subjects reconstructing the passages (as done in the original study) and their agreement with the original order of the
passages, since it is conceivable that subjects may agree highly among themselves on an order which is quite different from the original sequence in the speech sample.

The second additional procedure which we employed in this study is what we have called the method of unitization. It stemmed in part from the fact that transcription of speech into written prose is by no means simple. Among the problems which occur in the punctuation of speech is that the many idiosyncratic, incomplete, or ambiguous structures make it very difficult to apply the usual rules reliably. It was our thought that asking groups of subjects to divide unpunctuated speech samples into grammatical sentences and to cross out any words which could not be fitted into such sentences would provide us with additional measures of the communicability of schizophrenic speech. One can hypothesize, for example, that to the extent that schizophrenic speech is less coherent than normal speech, one would have to cross out more words.

Thus, in this study we will explore further the utility of the cloze procedure, particularly by relating it to outcome of illness. We will test out the other two techniques, which are sensitive to structural and semantic coherence and therefore potentially useful for measuring the communicability of schizophrenic speech and its relationship to outcome of illness. The relationship of the reconstruction technique and outcome will be specifically examined. Finally, we shall apply our findings and those of others toward a theory of schizophrenia.

Procedure

Speech Samples and Subjects

The speech samples used in this study were the beginnings of either extended samples of continuous speech obtained by the monologue procedure, which was devised to make interviewer questions unnecessary, or uninterrupted portions of our standardized interviews.

The monologue procedure consists of instructing the patient to begin speaking about the reason for his being hospitalized and to continue talking about any topic he wishes, such as his friends and his hobbies, until told to stop. The interview procedure begins in much the same way, except that general questions are asked whenever the patient is silent for more than two seconds, and unlike the monologue procedure, where the patient and interviewer are separated from each other by a screen, the interview is carried out under face-to-face conditions.
The method of reconstruction was applied to the speech samples of 13 schizophrenic patients (11 acute and 2 chronic) at the Brooklyn State Hospital and 12 nonpsychiatric patients at Presbyterian Hospital, both in New York City. These patients were selected so as to provide 13 schizophrenic-normal pairs (one normal patient was paired with two different schizophrenics) matched for sex, age, formal education, and, where possible, for ethnic group. Background data are summarized in part A of table 1.

The method of unitization utilized speech samples of 10 of the above pairs. Three male acute schizophrenic patients and their matches of

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<th>TABLE 1.—Background Information</th>
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### SCHIZOPHRENIC-NORMAL COMPARISONS

<table>
<thead>
<tr>
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<th>A. Reconstruction</th>
<th></th>
<th>B. Unitization</th>
<th></th>
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</thead>
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<tr>
<td><strong>Schizophrenics</strong></td>
<td><strong>Normals</strong></td>
<td><strong>Diff.</strong></td>
<td><strong>Schizophrenics</strong></td>
<td><strong>Normals</strong></td>
</tr>
<tr>
<td>N</td>
<td>13 (2 chronic, 11 acute)</td>
<td>12†</td>
<td>10 (2 chronic, 8 acute)</td>
<td>9†</td>
</tr>
<tr>
<td>Sex</td>
<td>2F, 11M</td>
<td>2F, 10M</td>
<td>2F, 8M</td>
<td>2F, 7M</td>
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<tr>
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<td>18-46</td>
<td>0-16</td>
<td>20-44</td>
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<tr>
<td></td>
<td>Median 33</td>
<td>32</td>
<td>3</td>
<td>32</td>
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<tr>
<td>Yrs. of Formal Educ.</td>
<td>Range 8-16</td>
<td>6-16</td>
<td>0-4</td>
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<tr>
<td></td>
<td>Median 12</td>
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<td>0</td>
<td>12</td>
</tr>
<tr>
<td>First Admissions</td>
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<td>—</td>
<td>6</td>
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### PROGNOSIS

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<th>D. Cloze Procedure Sample</th>
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<td>23 Acute Schizophrenics</td>
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<td>Sex</td>
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<td>Median 12</td>
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</tr>
<tr>
<td>First Admissions</td>
<td>4</td>
<td>10</td>
<td></td>
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*The ranges are taken over the differences for each pair, and the medians taken for the resulting distributions of differences.

†One male normal was matched with two different schizophrenics.
the above group were not included. Background data are summarized in part B of table 1.

