

SOME EFFECTS OF LSD-25 ON VERBAL COMMUNICATION

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The effect of LSD-25 on 2 dimensions of verbal behavior, predictability and volubility, was examined. 100-word samples of spontaneous speech from 10 alcoholic Ss under 4 drug conditions (predrug, 100 μ g., 200 μ g., postdrug) were elicited. 100 normal raters were asked to fill in every 5th-deleted word of the speech samples, all raters completing a set of 4 samples from randomly ordered Ss. The communicative value of speech (ratio of total to correct guesses) was found to decrease under LSD, as did volubility (number of words spoken). Additionally, an inverse relationship between predictability and volubility under the drug was suggested.

Investigators have reported remarkable alterations in personality, often judged therapeutically beneficial, resulting from the administration of the psychotogenic drug LSD-25 (Unger, 1963). These changes have alternatively been attributed in part to enhanced transference (Schmiege, 1963), heightened degree of empathy (Osmond, 1957), and similar factors relating to the communication process.

A study of the effect of LSD on the communication process in small group settings was undertaken by Lennard, Jarvik, and Abramson (1956). Using formal characteristics of communication such as quantity and direction of speech, and also the Bales Interaction Process Analysis categories, the authors found that nonpsychiatric subjects under LSD produce less speech, and that of lower density, with a greater number of unfinished sentences and interruptions. In a later study, Abramson, Hewitt, Lennard, Turner, O'Neill, and Merlis (1958) found that a schizophrenic patient in a three-person group including the schizophrenic, a stablemate (i.e., a specially selected normal with whom the patient could identify), and an interviewer, increased his communication output relative to the stablemate when he was administered LSD. Another investigator (Cheek, 1963), observing a four-man group, found the total interactions of the group increased under LSD, at dosages of 25 to and including 100 micrograms.

In these studies, communication was studied as a group process. In the work to be reported here, the informational value of speech, rather

than the pattern of communicative acts, was examined. The communicator's, or source's, output was evaluated in terms of its effect on the communicand, or the target. To measure the communicative value of speech, the cloze procedure (Taylor, 1953) was used. This technique involves the deletion of every n th word in a verbal passage, after which raters are asked to fill in the missing word with one that seems best to fit the remaining context. The number of correctly guessed words thus forms a measure of the predictability of the given verbal sample.

The cloze procedure has been used in a variety of contexts. It has been found to differentiate the speech of aphasics from that of normal subjects (Fillenbaum & Jones, 1962), and schizophrenic from normal speech (Salzinger, Portnoy, & Feldman, 1964). It has also been used to gauge the effect of psychotherapeutic interaction on predictability (Feldstein & Jaffe, 1963).

In the area directly relevant to the present effort, the cloze procedure has been used to measure the effect of drugs on predictability of speech. Salzinger, Pisoni, Feldman, and Bacon (1961) reported that the speech of one subject became less predictable with increasing dosages of chlorpromazine, while Honigfeld (1963), using psilocybin, again with one subject, found over a 3-hour period after drug ingestion, predictability first enhanced, later decreased.

The authors of the present study conducted a pilot investigation, examining the speech of one subject in a four-person discussion group, all subjects being under various drug condi-

tions (placebo, 25 μ g., 75 μ g. and 100 μ g. of LSD-25), finding predictability decreasing with mounting drug dosage.

However, in all three studies the speech of only one subject was examined, with experimental conditions sufficiently different to make comparisons across studies tenuous. In the present study the sample size of subjects as well as raters was increased, and the conditions under which the speech was elicited specified to facilitate replication.

METHOD

The subjects were 10 male patients from the Alcoholic Treatment Center of the New Jersey Neuro-Psychiatric Institute participating in a program in which LSD-25 was used as a psychoadjuvant to group therapy. The subjects were diagnosed as alcoholics with no known organic involvements, ranged from 29 to 63 years in age, with a median age of 37 years. Their education ranged from 8th grade to 4 years of college, with a median of 12th grade.

The drug was administered on two separate occasions, a low dose (100 μ g.) followed by a high dose (200 μ g.) 1 week later, at 8:30 A.M. Spontaneous speech of the subjects was recorded at 1:00 P.M. under both of these drug conditions, as well as during a predrug session 1 week before the first drug administration, and a postdrug session 1 week after the second drug administration.

