The Immediacy Hypothesis and Response-Produced Stimuli in Schizophrenic Speech

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Abstract

Speech samples emitted by 10 schizophrenics individually matched with 10 normals were compared and used to test the validity of the Immediacy Hypothesis, which states that schizophrenics are primarily controlled by the immediate aspects of their environment, whether response-produced or external. The responses of 230 undergraduates to the verbal materials indicated that schizophrenic speech consists of relatively short strings of words related to one another, while in normal speech the dependency of one word on another holds over longer spans. These results were interpreted to mean that schizophrenics have a greater tendency than normals to be controlled by immediate stimuli (in this case, response-produced), thus providing further evidence for the Immediacy Hypothesis.
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In the last ten years there has been a resurgence of interest in the construction of theories with respect to schizophrenia. Although the current state, in contrast to older theories, has produced testable hypotheses, many have become unduly complicated. The object of this paper is to present a relatively uncomplicated general hypothesis about schizophrenia and to test it on the verbal behavior of schizophrenic patients.

The hypothesis to be tested is known as the Immediacy Hypothesis and data supporting it have been summarized with respect to psychophysics, reaction time experiments, conceptual behavior, memory, learning, and verbal behavior (Salzinger, 1966; in press, a, b). The Hypothesis stated in its most general form is that schizophrenic behavior is primarily controlled by stimuli which are immediate in the environment. A person controlled by stimuli most immediate in his environment is likely to have difficulty in a sorting test because his behavior might well be controlled by the irrelevant stimuli put on the cards as distracting stimuli (Chapman, 1956); control of his behavior merely depends on which stimulus is acting on him immediately preceding his response. Given a situation where such an individual is required to judge the heaviness of weights, one would expect him to be more influenced than a normal individual by an anchor weight immediately preceding the weight to be judged (Salzinger, 1957) and to be less influenced by an anchor weight which is only a member of a series and whose effect must therefore
be maintained over a series of trials (Hurster, 1965). In constancy experiments, such a person's response would be expected to be controlled more by retinal image than by the actual object, since the former is a more immediate stimulus than the latter (Wędkowicz, 1964). In learning, one would expect a continuous schedule of reinforcer to result in equally rapid conditioning for the schizophrenic and the normal, but one would expect faster extinction in the former because of the absence of the immediate stimulus, the reinforcement (Salzinger & Pisoni, 1960).

It is perhaps even more interesting to speculate about how the Immediacy Hypothesis relates to speech and communicability. The Immediacy Hypothesis was first applied to studies which showed that the speech of the schizophrenic communicates less well than the speech of the normal (Salzinger, Portnoy, & Feldman, 1964a; 1966). The speech of the schizophrenic patient which followed the experimenter's instructions was not as different from that of the normal as was the speech which occurred later (without the experimenter's instructions as an immediate stimulus) in the course of the same monologue. In addition, however, the difference between the normals and patients was also explained in terms of the control exerted by stimuli which are response-produced. It was hypothesized that the general defect in communicability of schizophrenic speech could be attributed to the relatively short span of neighboring responses over which response-produced stimuli exert control. In other words, it was hypothesized that in schizophrenic speech the controlling response-produced stimuli were close by (as in lower order approximations to English -- Müller & Selfridge, 1950; Salzinger, Portnoy, & Feldman, 1962), while in normal speech they consist of both near and far response-produced stimuli.

In formulating a more exact test of the Immediacy Hypothesis, the following reasoning was used. If it is true that schizophrenic verbal behavior is primarily controlled by stimuli (including response-produced stimuli) which are close to a given response, then it follows that a given verbal response should be related primarily to the immediately surrounding words and very little to words further removed. Thus, if we take a particular string of words and delete one, the immediately surrounding words should allow another person to guess what word the schizophrenic speaker emitted. With a normal speaker, on the other hand, more surrounding words will be necessary for another person to guess what word was uttered.

Method

Subjects

Speakers. The speech samples which served as the source of the material in this experiment were taken either from monologues of schizophrenic and physically ill patients by means of a technique (Salzinger, Portnoy, & Feldman, 1964b) requiring no questions but allowing the patient to talk freely without interruption of any kind, or from unrelated speech samples of interviews (Salzinger & Portnoy, 1964). There were 20 male patients; 10 were schizophrenic (two chronic and eight acute) and 10 were normal subjects hospitalized for non-psychosomatic physical ailments. None of the schizophrenics were under the influence of tranquilizing drugs or currently under any other somatotherapy. The two patient groups were selected to provide 10 schizophrenic-normal pairs matched on age (schizophrenics had a median of 30.5, normals, 29.5 years), education (schizophrenics and normals had a median of 12 years of formal schooling), and, whenever possible, speech subcommunity (Hammer & Salzinger, 1964).
Clozers. Subjects who had the task of guessing the words which the speakers had emitted are called "clozers", and consisted of 230 undergraduate students with a median age of 21 years (85% had ages ranging from 18 to 23 years). All were native speakers of English. The cloze task was done during regular class time.

