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COMMUNICABILITY OF VERBAL BEHAVIOR IN SCHIZOPHRENIC PATIENTS AND ITS RELATIONSHIP TO CURRENT PSYCHOLINGUISTIC THEORY[1,2]

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The purpose of this paper is to relate past research on communicability of verbal behavior in schizophrenics to current psycholinguistic theory. The paper reviews the taxonomic methods (i.e., segmentation and classification) which have characterized past research on schizophrenic verbal behavior. It is concluded that although interesting results have been reported, specification of that aspect of schizophrenic language behavior which causes it to be labeled "aberrant" or "pathological" is still lacking. A more generalizable alternative than those previously suggested in the literature is proposed as the basis for interpreting schizophrenic speech. It is assumed that new developments in psycholinguistic theory will provide needed insights into the nature of the schizophrenic language disorder.

Schizophrenia has been and still is today the most baffling disease in psychiatry. Intellectual impairment, disturbances of emotional life-style and a striking lack of communication with others are typical features. In his classic treatise on schizophrenia Bleuler (1950) considered both semantic and syntactic irregularities as characteristic of schizophrenic speech, in accordance with numerous other psychiatrists like Meyer, Freud and Jung (Kasanin, 1944). These investigators suggested that schizophrenic speech utterances have a definite meaning and content even though they may be incomprehensible to an observer.

Schizophrenic speech has long aroused the curiosity of psychologists interested in language and thought processes. Several investigations have attempted to identify the "formal characteristics" of schizophrenic language. The typical study of this sort elicits a sample of either written or spoken language from patients and normals and then proceeds to a taxonomic (i.e., segmental and classificatory) analysis of the frequency of use or occurrence of the various kinds of linguistic units (e.g., nouns, verbs, adjectives, or

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the ratios between them). Many studies have been directed toward the formal differences between schizophrenics and normals, in an attempt to lay an empirical basis for hypotheses about the processes of schizophrenic language. Conversely, other studies have attempted to describe the differences between schizophrenics and normals within the context of some existing hypothesis. In the latter case, the differences between schizophrenics and normals have all too often been interpreted in the light of traditional psychological theories, (i.e., learning theory or psychoanalytic theory), with an almost complete disregard for linguistic methods and theory.

"Deviant" or "abnormal" verbal behavior is probably the most important criterion used by the clinician for diagnosis, prognosis and the evaluation of treatment in schizophrenia. As a result, the procedure for obtaining samples of schizophrenic verbal behavior is the routine clinical interview, during which the clinician typically elicits a verbal response from the patient by a series of specific questions (a structured clinical interview) or by more general questions that lead the patient into conversation (an unstructured clinical interview). In both cases the clinician uses the patient's verbal behavior to infer something about his illness.

In recent years, however, largely under the influence of Skinner (1957), new methods for the "experimental analysis of the interview" (Salzinger & Pisoni, 1958) have appeared. These methods specify "empirically" and "objectively" the manner in which an interviewer (clinician) controls and maintains the verbal behavior or speech production of the interviewee. While these conditioning studies have been quite revealing in demonstrating that speech production can be partly controlled by the interviewer, much remains to be done, not only in describing the formal aspects of schizophrenic language objectively and experimentally but also in providing an adequate explanation for the deviant language behavior.

Analytic Studies of Schizophrenic Language

Probably the most frequently studied descriptive characteristic of schizophrenic langauge is word usage. Several investigators have been interested in word diversity, i.e., whether patients use a wide or narrow range of different words to express themselves. The standard measure of "word diversity" is the Type-Token Ratio (TTR), the ratio of the number of different words (types) to the total number of words (tokens) in a given sample. Fairbanks (1944) and

Mann (1944) first used the TTR in studying language samples from schizophrenics and university freshman. Fairbanks, analyzing spoken samples, found that the difference between the two groups in mean TTR was significant, with the schizophrenics showing less diversity. Similarly, Mann found that the schizophrenics' TTRs in written samples were also significantly lower than the freshmen's.