The evaluation of the cloze procedure as a prognostic index was based partly on speech samples of 10 of the 13 schizophrenic patients comprising the method of reconstruction group and described above; the cloze procedure data for these 10 subjects had been collected in a previous study.39

Two of the patients (the chronic schizophrenics) were excluded from the prognostic study because they were interviewed 463 and 1365 days after coming to the hospital, while the remaining patients in the sample were interviewed within 14 days of their arrival at the hospital, during which time they had received no drugs or somatotherapy. One acute schizophrenic male patient was transferred to another hospital and his record was not available for follow-up.

In addition to the remaining 10 patients described above, the speech samples of another group of 13 schizophrenic patients were selected. The resultant group of 23 acute schizophrenic patients is described in part D of table 1.

Outcome of illness was determined by counting the number of days that the patient spent in the hospital within the 180-day period immediately following the current admission; if the patient left and returned within this period, days of hospitalization were cumulated. The number of days in the hospital ranged from 22 to 180, with a median of 101 days.

Description of Methods of Evaluation of Communicability

Method of Reconstruction. The first 200 words of each speech sample, preceding any reinforcement periods or interviewer utterances except, of course, the initial instructions, were divided into 10 successive 20-word segments and typed on 2 by 6 inch white cards in two lines of 10 words each (whenever space permitted) without any punctuation. All subjects in this experiment were college students and native speakers of English and were paid for their time. Each was tested individually and was given the following instructions:

I am going to place before you a series of cards. On each card there is a segment of speech selected from tape-recorded samples of the continuous speech of one person. The segments are now in scrambled order. You are to read them carefully and rearrange them into the order in which they were originally spoken. Put the first card with the typed material facing up beside the number 1, the next beside the number 2 and so on. When in their correct
order, the segments will form a continuous, uninterrupted excerpt from the speech of one person.

You will have up to three minutes to sort these cards. Although I am not primarily interested in the time it takes you, I will record the time. Do you have any questions?

After the subject had ordered the speech segments of one person, he was given another set and told to perform the same task. Twenty subjects ordered the speech segments of seven schizophrenic patients and their normal matches and another group of 20 subjects ordered the speech segments of the six other schizophrenic patients and their matches. None of the subjects was told that any of the speech samples came from schizophrenic patients. Both the order of segments within a speech sample and the order of the speech samples themselves were randomized.

Cloze Procedure. The initial section of each speech sample, preceding any reinforcement periods or interviewer utterances except, of course, the initial instructions, was mimeographed on a separate page, without any punctuation and with every 5th word deleted (except numbers and proper nouns) and a blank substituted, for a total of 40 blanks per passage. Wherever the fifth word was a number or proper noun, the next word was deleted. The corresponding number of words was added to the passage so that there were always forty blanks with 4 words following the last blank. This resulted in the actual passage lengths for the normals ranging from 204 to 212 words, with a median of 206. For the schizophrenics the range was 204 to 213 words, with a median of 205. The passages were then distributed to groups of college students, all native speakers of English, who were told that they were being given samples of continuous speech and that they were to fill in each blank with whatever single word they thought belonged there.

Ten speech samples were presented to the subjects in groups of four passages containing two schizophrenic-normal pairs. There were 17 completed cloze forms for one patient, 16 for four patients, 15 for four patients, and 30 for one patient. Thirteen of the speech samples were given to the subjects in groups of four patients. Of these, there were 14 completed cloze forms for two patients, 16 for six patients, 17 for two patients, and 18 for three patients.

Unitization Procedure. The passages on which the cloze procedure was based were mimeographed and distributed to college students, all
native speakers of English, who were tested in groups. They were given the following instructions:

On the following pages you will find the verbatim typescripts of tape-recorded speech samples. Each page is taken from the speech of a different person. We know that most people do not always speak in perfect, grammatical sentences, but instead speak with some repetitions, incomplete sentences, corrections of words spoken just previously, etc. Some speech has very little of this; some has quite a bit.

Your task is to divide the following speech samples into complete grammatical sentences in the best way you can. The only change you may make is to cross out words. You may not add or change words or rearrange the words already present. Indicate the sentences by enclosing them in parentheses. Indicate the words to be eliminated by drawing a line through them.

Seven pairs of speech samples were presented in sets of 2—i.e., one patient and his normal match. There were five pairs of passages unitized by 17 subjects, one pair unitized by 18, and one pair unitized by 19. Three pairs of speech samples were administered in sets of 4—i.e., two patients and their normal matches. Fifteen subjects unitized one pair and 16 the two remaining pairs of passages.

RESULTS AND DISCUSSION

Schizophrenic—Normal Comparisons

Method of Reconstruction. These data were analyzed in terms of five different measures:

1. Kendall's coefficient of concordance, \( W \),\(^{42}\) was used to measure the amount of agreement among the subjects' orderings of the 10 speech segments, thus giving us a measure of general contextual constraint.