Selection of speech segments

The segments presented to the 230 clozers in this experiment were selected from the speech of the schizophrenics and normals in such a way as to produce items representing two different grammatical classes (function words, consisting largely of articles, prepositions, and conjunctions; and lexical words, consisting largely of nouns, pronouns, verbs, adverbs, and adjectives) and words of two different levels of "guessability" (high and low) in the cloze procedure. The speech samples from which the segments were selected had been subjected to the cloze procedure in a previous study (Salzinger, Portnoy, & Feldman, 1966), i.e., every fifth word had been deleted and a group of normal subjects (clozers) was asked to guess the deleted words; those deleted words which had been guessed correctly by most of the clozers (50% - 93%, Median 73%) constituted the category of high guessability items (Hi) and those not guessed correctly by most of the clozers (7% - 47%, Median 27%) were considered to be the low guessability items (Lo). Each of the 20 speech samples gave rise to two Hi items and two Lo items; of each of these, one was a function word (F) and the other a lexical word (L). Furthermore, for a given schizophrenic-normal matched pair, the segments were equated by having the deleted word the same part of speech (F or L) and the same level of guessability (Hi or Lo, with no difference in guessability exceeding 15% within a Hi-Hi or a Lo-Lo pair).

Each of the segments consisted of one blank substituted for each of the above described words and surrounded by different numbers of words of context from the original speech samples. Context consisted of 2, 3, 8, 16 and 28 words surrounding the blank, half on each side. Each segment was presented on a separate page in a booklet of 40 randomized segments, 20 schizophrenic and their 20 matched normal speech segments. Each of the booklets contained all types of items (F and L, Hi and Lo, and all degrees of context). The types were not equally represented in each booklet. Each of the 10 booklets contained a particular item and its paired item in one degree of context only. Each of the 400 stimulus items (20 speech samples x 4 items from each sample x 5 degrees of context for each item) was therefore responded to by 23 clozers.

Clozers were instructed to guess each deleted word. They were not told that some of the speech segments came from schizophrenic speech samples. They were merely told that the material was taken from tape recorded speech samples and that each segment needed a single word to be written in the blank on each page.

Below are two matched speech segments, the first the normal one, and the second the schizophrenic one. The word to be guessed appears below the item. The items are here presented under maximum context conditions. Other context conditions can be seen in these examples by viewing the item with one word before and one after the word to be guessed for the context of 2; 2 words before and 2 after for the context of 4, etc.
Example of a normal speech item:
high hopes for success and incidentally my hearing is is perhaps a
little more _______ to me than it may be to some other
people in this sense that

Correct word to be filled in: important.

Example of the schizophrenic speech item matched to the above:
very well very loosening effect I felt there I wasn't too happy
there very _________ to get acquainted with people there
I felt that it was out of I

Correct word to be filled in: hard.

The data were scored in terms of the number of guesses that matched the
deleted word exactly and the number of guesses that matched the deleted word in
grammatical class. The grammatical classification was that used by Feldman (in
press) and Portnoy (in press); it is based on the classical grammatical categories
with some modifications, and has high reliability.

Results and Discussion

The exact correct word

Figure 1 shows the data in terms of the mean number of correct guesses for
the schizophrenic and normal segments, separately for the lexical and function

words of high and low guessability. Each of the eight curves was subjected to a
simple analysis of variance over the five degrees of context. Those that gave
rise to a statistically significant difference were then further analyzed for
trend (Edwards, 1960), and each of these showed a significant linear trend.
Table 1 presents the F values and significance levels for the analyses of variance
and the trend tests. Statistical significance of the trend tests is also

indicated in Fig. 1 by the circles around the word type designations of the curves.