Comparable measures of "flexibility" have been employed by other investigators. Whitehorn and Zipf (1943) analyzed the language of normals, children, and paranoid schizophrenics for repetition and diversification. Like Fairbanks and Mann, they found a greater tendency to repetition among schizophrenics than among normal adults. Similar results have since been reported by Lorenz and Cobb (1954), Feldstein and Jaffe (1962), Hammer and Salzinger (1964) and Salzinger, Portnoy, and Feldman (1964).

Investigators of schizophrenic language have also used extensive analyses of word length (Zipf, 1935). In general, results indicate that mean word length and 90th-percentile word length tend to be higher with schizophrenics than normals; in other words, schizophrenics apparently use words which occur less frequently than do normals (Salzinger, Portnoy, Pisoni, & Feldman, 1968).

Another descriptive characteristic which has been of interest in studying schizophrenic language is the relative frequency of the various traditional "parts of speech." Fairbanks (1944) found that schizophrenics used significantly fewer nouns, conjunctions, prepositions, adjectives and articles in speech than did the freshman controls, and significantly more pronouns, verbs, and interjections. A more recent study (Salzinger, Portnoy, Pisoni, & Feldman, 1968) with matched schizophrenic and non-psychiatric patients render Fairbanks' results suspect since no significant differences were found between schizophrenics and hospitalized normals in the frequency of occurrence of any of the major grammatical classes (see Table 1).

Insert Table 1 about here

The "Adjective-Verb Quotient" (AVQ) has also been used in descriptions of schizophrenic speech. A low AVQ reflects a lack of description and qualification but a high degree of action, whereas a high AVQ indicates a relative lack of action but a high degree of description and qualification. Fairbanks and Mann (1944) both report high AVQs for the freshmen controls as against the schizophrenic patients.

Measurement of Communicability

It probably comes as no surprise that patients classified as schizophrenic communicate, i.e., transmit information, less effectively than normals. In fact, deviant communication by a mental patient tends to provoke a diagnosis of schizophrenia more readily than almost any other response in the schizophrenic syndrome.

The most interesting of recent studies in communicability of schizophrenic speech use methods suggested by information theory to describe quantitatively the various constraints which govern speech production and perception. Numerous techniques have been devised to measure the readability or communicability of a given language sample. The best known of these techniques has probably been the "cloze procedure," (Taylor, 1953; 1956). The cloze procedure (from closure as used in Gestalt psychology), which originated as a measure of readability in journalism, assumes that language is redundant and that a reader is familiar with the semantic and syntactic properties of his language, i.e., that the elements in a sentence contain certain redundancies which are inherently predictable by a person knowing the language. The technique involves the systematic deletion of words from a given verbal passage and the prediction of these deleted words by a group of judges or "clozers." Each passage can then be described in terms of the number of words guessed correctly, (i.e., exact prediction of the deleted word) and in terms of the number of words guessed that are of the same grammatical class as the deleted word, (i.e., grammatical prediction). Taylor (1956) originally suggested both techniques. The first method has been used to determine which passages are more readable or comprehensible, while the second method has been used to arrive at a "quantitative" measure of syntactic organization. Since then the cloze procedure has been used to investigate statistical approximations to English (Salzinger, Portnoy, & Feldman, 1962), the effects of drugs on speech, (Salzinger, Pisoni, Feldman, & Bacon, 1961; Honigfeld, 1963), differences between suicide notes and control letters (Osgood & Walker, 1959), the effect of psychotherapeutic interaction on predicting the speech of patients (Feldstein & Jaffe, 1963), and the nature of aphasic speech (Fillenbaum & Jones, 1962).

According to Osgood (1959), the cloze procedure measures "the degree of correspondence in toto of the source's system of language habits--including both semantic and grammatical habits--to those of other users of the same language." As will be seen, the cloze procedure has been used to evaluate both the encoding (production) and decoding (perception) processes of schizophrenic patients.

Communicability of Verbal Behavior in Schizophrenia

Perception of speech by schizophrenics. Several studies have examined the performance of schizophrenics in decoding language materials (Chapman, Chapman, & Miller, 1964), but only one has attempted to measure comprehensibility with schizophrenics as judges.