2. Spearman's rank order correlation coefficient, \( \rho \),\(^{42}\) was employed to measure the amount of agreement between the subjects' orderings and the order in which the segments were actually emitted by the speaker, thus providing us with a measure of the communicability of the different speech samples.

3. A sequence error score was constructed to measure the extent to which each subject ordered successive pairs of speech segments the way the speaker emitted them, thus giving us another measure of communicability. The score itself consists of the number of pairs placed in an order different from the spoken one and thus can vary from 0 to 9 for each subject.

Two additional error scores were obtained separately for the first
half and the last half of each speech sample by counting the number of
incorrectly ordered pairs for cards 2-5 and cards 6-9. The first and
last cards were omitted from this analysis, so that all cards of each
set had surrounding context in the original speech.

4. A sequence error agreement score was devised in order to mea-
sure the extent to which subjects agreed on the same incorrect sequences.
Presumably, if subjects agree on an order which is at variance with
the spoken order, then these results would indicate not only that there
is a general fault in communicability, but that the structure is consist-
ently misleading to the hearer. The score is based on the ratio of
the number of different incorrect segments placed immediately pre-
ceding a given segment to the total number of such incorrect pairings.
The resulting ratios, except those where either one or no error was
made, were averaged across cards to yield the final ratio for that
speech sample.

5. Mean log time to complete the reconstruction task was taken as
a measure of the degree of difficulty in ordering the speech segments,
and we assume that such difficulty is another aspect of communicabil-
ity. It was measured from the time the subject was first exposed to
the segments to the time he indicated that he was finished with them.

The first point that can be made about the coefficients of concordance
in fig. 1 is that all but one of them are statistically significant at the
.05 level (two-tail) or better (X² test for significance); the only ex-
ception is one schizophrenic patient’s speech sample which just misses
reaching significance. The result is, of course, evidence for the fact
that any English language sample, even a schizophrenic sample, exerts
enough contextual constraint to produce a great deal of agreement
among a group of English speaking subjects. Furthermore, the rank
order correlations (fig. 1) are all quite high, showing again that the
structure of English is such that speech can withstand a good deal of
mutilation (in this case segmentation) and still be restorable to the
order in which it was emitted.

Fig. 1 also allows us to compare performance on the normal and
schizophrenic speech samples. Nine of the 13 pairs of speech samples
show a greater amount of agreement for the normal than for the schizo-
phrenic (there is no statistical test for the significance of the difference
between two W’s). It is noteworthy that both female speech samples
go in a direction opposite to the majority of the group. The small
size of the sample prohibits our making any conclusions about sex
differences, however. As far as restoring the original order is con-


Fig. 1.—Reconstruction technique. Top: Kendall’s coefficient of concordance for agreement among subjects’ orderings of normal and schizophrenic speech segments. Bottom: Rank order correlation coefficients between subjects’ orderings of normal and schizophrenic speech segments and the order of the segments in the original speech. Results on each measure are shown separately for each schizophrenic-normal matched pair. Pairs A and B are females; pairs D and E each include a chronic schizophrenic.

cerned, the rank order correlation coefficients show that subjects have greater ability to restore the original order of the normal than of the schizophrenic speech samples in eight of the matched pairs, that they are equally able to restore the order in one pair, and that they show greater ability to restore the schizophrenic speech sample in four pairs. Again, both female pairs go in a direction opposite to the majority of the group. It is to be noted that the rank order correlation coefficient as used here was based on the ordering given by the subjects as a group, thus allowing for the cancellation of idiosyncratic errors
in ordering and resulting in the relatively high positive relationship between subject and speaker order.

Although there is no statistical test for the significance of the difference between two Spearman rank order correlation coefficients, we used the parametric equivalent to give us some notion of significance. Of the eight pairs for which $R_a$ is higher for the normal speech, seven are significant at the .002 level or better and one is above .05; of the four pairs for which $R_a$ is higher for the schizophrenic speech, two are significant at the .02 level or better and two are above .05 (all one-tail tests). We made use of the sequence error score in order to take into account each individual's deviation from the speaker's order.