One other set of statistical analyses was carried out on the exact correct
responses. For each degree of context and for each type of word deleted, a
correlated t-test was performed between the normal and schizophrenic speech
segments. Statistically significant differences were found only for the Lo F words. For all degrees of context, the normal Lo F speech segments are better predicted than are the schizophrenic ones (see Fig. 1). At 2 words of bilateral context this difference does not reach statistical significance; at 4 words it reaches the .05 level of significance and at 8, 16 and 28 words of context, the normal speech segments produce significantly more correct guesses than the schizophrenic ones at the .01 level. Although both the normal and the schizophrenic speech segments show a significant linear trend over the various degrees of context, it is clear that the increase for the schizophrenic speech segments is less than that for the normal segments and that the increase for the schizophrenic segments occurs, as predicted, at low levels of context. The fact that any of the word types, at any of the degrees of context, should yield a significant difference between schizophrenic and normal speech segments is of particular interest, since the words were deliberately selected to yield matches which attempted to eliminate normal-schizophrenic differences. The increasingly larger differences with context (as shown by inspection of Fig. 1 and the decreasing probability level) give evidence for the Immediate Hypothesis, in that, when the number of response-produced stimuli is small (low context), schizophrenic and normal speech segments give rise to approximately the same scores, but as the number of surrounding words increases, these more remote words act as stimuli only for the normal speech segments, not for the schizophrenic ones.

Among the F words, "and" occurs as the deleted word 8 times for the normal speech segments and 4 times for the schizophrenic segments. Results on these words over the different degrees of context showed that the schizophrenic segments remained practically constant over context while the normal segments yielded very much the same increase in correct guesses as the total curve in Fig. 1. Thus when we match the schizophrenic and normal speech segments in terms of the exact word deleted, the immediacy effect appears with equal force as with the entire sample of words.

For Hi F words, only the normal speech segments profit from an increase in context since only the normal speech segments yield a significant linear trend; the schizophrenic speech segments do not even reveal a significant difference among the different degrees of context. Although, as already indicated, the schizophrenic Hi F words do not differ significantly from the normal Hi F words, comparison of the trends of the two curves (Fig. 1) shows the schizophrenic words to be more predictable at the low contexts (where only the immediately surrounding context is given to the clozers and therefore where only the immediate stimuli can be effective) and the normal words to be more predictable at the high contexts (where both immediate and remote words can be effective). Words more remote from the word to be guessed are helpful in suggesting the word actually emitted by the normal but not so for the schizophrenic's word.

F words emitted by schizophrenics are less dependent upon relatively remote words than are the F words emitted by normals. This class of words shows that schizophrenic speech is determined by the more immediate response-produced word stimuli to a greater extent than is the speech of normals.

One would expect the immediacy effect to be most pronounced for the F words since they clearly depend for their meaning on the surrounding context; on the other hand, L words also must derive at least some of their meaning from the surrounding words. Examination of the Hi L words shows a significant increase in number of correct guesses with an increase in context for both schizophrenics
and normals. Nevertheless, the analyses of variance show greater statistical significance for the normal than for the schizophrenic speech segments. Furthermore, inspection of the two relevant curves in Fig. 1 shows that the normal segments start from a lower point of guessability at low context (even though the difference between the schizophrenics and normals is not statistically significant), with the two curves remaining closer together at higher contexts. The initially lower level of the normal speech segments, or at least the greater significance of the linear trend for the normal segments, suggests, again in accordance with the Immediacy Hypothesis, that normal speech requires more remote words for the guessing of a particular word (for the understanding of it), and, therefore, in the production of normal speech the closely neighboring words (the immediate stimuli) do not determine any given word as much as they do in the case of schizophrenic speech.

The last class of words to be considered, the Lo L words, show no significant difference as a function of different degrees of context, although again the trend goes in the predicted direction, i.e., the normal segments appear to benefit from an increase in context at a point where the schizophrenic segments no longer do.

The reader is reminded that the deleted words were equated on a number of variables, including their guessability as measured by previously obtained cloze procedure scores. They were not, however, matched in terms of their general frequency of occurrence in the English language (Thorndike & Lorge, 1944). Table 2 presents the geometric means of the frequency of occurrence of the deleted words of the various classes for the schizophrenic and the normal speech segments.