Honigfeld (1963) used the cloze technique to evaluate the ability of schizophrenic patients to understand normal speech (newspaper text), psychotic speech (schizophrenic interview transcripts) and "pseudopsychotic" speech (speech under the influence of psilocybin, an hallucinogenic drug). The normals did significantly better than the schizophrenics on all speech samples. Honigfeld's results contradict the traditional claim by clinicians that schizophrenics have their own special language and thus can better communicate with one another than with normal people. However, Honigfeld's study gives rise to a serious methodological question. It has been noted that there are systematic differences in comprehensibility between spoken and written verbal materials (Portnoy, 1968). All three types of material used in Honigfeld's study should obviously have come from the same mode--or better still, modes--of production. More serious still is the fact that his patients served only as judges and never as emitters (encoders). Studies at the Biometrics Laboratory (Hammer, Salzinger, & Pisoni, 1968) and Portnoy (1968) indicate that there is no simple relationship between "communicability" (i.e., encoding) and "comprehensibility" (i.e., decoding) for a given subject on cloze performance: the performance of one subject in clozing (i.e., restoring the deleted words in a transcript) does not necessarily correlate with the performance of other subjects (judges) in clozing a passage emitted by him.

Production. To assess the differences in communicability between schizophrenic patients and nonpsychiatric patients matched for age, sex, and educational background, Salzinger, Portnoy, and Feldman (1964; 1966) used three techniques: (1) the method of reconstruction, (2) the method of unitization and (3) the cloze technique.

The speech samples (200 word passages) used in their studies were the beginnings of either extended samples of continuous speech obtained by the monologue procedure (i.e., open-ended dialogue) or were uninterrupted portions of the beginnings of a standarized interview.

The first of these techniques, the method of reconstruction, was suggested by Becker, Bavelas, and Braden (1961), who used intersubject agreement on the correct sequencing of a series of randomized sentences to establish an index of sentence contingency. In the Salzinger, et al. (1966) study, each of the 200-word passages from both patients and normals was divided into 10 successive 20-word segments and typed on index cards without punctuation. Separate groups of native English-speaking college students serving as judges, were given scrambled sets of cards and were told to reconstruct the original passage within a fixed time. From this sorting task a measure of reconstructability was calculated which indicated the agreement among Ss and their agreement with the original text. Results confirmed expectations: there were more ordering errors with material from schizophrenics than with that from normals.

For the second technique, the method of unitization, the same speech samples were mimeographed without punctuation and distributed to groups of college students, who were asked to divide the speech samples with parentheses into "complete grammatical sentences;" the only other change they could make was to delete words by drawing a line through them. The number of units (i.e., grammatical sentences) and the length of each unit (i.e., the number of words in each sentence) did not differentiate schizophrenics from normals. On the other hand, the number of words crossed out (i.e., identified by the S as intrusions), did differentiate between schizophrenic and normal Ss. This confirmed the hypothesis that schizophrenic speech is less coherent than normal speech.

In the third technique, the cloze procedure, each of the same speech samples was presented on a separate sheet without punctuation and with every fifth word replaced by a blank of constant size. Groups of Ss were assigned to fill in each blank with the word they thought fitted it best. The C-scores--the ratios of each S's correct guesses to his total guesses--once again supported Salzinger's hypothesis of lower communicability in schizophrenics than normals. An additional finding was that C-scores decreased in the second half of schizophrenic passages but increased in the second half of normal passages. Salzinger interprets this result as supporting his "Immediacy Hypothesis" of schizophrenic behavior:

> the behavior of schizophrenics is determined primarily by stimuli immediate in their temporal and spatial environment. With respect to verbal behavior, the critical stimuli to be considered are those generated by the speaker himself, i.e., the verbal responses which the patient emitted prior to the

> response in question. The hypothesis, therefore, states that any given verbal response in a schizophrenic is primarily related to the words in the immediate vicinity but only to a minor degree to the words which are more remote, while normal speech is determined by both close and remote stimuli (verbal responses) [Salzinger, Portnoy, & Pisoni, 1969].

Thus, while increased context (first half of passage to second half) facilitated the prediction of normal speech production, the increased context had a detrimental effect on the prediction of schizophrenic speech production, presumably because schizophrenics are unable to respond to remote stimuli. Discussion by Salzinger et al. (1966) of the schizophrenic's sentence production is predicated on a simplistic notion of the structure of 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 that he has just uttered but to the last two words, the last three words, usually to many words he has uttered previously. One would expect that an individual who is unable to react to stimuli remote either in time or space would have difficulty in making himself understood [Salzinger, et al., 1966, p. 125].