Fig. 2.—Reconstruction technique. Sequence errors in subjects' orderings of segments of normal and schizophrenic speech for the total sample (top), the first half of each sample only (middle), and the second half of each sample only (bottom). Results on each measure are shown separately for each schizophrenic-normal matched pair. Pairs A and B are females; pairs D and E each include a chronic schizophrenic.
Inspection of fig. 2 shows 10 of the 13 pairs to have more errors on the schizophrenic than the normal speech samples, and again both female pairs are opposite in direction to the majority of the group. (Nine of the 10 show a significant difference by the matched pairs signed ranks test at .04 and better; the other one has a $p = .46$. Of the three others, only one is significant at .001; the others have p’s

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**Fig. 3A.**—Reconstruction technique. *Top:* Cumulative frequency distributions of time taken by subjects to complete the reconstruction of samples of normal and schizophrenic speech. Each point is a geometric mean of the subjects’ reconstruction times for a given speech sample. *Bottom:* Cumulative frequency distributions of rank order correlation coefficients between subjects’ orderings of normal and schizophrenic speech segments and the orders of the segments in the original speech.
of .17 and .25; all are one-tail tests.) Thus, this score yields a stronger indication of difficulty in communicability of schizophrenic speech than the scores dealt with above. The sequence error score has another advantage: it can be broken down into scores for first and second halves of each speech sample. A previous study on the cloze procedure indicated not only a difference between the communicability of schizophrenic and normal speech samples, but also that the second half of the speech samples differentiated the groups better than the first. Inspection of fig. 2 shows a similar finding for the reconstruction technique. Cards 2-5 of the speech sample show that nine schizo-

![Graph](image)

**Fig. 3B.**—Reconstruction technique. Top: Cumulative frequency distributions of sequence error scores for subjects' orderings of normal and schizophrenic speech segments. Bottom: Cumulative frequency distributions of Kendall's coefficient of concordance for agreement among subjects' orderings of normal and schizophrenic speech segments.
phrenic members have more sequence errors than the normals, while cards 6-9 indicate that 11 schizophrenic members have more sequence errors than the normals; and this time, only the two female pairs yield results opposing the rest of the group. Thus we have more evidence for the notion that the schizophrenic patients’ speech communicates less as their responses come to depend more and more on their own previous responses and are guided less and less by external stimuli, such as instructions or the interviewer’s questions.

Despite our matching procedure, we thought it might be worthwhile to examine the data for the group as a whole. In view of the fact that we were dealing with a comparison of groups, we omitted from consideration the two chronic patients (and their matches) who were interviewed as indicated above after having spent a long time in the hospital, rather than a few days after admission as was true for the other patients. The cumulative frequency distribution of the coefficients of concordance (fig. 3B) shows a rather interesting result. From a W score of 0 to about .30 there is an equal likelihood that a given individual will be a normal or a schizophrenic. Between .30 and .60 the probability appears to be 0 that such an individual will be normal and 1.00 that he is a schizophrenic patient. Finally, should an individual’s speech sample result in W scores above .60, then the probability appears to be 1.00 that he is normal and 0 that he is schizophrenic. The small size of the sample, however, prevents us from recommending it as a diagnostic aid. Nevertheless, these findings do suggest that schizophrenic speech leads to a medium amount of agreement in the reconstruction task—i.e., that on the whole communicability of schizophrenic speech is poorer than that of most normal speech but in the majority of cases better than the poorest normal speech.

The cumulative frequency distribution of the rank order correlation coefficients (fig. 3A) shows, as did the comparison in pairs, that most speech samples, whether normal or schizophrenic, result in rather high correlations between group ordering and the order in which the segments were originally emitted. Nevertheless, one can see that six normal speech samples give rise to correlations of 1.00 and only one schizophrenic speech sample does as well; furthermore, five schizophrenic speech samples produce correlations of .80 or less, while only one normal speech sample does as poorly. Again the score suggests itself as a possible diagnostic index.

Finally, inspection of the cumulative distribution of the sequence
errors (fig. 3B) shows that seven normals have scores below 32 while no schizophrenics do.

The sequence error agreement score showed, for nine of the 13 pairs, that when the subjects placed normal speech segments in the incorrect order, they were more apt to agree on this order than when they placed schizophrenic speech segments in the incorrect order, thus suggesting that normal speech samples exert greater contextual constraint than schizophrenic speech samples, even when the constraint produces an order differing from that of the speaker. Since only eight of the 13 pairs yielded this result, and since this score cannot, unlike the other scores above, be evaluated statistically (each patient-normal pair giving rise to only one score), these results must be viewed with caution.