The speech was elicited in the following manner. The subject was comfortably seated, facing a mirror, with a tape recorder in view. On each occasion the interviewer used these instructions:

I am going to ask you to tell me something about yourself. I would like you to look into this mirror and for 5 minutes say aloud whatever thoughts about yourself come to your mind. I don't care what you talk about—your appearance, what sort of person you are, how you get along with other people, how other people might think or feel about you, just so long as you talk about yourself. Are there any questions?

The interviewer then left the room, returning in 5 minutes, saying:

Now I am going to ask you to tell me something about your family. For 5 minutes I would like you to say aloud whatever thoughts about them that come to your mind. You can talk about whatever you want, what sorts of people they are, how you all get along, how you might think or feel about them, just so long as you talk about your family. By family, I mean either your parents or your wife and children, or both. Are there any questions?

Leaving the subject again, the interviewer returned once more after 5 minutes, this time asking the subject:

Now I am going to ask you to tell me something about this group with whom you are taking LSD. For 5 minutes I would like you to say aloud whatever thoughts come to your mind about this group. You can talk about whatever you want, what sorts of people they are, how you all get along with one another, how you might think or feel about them, just so long as you talk about the group. Are there any questions?

Thus the subjects produced a total of three 5-minute segments of speech during each session.

The taped speech was transcribed, including all repetitions, uncompleted words, sighs, etc. The first 100 words of the first segment (self-description) of each of the 4 monologues from all 10 subjects were selected, representing the 4 experimental conditions. From these speech samples broken words and other speech disruption were deleted, but repetitions were retained.

The samples were then prepared by the deletion of every fifth word, with a space of uniform length substituted. Wherever the fifth word was a proper noun or number, the next word was deleted with a corresponding number of words added to the passage, so that the last twentieth blank was always followed by four words.

The four speech samples of 10 subjects were duplicated 10-fold to allow for the construction of 100 booklets containing 4 speech samples each. Each rater thus filled in one sample of each drug condition randomized with regard both to subjects and order of drug condition.

The raters used were 100 female members of the Junior class of Trenton State College (age range 19-21) who received the following instructions in a group session:

This is a study of language. On each of the next four pages of your booklet is a sample of a person's speech. All punctuation has been omitted. You will notice that every so often there is a blank; every fifth word which was spoken has been left out. Your job is to fill the blank with the word you think will make the most sense. The missing words are *not* numbers or names. This is difficult and often you will have to guess. Do the best you can. It is *very important* that you fill in *all* the blanks. Work as quickly as you can.

Most raters completed the task in less than the allotted 30 minutes. The data consisted of the number of guessed words identical to those recorded.

RESULTS AND DISCUSSION

Predictability and Drug Condition

Table 1 presents the mean cloze scores (ratio of correct to total guesses) of the 10 ratings obtained for each speech passage of the 10 alcoholic subjects in each of the 4 drug conditions.

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* $p < .01$.

The predictability of speech appears to decline when the subject is under LSD-25. The mean cloze scores show greatest predictability in the predrug phase, then the postdrug phase. The high dose condition is least predictable, and the low dose condition only slightly more so.

Table 2 shows the results of an analysis of variance (performed on the original measures) investigating the influence on predictability of the drug conditions and the subject giving the spontaneous speech sample, and the interaction of these two factors.

Evidently, the drug condition has a significant influence upon the predictability of the speech samples, for the speech of the 10 subjects is significantly ($p < .01$) more difficult to predict when they are under the effect of LSD-25.

Also, the speech of some subjects is more difficult to predict than the speech of others ($p < .01$). The interaction F ratio is also sig-

TABLE 1

MEAN CLOZE SCORES OF TEN RATINGS OF SPEECH SAMPLES OF TEN SUBJECTS UNDER FOUR DRUG CONDITIONS

Subject	Drug condition			
	Predrug	Low dose (100 μ g)	High dose (200 μ g)	Postdrug
A	.40	.26	.27	.47
B	.46	.38	.47	.33
C	.61	.30	.33	.37
D	.61	.29	.34	.32
E	.48	.44	.65	.54
F	.42	.50	.39	.32
G	.31	.47	.26	.43
H	.45	.39	.29	.34
I	.37	.43	.25	.63
J	.31	.27	.33	.36
Grand M	.44	.38	.36	.41

TABLE 2

ANALYSIS OF VARIANCE OF DIFFERENCES IN CLOZE SCORES IN RELATION TO DRUG CONDITIONS AND SUBJECTS

Source	df	MS	F
Subjects (A)	9	49.69	12.43*
Drug conditions (B)	3	50.96	12.68*
A $\times$ B	27	31.37	9.84*
Within treatments	360	4.00	
Total	399		

* $p < .01$.