A number of methodological criticisms can be made of this study and the earlier Salzinger study (1964).

First, the choice of unit size for the reconstruction method was arbitrary. It would surely have been more enlightening from a psycholinguistic point of view to use the grammatical units selected by the judges in the unitization task rather than the 20-word segments actually used (without any apparent rationale). Further lack of psycholinguistic sophistication is apparent in the investigators' handling of the unitization method. The instrusions crossed out by the judges should have been, but were not, classified grammatically. Similarly, no attempt was made to go beyond a rudimentary grammatical classification of the speech samples (see Table 1).

The use of the cloze procedure was also defective. The investigators failed to identify the incorrect cloze predictions by grammatical class. If they had, they could have compared the prediction of syntactical organization for schizophrenics and for normals. Finally, the judges used in all three production methods were normal college students. It would have been better if the same groups (patients and normals) who gave the speech samples had then been used as judges, in order to describe systematically not only their production but also their perception.

A Test of Salzinger's Immediacy Hypothesis

Salzinger, Portnoy, and Pisoni (1969) selected speech monologues from 10 schizophrenic patients and 10 matched normals (Salzinger et al., 1966). From each monologue four words were selected for clozing by a group of 230 undergraduate students. The test words were selected to be function and lexical words of high or low predictability based on cloze scores from the two previous studies (1964; 1966). Each of the monologues thus provided a high- and a low-predicted function word and a high- and low-predicted lexical word. The stimulus segments used for prediction were mimeographed texts consisting of blanks replacing each of the test words, bracketed by contexts of increasing length taken from the original speech samples. Contexts consisted of 1, 2, 4, 8, and 14 words on each side of the blank for each test item. Each of these stimulus segments was predicted by 23 judges.

The data were scored in percent correct attainment of deleted words (%C). The results showed a significant difference in %C as a function of context across patients and normals.

A comparison of %C for segments from the monlogues of schizophrenics with %C for those of normals showed that function words were guessed correctly significantly more often in normal than in schizophrenic speech segments at the higher levels of context, i.e., 8 and 14 words of context. No significant differences were found in %C for blanks replacing lexical words (see Figure 1). According to Salzinger, et al. (1969):

> Although both schizophrenic and normal speech was shown to profit from context, the results revealed that more context in normal speech produced a greater increase in %C than it did in schizophrenic speech. Since lexical words are not as dependent on context for their meaning as are the function words, the significant difference for function words (and the lack of difference in lexical words) between normals and schizophrenics supports the immediacy hypothesis. It shows, since additional context produces a greater difference between normals and schizophrenics, that connections among the words of schizophrenics hold over shorter sequences (response-produced stimuli are more immediate) than those of normals. Thus, the lower communicability of schizophrenic speech can be explained in terms of the greater importance of immediate stimuli in determining schizophrenic speech.

One of the central tenets of current psycholinguistic research (Miller, 1965) is that sentences are not organized in a left-to-right probabilistic

fashion but rather have a hierarchical structure from top to bottom. Unfortunately for the behaviorist simple theories conceived in terms of "chaining successive responses" and of external factors such as present stimulation and history of reinforcement have not been able to provide an adequate account of linguistic behavior. The implicit finite-state model of Salzinger et al. (1966) is like ones already shown to be inadequate as a theory of natural language (Chomsky, 1957, pp. 18-25). Accordingly it is suspect as the basis of a theory of the special case of natural language encountered in schizophrenia.

Summary and Conclusions

The characteristic emphasis on analytic taxonomic procedures in the psychological study of schizophrenic language can be viewed as the theoretical basis which unites the studies discussed in the present paper. Although a more powerful alternative approach to understanding the nature of schizophrenic language is needed, a number of interesting suggestions can be derived from their findings: intrusions occur more often with schizophrenics than normals; schizophrenics tend to use less frequent words than do normals and to be more repetitive in their vocabulary; schizophrenic speech is less predictable and less coherent than normal speech. However, we are still far from specifying the nature of the language disorder in schzophrenia. It is one thing to make observations and provide descriptions of schizophrenic language but quite another to provide a theoretical basis for explaining and predicting this language disorder.