The time it takes the subjects to order the speech segments constitutes the last measure on the reconstruction task. All but one of the patient-normal pairs showed that it took longer to reconstruct the schizophrenic speech sample than the normal speech sample (see fig. 4). The one exception is again one of the female pairs. Matched pairs signed ranks tests (performed on log seconds) were used to assess the significance of the difference for each pair. The one exception to the general trend was not significant ($p = .13$). The 12 pairs which went in the predicted direction had the following

![SCHIZOPHRENIC-NORMAL MATCHED PAIRS](image)

**Fig. 4**—Reconstruction technique. Time (geometric mean of subjects' reconstruction times for a given speech sample) taken by subjects to complete the reconstruction of samples of normal and schizophrenic speech. Results are shown separately for each schizophrenic-normal matched pair. Pairs A and B are females; pairs D and E each include a chronic schizophrenic.
one-tail p levels: four matches, \( p = .001 \); two matches, \( p = .004 \); and one each of .005, .02, .06, .07, .09, and .13. Thus again, and perhaps most clearly, we have an indication of a deficit in communicability of schizophrenic speech.

In summary, one can conclude on the basis of the method of

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![Graphs showing data comparison between normal and schizophrenic subjects.](image)

**Fig. 5.—** Unitization technique. *Top:* Total number of words (between and within units) which subjects crossed out per 100 words of the speech sample. *Middle:* Number of words crossed out between units only, per 100 words of the speech sample. *Bottom:* Number of words crossed out within units only, per 100 words of the speech sample. Results on each measure are shown separately for each schizophrenic-normal matched pair. Pairs A and B are females; pairs D and E each include a chronic schizophrenic.
reconstruction that there is less ability to communicate in schizophrenic
than in normal speech, whether one considers short units as in the
cloze procedure\textsuperscript{39} or long units as in the reconstruction technique.
Differences in the kinds of information yielded by the two techniques
will be considered later.

Method of Unitization. These data were analyzed in terms of the
following measures:

1. Number of units (sentences) per 100 words of text
2. Number of words per unit
3. Number of words crossed out per 100 words of text:
   a—between units
   b—within units
   c—total

The first two measures—namely, number of units and length of
unit—do not differentiate normals from schizophrenics, p levels being
considerably larger than .05 on the basis of matched pairs signed
ranks tests applied to the 10 matched pairs. On the other hand, the
number of words crossed out because they cannot be fitted into
units does differentiate between the schizophrenic and normal subjects
(see fig. 5) with one-tail p levels of .05, .03, and .005 for the difference
in number of words crossed out respectively between units, within
units, and between plus within units. Furthermore, comparisons made
separately between members of each pair show for the most part
highly significant p levels. These results also indicate that most words
to be crossed out occur between units but that the total number of
words crossed out discriminates best.

In summary, schizophrenic speech is characterized by having a
larger number of intrusions (as measured by number of words crossed
out) than normal speech; this result suggests that the greater difficulty
in filling in the cloze procedure blanks of schizophrenic speech samples
stems at least in part from words which cannot be related to the
surrounding speech even when they are actually supplied to the
“listener” and which therefore would certainly be very difficult to
predict. Such a finding is consistent with the study by Sommer,
Dewar and Osmond,\textsuperscript{43} who found that schizophrenics emit less common
associates in a word association test than normals do, but goes beyond
their finding to suggest that schizophrenic speech contains more words
not related at all to their context.

Speech Rate. The length of time the original speakers took to emit
the speech samples used for the method of reconstruction above was measured.

A matched pairs signed ranks test applied to the above 13 pairs (and including one normal twice who was matched to a chronic and to an acute schizophrenic patient) showed the patients to speak significantly more slowly ($p < .001$, two-tail). This significant difference remained ($p < .02$, two-tail) when the two chronic patients and their matches were eliminated (in which case each normal is included only once). Goldman-Eisler\(^\text{12}\) has already demonstrated that most of the variation in speed of talking can be accounted for in terms of pauses between words rather than in terms of time spent in vocalization, and she also showed\(^\text{13}\) that an increase in pause length before a word

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**Fig. 6.**—Rank order correlation scatter diagrams relating cloze procedure scores to outcome of illness (as measured by number of days in hospital during 180-day follow-up period) for 23 acute schizophrenic patients. The correlation is \(-.47\) with C score (top) and \(+.57\) with D score (bottom).
indicates an increase in information. Translated into the terms of our cloze procedure it means a smaller number of correct guesses of a deleted word after a long pause, and it therefore constitutes still more evidence for difficulty in schizophrenic communication. This led us to compute a rank order correlation between length of time to emit 200 words for the 23 schizophrenics for whom we have cloze procedure data and their cloze procedure scores. The correlation was —.42 (.01 < p < .05, one-tail), thus verifying our hypothesis that slower speech will produce difficulty in communicability. In another study in our laboratory we examined the effect of chlorpromazine on speech rate as well as on the predictability of speech, and we found a reduction in both speech rate and in cloze score—i.e., in communicability as a function of increasing dosage. Finally, Feldstein and Jaffe found a larger number of filled pauses in schizophrenic than in normal speech as well as a positive relationship between irrelevant elements in speech and the proportion of filled pauses.