TABLE 3

VERBAL OUTPUT (NUMBER OF WORDS) OF TEN SUBJECTS UNDER FOUR DRUG CONDITIONS

Subject	Drug condition			
	Predrug	Low dose (100 μ g)	High dose (200 μ g)	Postdrug
A	1,664	909	1,230	1,894
B	1,220	1,181	291	1,259
C	1,069	1,224	1,017	1,477
D	2,129	1,569	1,005	1,762
E	985	270	264	836
F	1,670	337	540	1,806
G	1,220	553	485	967
H	2,127	1,692	1,568	2,277
I	1,869	1,659	1,243	1,671
J	2,502	2,154	1,983	2,462
M	1,645.5	1,154.8	962.6	1,641.1

TABLE 4

ANALYSIS OF VARIANCE OF DIFFERENCES IN VERBAL OUTPUT OF TEN SUBJECTS IN FOUR DRUG CONDITIONS

Source	df	MS	F
Between conditions	3	1,303,392	4.67*
Within sets	36	278,808	
Total	39		

* $p < .01$.

nificant ($p < .01$), indicating that the predictability of some subjects is more affected by the drug condition than the predictability of others.

Volubility and Drug Conditions

Another dimension of the subjects' verbal behavior was examined in relation to the drug conditions, that of volubility, defined as quantity of verbal output per unit of time. A measure of the total verbal output for each subject under each condition was established by summing the words of the typescripts yielded by the three 5-minute monologues.

Table 3 presents the resulting figures, showing verbal output to be highest in the predrug conditions, decreasing with increasing drug dosage, returning to near predrug level in the postdrug session. An analysis of the variance due to the difference in drug conditions, presented in Table 4, shows the drug conditions to have a significant ($p < .01$) effect on verbal output. All subjects speak less while under the influence of the drug.

TABLE 5
CORRELATIONS BETWEEN CLOZE SCORES OF RATERS AND
VERBAL OUTPUT OF SUBJECTS IN FOUR
DRUG CONDITIONS

Drug condition	r^*
Predrug	-.24
Low dose—100 μ g	-.53
High dose—200 μ g	-.54
Postdrug	-.30

*.60 significant at the 5% level.

Predictability, Volubility, and Drug Conditions

Next, the relation between predictability and volubility was examined. Table 5 shows the rank order correlations between amount of verbal output and cloze scores of passages for each subject in the four drug conditions.

All four coefficients are negative; two approach significance at the $p = .05$ level, suggesting an inverse relationship between volubility and predictability when the drug effect is present. It appears that those subjects who are more voluble under the drug are also less predictable under the drug. However, this relation between volubility and predictability is weaker when the subjects are free of drug effect. It may be that talkativeness under the drug is associated with loss of control and a loosening of associative bonds. Further examination of the speech protocols in order to investigate this finding is now in progress.

Stability of Volubility and Predictability

Stability of the subjects through the various conditions in terms of volubility and predictability was also examined. The verbal output scores of each subject in the two nondrug and drug conditions were summed, rank ordered, and correlated, yielding a rho of .85, which is significant above the .01 level, indicating that subjects maintain their relative position of volubility to a high degree across conditions. The subjects' cloze scores were similarly treated, yielding a rho of .06, which is not significant, suggesting that predictability is a characteristic of speech more variable and sensitive than is volubility. This assumption is somewhat strengthened by the fact that all subjects lowered their verbal output under LSD-25, whereas three subjects deviated from the general trend by rising in

predictability under the drug. The cloze technique may be tapping multiple factors differentially affected by the drug conditions.

Thus, our findings support those of our own pilot studies and those of other investigators that communication as measured by predictability of speech and amount of verbal output is reduced by the administration of LSD-25. In view of this, it is interesting that the therapeutic effect of the drug has been attributed to facilitated communication and increased empathy.

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