Recent linguistic theory has emphasized the fact that equivalent surface structures (i.e., in the Salzinger et al. (1966) study, the number of words within a grammatical unit) do not necessarily imply that there are equivalent deep structures or underlying representations. Current research (Tikofsky & Pisoni, 1969; Pisoni & Gerstman, 1968) indicates that certain psycholinguistic variables (i.e., semantic and syntactic constraints) which affect cloze performance operate not only at the level of surface structure but also in deep structure. In fact, it is quite conceivable that the real differences which affect the clozing performance of schizophrenics and normals might lie in the deep structure as well as in the surface structure.

The distinction between linguistic competence and psycholinguistic performance, i.e., knowledge of language rules (rules which relate deep structures to

surface structures) as opposed to their use, is important in any consideration of deviant or abnormal language. To the extent that schizophrenic language is different from normal language, generative theory allows two possible explanations: either patients do not share the same common knowledge of the rules of their language, or they do not use their knowledge of these rules in the same manner as do normal speakers and listeners.

In a first approximation to an answer to this problem a recent study (Gerver, 1967) examined the effect of linguistic rules (i.e., semantic and syntactic rules) on the perception of speech by normals and by chronic schizophrenics. The Ss heard recorded sentences in which semantic and syntactic rules were systematically varied according to procedures outlined by Miller and Isard (1963) and Marks and Miller (1964). In an immediate-recall task it was found that although the schizophrenic group performed at a significantly lower level than the control group in terms of the number of words correctly recalled; semantic and syntactic rules aided the schizophrenic group in correct perception, retention, and recall of speech as they did the control group. It was concluded that variability in linguistic behavior in schizophrenic patients may be due to variability in the use of the rules of the language (performance) rather than a lack of knowledge of these rules (competence).

Two studies, Honigfeld's (1963) with the cloze procedure and Gerver's (1967) with varied linguistic rules; suggest that schizophrenics have the same knowledge of the rules needed for the perception of language as do normals; though their level of performance on psychological tasks is appreciably lower.

Two alternative areas of investigation now open up: First, the way schizophrenic patients use linguistic rules should be examined to determine whether the differences occur in deep-structure grammatical relations or are a result of transformation rules relating deep structures to surface structures. Second, it appears in the Salzinger, et al. (1964; 1966; 1969) studies, for example--that the nature of the language disorder in schizophrenia may be only productive and not also perceptual in nature. Research is needed to identify the processes of linguistic production that control the ability of schizophrenics to communicate.

The chief goal of any research on language behavior in schizophrenia must obviously be the specification of that aspect of the behavior which causes it to be labeled "aberrant" or "pathological." Adoption of a psycholinguistic point of view as suggested here appears to offer new insight into the nature of schizophrenic language disorder.

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Footnotes

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[2]A major focus of this report is the numerous studies on communicability in schizophrenics which have originated at the Biometrics Research Unit of the New York State Department of Mental Hygiene. In this connection, thanks are offered to Kurt Salzinger, Stephanie Portnoy and Richard S. Feldman for introducing me to the study of schizophrenic speech and for guiding me during the past few years.

Table 1

Patient-Normal Grammatical Classification Data

(From: Salzinger, Portnoy, Pisoni, & Feldman, 1968)

N=13 Matched Pairs

Scale	Patient		Normal	
	Mean Proportion	S.D.	Mean Proportion	S.D.
Grammatical Classification				
1. Noun	0.14	0.02	0.14	0.03
2. Verb	0.11	0.03	0.11	0.03
3. Adjective	0.05	0.03	0.06	0.02
4. Adverb	0.10	0.04	0.10	0.02
5. Pronoun	0.15	0.03	0.14	0.04
6. Preposition	0.12	0.02	0.09	0.03
7. Conjunctions	0.08	0.03	0.09	0.02
8. Articles	0.06	0.02	0.07	0.02
9. Contractions	0.03	0.02	0.03	0.02
10. Function Words	0.25	0.03	0.25	0.03
11. Lexical Words	0.40	0.05	0.42	0.03
Descriptive Measures				
1. C-Cloze Score (Correct)	0.40	0.06	0.50	0.09
2. C + G Cloze Score (Grammatical)	0.68	0.08	0.73	0.06
3. Mean Word Length	4.02	0.22	3.95	0.22
4. 90th Percentile Wd. Length	7.85	0.53	7.66	0.46