Communicability and Outcome of Illness

Another way of testing the utility of our measures of speech disorganization is to relate them to outcome of illness with an eye to employing them as prognostic indexes.

Cloze Procedure. Two cloze procedure scores were used and are more fully described by Salzinger, Portnoy and Feldman. 1. The C score consisted of the proportion of correct guesses out of total guesses made. A correct guess was one which matched the deleted word exactly.

2. The D score consisted of the proportion of all incorrect guessed words which were different from each other.

The rank order correlation of the C score and outcome (see procedure section) was —.47 (.01 < p < .05, one-tail); the data are plotted in fig. 6. Thus the better a patient communicates, the shorter his stay in the hospital. When relating outcome to the C score based on the first 100 words only, however, the rank order correlation was —.29 (p > .05, one-tail); for the second 100 words it was —.48 (.01 < p < .05, one-tail). Thus, as in our previous study on the cloze procedure and schizophrenic-normal differences, when the patient is further removed from the external stimuli and has to rely more and more on what he himself produces as stimuli for further speech, more of his pathology appears (there are larger differences between normals and schizo-
phrenics and therefore his speech becomes better related to outcome of illness.

The rank order correlation between the D score and outcome is +.57 (p<.01, one-tail) and the data are plotted in fig. 6. Thus we find that the greater the D score (the less the contextual constraint as measured by agreement on the incorrect responses), the longer the stay in the hospital and, one may assume, the more seriously ill the patient. The correlation of the D score for the first 100 words with outcome is +.41 (.01<p<.05, one-tail), and like that for the C score is higher for the second than for the first 100 words (+.53, p<.01, one-tail). It is interesting to note that while the D score does not differentiate normals from schizophrenics, it does seem to differentiate degrees of psychopathology. The interesting question presents itself as to whether the D scores on the normals might serve as predictors of psychopathology in normal individuals.

Method of Reconstruction. Correlations between outcome of illness and the following variables were all quite low and nonsignificant (p>.05, one-tail): time to complete the reconstruction task, W, and the rank order correlations between the subjects’ ordering and the original speaker’s ordering. However, the sequence error score yielded a rho of +.66 (.01<p<.05, one-tail), indicating that the more difficult the subjects found it to order the speech segments, the longer those patients stayed in the hospital (see fig. 7). In addition, we find again that the relationship is much clearer for the second than for the first 100 words; the correlation is +.21 (p>.05, one-tail) for the first half of the speech sample, but +.88 (p<.01, one-tail) for the second half.

The sequence error agreement score (see fig. 7) correlated —.74 (p = .01, one-tail) with number of days spent in the hospital, indicating that the less the agreement on reconstructing incorrect orders of the speech segments (the greater the sequence error agreement score), the shorter the stay in the hospital. This seems at first to contradict the results on the D score in the cloze procedure, which showed a high positive correlation with number of days spent in the hospital. The explanation must lie in the different lengths of the units involved in the two techniques and the effects of different kinds of errors in producing important changes in the passages. Since the method of reconstruction deals with larger units, with each incorrectly placed speech segment involving 20 words or 10 per cent of the sample and each cloze procedure error involving only about
.5 per cent of the sample, agreement on its errors reveals in addition to high contextual constraint significant misunderstanding of the speech sample. Even though relatively high agreement on errors in the cloze procedure is associated with a short stay in the hospital because it shows integrity of the speech sample, such agreement in the method of reconstruction is associated with a long period of hospitalization because it shows gross misunderstanding of schizophrenic speech. In view of this explanation it is not surprising that the W score correlated +.02 with stay in the hospital, since it incorporates in one score the contextual constraint which leads to correct

![Graphs showing correlation between sequence errors and days in hospital.](image)

**Fig. 7.**—Rank order correlation scatter diagrams relating reconstruction technique scores to outcome of illness (as measured by number of days in hospital during 180-day follow-up period) for 10 acute schizophrenic patients. The correlation is +.21 with sequence errors in reconstructing the first half of each speech sample (top left), +.88 with sequence errors for the second half (top right), +.66 for sequence errors in reconstructing the total sample (bottom left) and -.74 for the sequence error agreement score among subjects reconstructing the total sample (bottom right).
as well as to incorrect responses, the two types of constraints being opposite in effect as far as communicability is concerned.