It is noteworthy first of all that the L words, whether Hi or Lo in the cloze procedure, are of considerably lower frequency of occurrence in the English language (Thorndike & Lorge, 1944) than are the F words. In 3 of the 4 cases, the Hi words are of higher frequency of occurrence than the corresponding Lo subclass; however, the reverse is true for the normal F words. Comparison of the Lo F words shows that the normal words are of higher frequency of occurrence than the corresponding words from the schizophrenic samples. It seems unreasonable to believe that this might account for the difference in guessing performance on the segments, since the guessing difference is not the same over all degrees of context, and furthermore, as already indicated above, when comparing the very same word ("and") in both groups, the same effect still holds. The proportionately larger difference in frequency of occurrence for the Lo L words does not produce a significant difference in guessability between schizophrenic and normal segments. Finally, it is of interest to note that the two Hi samples are of higher frequency of occurrence for the schizophrenics than for the normals while the two Lo samples are both of lower frequency of occurrence for the schizophrenics. It suggests that the guessability of the schizophrenic speech segments was, to a greater degree than the guessability of the normal speech segments, determined by first order probability level of the words, namely, by their general frequency of occurrence in the English language. Obviously the immediately neighboring words also determined the words emitted by the schizophrenics, but the fact that the simple frequency of occurrence should be more important for the schizophrenics
than for the normals is another bit of evidence for the independence of context in schizophrenic speech.

Words of the correct grammatical class

Since the deleted words were not selected to be matched on predictability in terms of correct grammatical class, no direct normal–schizophrenic difference tests were made. However, all the subgroups of word types were tested with respect to differences over different degrees of context. Only the normal Lo F words yielded significantly different scores over the different degrees of context, and also showed a statistically significant linear trend over increasing degree of context (0.01 < p < .05). Clearly the measure, number of grammatically correct guesses, is not very sensitive to context effects as measured here. Nevertheless, the one class which did show a significant trend was a class which intuitively is dependent on context. It is to be noted that only the normal Lo F words showed the context effect.

In conclusion, the data presented here are consonant with the Immediacy Hypothesis in that the normal speech segments are generally more sensitive to increases in context, suggesting that in normal speech the words more remotely situated with respect to a word to be guessed are related to that word, but that only a relatively weak relation of this sort exists with respect to schizophrenic speech. In other words, the response-produced stimuli in schizophrenic speech act primarily on the immediately neighboring words and not enough on the more remotely situated words. This kind of omission of words may contribute to the condition which clinicians have for many years been describing in schizophrenics as difficulty in communication. Such production of speech may also be seen to interfere with other types of behavior often found to be defective in schizophrenics, such as their proverb interpretations or word definitions, where connections over short spans might well produce the kind of concrete reasoning which has been reported in the literature (Chapman, Chapman & Miller, 1964).
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A subsequent check of how well the items were in fact matched on grammatical predictability, separately for Hi L, Lo L, Hi F, and Lo F items, showed no significant differences between the schizophrenic and normal items (all p-levels > .05, 2-tail t-tests). The overall median difference in predictability was 13%, with a range of 0 to 64%. With respect to the guessability of exact words, of course, no Hi-Hi or Lo-Lo difference exceeded 15%. 

Table 1

Results of Analyses of Variance and Trend Tests Applied to Exact Correct Responses Given to Different Kinds of Schizophrenic and Normal Speech Segments by 230 Clozers

<table>
<thead>
<tr>
<th>Word Type</th>
<th>Grammatical Class</th>
<th>Guessability</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schizophrenic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A of V</td>
</tr>
<tr>
<td>Function</td>
<td>High</td>
<td></td>
<td>1.16</td>
</tr>
<tr>
<td>Function</td>
<td>Low</td>
<td></td>
<td>3.30*</td>
</tr>
<tr>
<td>Lexical</td>
<td>High</td>
<td></td>
<td>3.91*</td>
</tr>
<tr>
<td>Lexical</td>
<td>Low</td>
<td></td>
<td>2.47</td>
</tr>
</tbody>
</table>

* .01 < p < .05

** p < .01
Table 2

Geometric Mean Frequency of Occurrence of Each of the
Deleted Words for Schizophrenic and Normal Word Classes

<table>
<thead>
<tr>
<th>Part of Speech</th>
<th>Lexical</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Schizophrenic</td>
<td>1,390</td>
<td>15,400</td>
</tr>
<tr>
<td>Normal</td>
<td>2,960</td>
<td>6,990</td>
</tr>
</tbody>
</table>

Note: All word frequencies are based on the magazine count of Thorndike and Lorge (1944).
Fig. 1 Mean number of correct words guessed to schizophrenic and normal speech segments by 230 clozers as a function of number of words of bilateral context, with type of word as a parameter. The circled word types designate statistically significant trends (p < .05) over increasing degrees of bilateral context.
Fig. 3. Characteristics of correct word-guessing mode of output given by C2H after an initial distribution of words of bilateral context with type of order of presentation. The difference between the number of correct guesses and the number of trials is statistically significant (p < .05) in all cases.