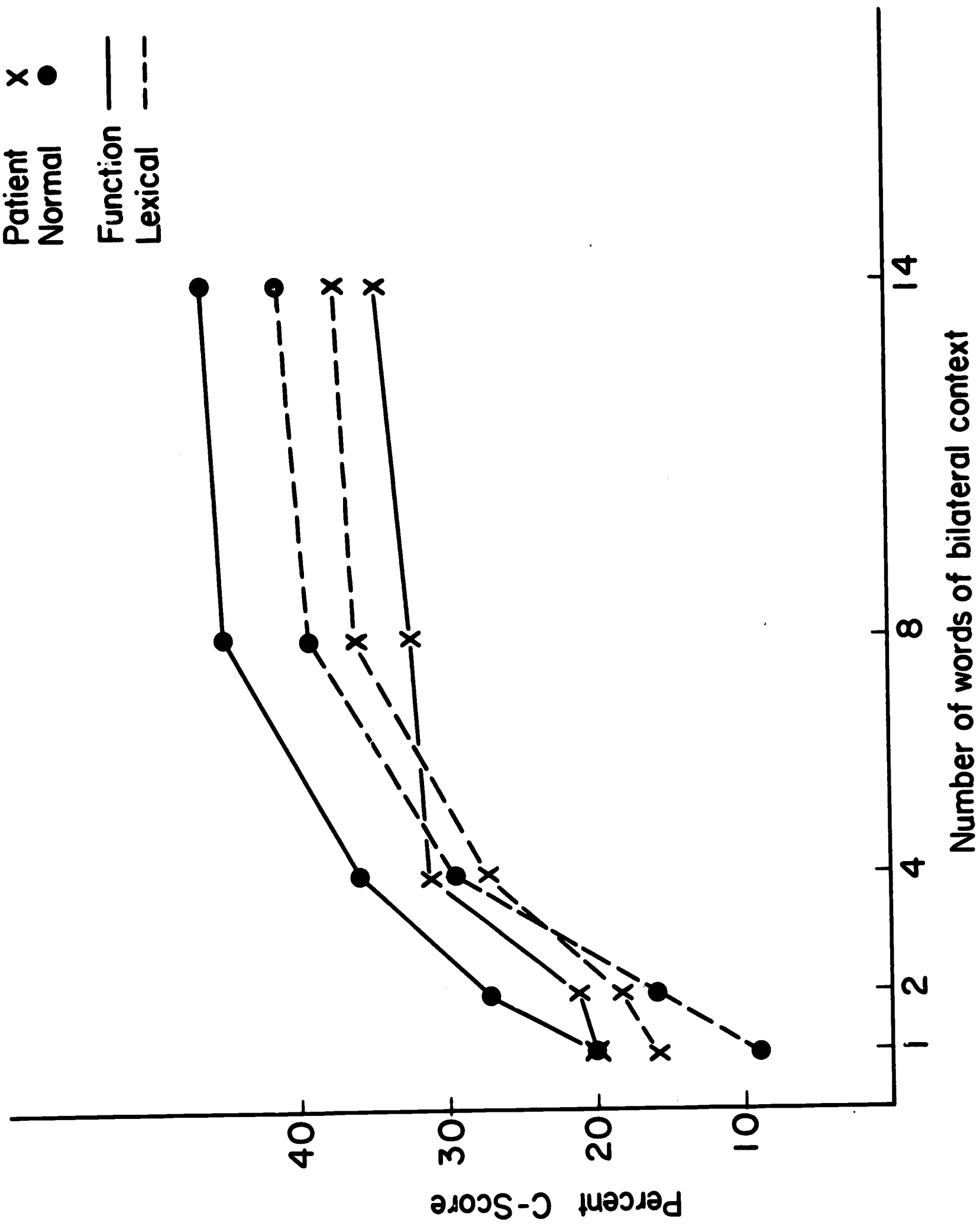
Patient ● X
Normal
Function ——
Lexical - - -
Percent C-Score
40
30
20
10
1
2
4
8
14
Number of words of bilateral context

Figure 1