Since we could follow up only eight schizophrenic patients on the unitization technique, we decided to await a larger sample before testing the relationship of its measures to outcome.

*Interrelationship of the Three Measures of Aspects of Communicability*

Final conclusions on the interrelationship of the three techniques will have to await empirical correlations. Some comments on the theoretical relationships are, however, in order. The cloze procedure appears to us to be the most comprehensive way of measuring communicability since both the semantic and the syntactic properties of the speech sample would seem to determine the cloze score; it appears to be the most direct way of measuring communicability since the respondent must supply the correct word in order to demonstrate his understanding of the speech sample. The other two techniques appear to concentrate more on ways of describing the structure of the speech samples and appealed to us primarily as determinants of communicability rather than as overall measures of communicability. Thus one can conceive of a passage which might be almost completely incomprehensible semantically and yet one which, because of good syntactic structure, could be reconstructed easily.

Only the intrusions—that is, the words which subjects cross out in the unitization technique—seem close to a direct measure of communicability, but even these need not reduce communicability drastically as in the case of words repeated immediately. It appears that both the nature of the speech samples as measured by the techniques of unitization and reconstruction, and their communicability as measured by the cloze procedure, relate to psychopathology. The actual degree of independence of these techniques will be investigated in a later paper.

*Some Comments Toward a Theory of Schizophrenia*

Our findings probably do not serve as a source of embarrassment to any of the leading theories of schizophrenia presently extant. Mednick,23, 24 for example, has suggested in his theory of schizophrenia that the greater anxiety, or what he now terms the greater arousal level, to be found at least in the beginning of schizophrenia is associated with greater stimulus generalization and a tendency to make responses which avoid further anxiety, with the result that the schizophrenic
patient will "experience atypical thought sequences and tangential intrusions into his stream of ideation" (p. 172). He goes on to suggest that remote associations are more likely to be positively reinforced than are close associations because they result in a drop in anxiety and so are drive-reducing. Our data are certainly not in conflict with the predictions of such a theory, although we may not agree with the usefulness of a concept like drive reduction. The theory of the "double-bind" suggests that the only way in which the schizophrenic patient can extricate himself from the double-bind is to make what we like to call avoidance responses. These investigators have pointed out that the patient makes utterances which are rich in metaphor, that the patient is unaware of speaking in metaphors, and that this is one of the methods which he has learned in order to escape from and respond to the double-bind situation. The schizophrenogenic mother sets up a conflict in which she punishes him for his behavior (no matter what it is) but does not allow him to react to her as a source of punishment. Furthermore, our results appear to agree, at least in general outline, with the idea of some language difficulty as suggested by Arieti, or Goldstein. These theories do not, however, explain some other findings in the literature about differences between normals and schizophrenics. Among these are differences in psychophysical tasks. An experiment by Lovingier, to take but one example, has shown that schizophrenic patients in poor contact show less object constancy than do normals. The schizophrenic patients react to the immediate stimuli which impinge upon them. In this particular experiment the subjects seem to react to the visual angle on the retina, rather than to their experience which should have made the distance factor and the visual angle influence their judgment. Object constancy is, after all, an important aspect of a person's experience. An individual who stands on top of the Empire State Building and who is asked to judge the height of a person down below, even though the visual angle would be very tiny indeed, would not judge the height of a human being as one inch but would instead judge this individual to be approximately five feet. In other words, a normal individual reacts not only to the immediate stimuli that impinge upon him but reacts to the immediate stimuli plus the history surrounding these particular stimuli. That the schizophrenic patient has a tendency to be ahistorical is a finding which has been in the literature for a while. In one of our own experiments, for example, we found that schizophrenic patients extinguish faster than do normals. This finding has been confirmed in experiments by
Rickard, Dignam, and Horner, who found rapid extinction during minimal reinforcement periods, and by Dinoff, Horner, Kurpiewski, and Timmons, who found rapid extinction when reinforcement was withheld. In other words, the schizophrenic patient reacts immediately to the cessation of reinforcement. The schizophrenic patient acts as if there had been no previous conditioning or relatively little conditioning before extinction had set in, while the normal individual accounts for his history in his subsequent behavior. In still another experiment done in our laboratory, it was demonstrated that the schizophrenic patient, in a task of absolute judgment, had a tendency to react to the immediate effect of an anchor rather than to the instruction which preceded the anchor and which told him to take the effect of the anchor weight into account. The normal individuals, on the other hand, were able to so adjust their judgments of the weights that they compensated for the effect of the anchor. Again, we have evidence here that the schizophrenic patient reacts to the immediately effective stimuli rather than to past stimuli.

For a long time now investigators of schizophrenia have pointed out that schizophrenics have a tendency to react to such extraneous stimuli as the amount of dirt on cards used for sorting tasks, rather than to the design to which they were instructed to react. It was Chapman who showed by means of an experiment that schizophrenic patients have a greater tendency to react to distracting stimuli on cards on a sorting task than do normal individuals. Again our interpretation is that schizophrenic patients react to those stimuli which are immediately present. In fact, they react to them in a way which is not selective. It is for this reason that Chapman found that schizophrenic patients’ performances became worse as the number of distracting stimuli increased. This was not true for the normal control group used in Chapman’s experiment.

The question might be asked, “How does all this relate to language?” One of the most important aspects of language is the fact that a speaker in emitting his words must react not only to the word he has just uttered but to the last two words, the last three words, and usually to many words he has uttered previously. One would then expect that an individual who is unable to react to stimuli remote either in time or in space would have difficulty in making himself understood. This is, in fact, what we have found. We might also remind the reader of another study done in our laboratory, where we found that schizophrenic patients tended to repeat their words
as well as sequences of words over shorter intervals than did normal individuals. Interestingly enough, a study by Yavuz has demonstrated a tendency of schizophrenics to repeat bigrams, in a letter-listing task, more frequently than normals. Again this seems to give evidence for the notion that schizophrenic patients have difficulty in reacting to stimuli which are not immediate. Thus we are suggesting that what looks like thought disorder might more generally be viewed as a prepotency of immediate stimuli over remote stimuli.

The schizophrenic patient’s hallucinatory behavior can perhaps also be explained in terms of the effect of immediate stimuli. In the absence of any external stimulation powerful enough to capture his attention, his thoughts become the “voices” which control his behavior.

If one accepts the notion that a schizophrenic patient reacts prepotently to immediate stimuli, then this has a number of implications about treatment. One clear implication, for example, is that one has to use stimuli which are powerful and which are immediate, if one is interested in controlling the behavior of a schizophrenic patient. This is really not a surprising remark for any person who has ever worked with schizophrenics. All but the most disturbed patients can be gotten to pay attention as long as one tries hard enough with sufficiently powerful stimuli. Thus, if one wants to control the behavior of a schizophrenic patient, one would probably have to use such immediate stimuli all of the time in order to be able to restrain the patient from his psychopathological behavior and allow normal behavior to occur. Presumably, if the reinforcing stimuli could also be very powerful after the normal or more nearly normal behavior is emitted, this would then be a potential technique for modifying the behavior of the schizophrenic patient so that eventually he may not have to depend upon powerful immediate external stimulation. In regard to this, we might consider the possibility that tranquillizers may work against this approach by lowering the patient’s reactivity to any external stimulation. Salzinger, Pisoni, Feldman, and Bacon have already collected data supporting the hypothesis that chlorpromazine reduces the amount of control exerted by reinforcement.

Finally, one ought to consider the possibility that the reason the schizophrenic patient is quite so difficult to treat successfully is that he is basically ahistorical, and that if this be true, then schizophrenic patients must be people who should be exposed to such powerful immediate external stimulation all of the time, in order to keep them going along as normal individuals.
Summary

In this chapter we presented three objective techniques for the assessment of communicability of schizophrenic speech, examined their ability to distinguish normal from schizophrenic language (as possible diagnostic measures), and related them to degree of psychopathology within the schizophrenic group (as a possible prognostic index). The first assessment technique, the method of reconstruction, consists of having normal subjects put randomized speech segments into the order in which they think the speaker uttered them. The second technique, the method of unitization, consists of having normal subjects divide unpunctuated speech samples into complete sentences, deleting any words which could not be fitted into these sentences. The third technique, the cloze procedure, consists of having normal subjects guess words which have been systematically deleted from the speech samples. All three techniques were found to yield useful measures.

The results of this study, together with data from other experiments, led us to propose the notion that the basic deficit in the schizophrenic patient's behavior consists of his being controlled primarily by stimuli immediate in space or in time. It is for this reason, we contended, that he has difficulty in sorting tests, that at least in the more deteriorated stage he shows less object constancy, that he extinguishes faster after conditioning (to give but a few examples from areas outside language), and that in language he shows "loose association" and poor ability to communicate because language requires that the speaker react to long-range stimuli.

REFERENCES

7. Von Domarus, E.: The specific laws of logic in schizophrenia. In Language


46. ———: Application of cloze procedure to the verbal behavior of mental patients. Paper read at Study Section on Verbal Behavior, American College of Neuropsychopharmacology, Washington, D.C., 1963.
