

LYSERGIC ACID DIETHYLAMIDE (LSD-25): XII.
A PRELIMINARY STATEMENT OF ITS EFFECTS
UPON INTERPERSONAL COMMUNICATION*¹

Departments of Medicine, Neurology, and Psychiatry of Mount Sinai Hospital, New York City; and the Bureau of Applied Social Research, Columbia University

H. LENNARD, M. E. JARVIK, AND H. A. ABRAMSON²

A. INTRODUCTION

Lysergic acid diethylamide is a drug which has been shown to produce a variety of changes in the intellectual (10, 13) and emotional functioning of non-psychotic adults (4, 11, 12, 14). Previous work in this laboratory has demonstrated that performance on objective tests measuring memory (8), concentration (5, 7) and motor abilities (1, 9) is impaired when subjects receive LSD-25. Some effects of this drug on social perception have been described by Hyde *et al.* (6).

The present paper attempts to describe the patterns of interpersonal communication of a small group of individuals under the influence of LSD-25. Our objective was to specify the dimensions along which interpersonal communication is modified and the dimensions along which it is unchanged when this agent is administered to several individuals in a group situation. The substance of this paper will consist of a discussion of a series of specific hypotheses which were formulated to explore the problem and is intended to serve as a preliminary report to be followed by a more intensive examination of this problem.

B. METHOD

1. *Subjects*

There were four paid, adult volunteers, three female and one male considered non-psychotic on the basis of a psychiatric interview and a battery of clinical psychological tests (2). Intelligence, as measured by the Wechsler-Bellevue Intelligence Scale, ranged from superior to very superior. Body weight ranged from 130 to 160 pounds. Age ranged from 22 to 26 years.

*Received in the Editorial Office on October 15, 1955, and published immediately at Provincetown, Massachusetts. Copyright by The Journal Press.

¹This investigation was aided by a grant from the Geschickter Fund for Medical Research.

²We are indebted to Sandoz Pharmaceuticals, Inc., for supplies of LSD-25 and other compounds.

All subjects were college graduates, three in the field of education and one in business administration.

2. Procedure

a. Experimental conditions. At 9:30 A.M. two subjects received 50 micrograms of LSD-25 and two received 100 micrograms. The drug was given orally in 75 cc of tap water. Five months later a second experiment was conducted where the subjects were given a placebo consisting of 75 cc of tap water only. Since LSD-25 has no taste, odor, or color, subjects were unaware of the dosage they received.

At each session the subjects had eaten no food since the previous evening. One-half hour after the ingestion of the drug or placebo they ate a light breakfast. Neither smoking nor stimulants, such as coffee or tea, were allowed during the entire testing period. Prior to the drug experiment all subjects had participated in placebo experiments and two had received LSD-25. Between the drug and placebo experiments in this study there were several other LSD-25 sessions.

b. Data obtained. The following types of data were available for this preliminary analysis:

(1). Condition 1. A typed script from a tape recording of the above group, under the influence of LSD-25, discussing the topic, *The Place of Women in Society*.

(2). Condition 2. A typed script from a tape recording of this group discussing the same topic after they had received placebos.

(3). Condition 3. Typed scripts from tape recordings of group discussions in which members of our experimental group participated individually. The data used came from earlier sessions where the experimental member from the present group was under a placebo or "normal" condition while the others in his group were under the influence of LSD-25.

3. Analysis of Data

a. Frame of reference for analysis of group communication. A full exposition of our orientation with regard to group behavior must be postponed to a later date. At this time we shall briefly state our position. We agree with Bales that in studying group behavior, process, or functioning, what we are actually talking about is, "a sequence of qualitatively different activities of human beings, which is distributed in time and between individuals in a way that seems to be organized or patterned in a great number of ways"

(3). Further, we believe that all interaction has "a problem solving direction

whether the people are trying to solve what we might call a substantive problem or not . . . the 'problems' involved are problems of interacting together and communicating" (3).

The study of the effect of LSD-25 on group behavior was made through the utilization of the most basic and easily quantifiable variables present. In order to arrive at generalizations of human behavior or the situation in which it takes place, we think it necessary to reduce stimulation and action into component parts which lend themselves to objective measurement.

b. *Variables used.* Two types of variables were used:

(1). Formal characteristics of communication: *quantity of speech* (number of words, number of lines, number of thought units); *direction of communication* (who initiates; amount of communication; to whom addressed); *other characteristics of communication* (interruptions, unfinished thought units, etc.).

(2). A system of categories devised by Bales (3) for the analysis of group interaction. Among the various methods of analysing interaction now available, the Bales system has been most widely used, thus providing us with a body of comparative data. The system of categories employed is described in Figure 1.

The set of categories used is "completely inclusive in the sense that every act which can be observed can be classified into one positively defined category" (3). The method is continuous in that every act is classified. The system further permits the scoring of "who to whom, in that for every act the author of the act (the actor) and 'target object' can be identified" (3). The target object is defined as "that area of focus of the situation (i.e., self, other, in-group or outer situation) which the actors aim to affect or change, or which is affecting or changing him, and to which he is, therefore, giving primary attention in the present momentary act" (3). We note that the unit of observation is the single act which is defined as "the single item of thought or the single item of behavior. Often the unit will be a single sentence expressing or conveying a simple thought" (3).

We should point out that our scoring deviated from Bales' method in that we classified responses from verbatim transcripts rather than from observation. The reliability of the scoring, computed for 100 acts, by inter-coding agreement, was better than 80 per cent.

In presenting our findings we shall first state the specific hypothesis explored, and the rationale for its formulation.

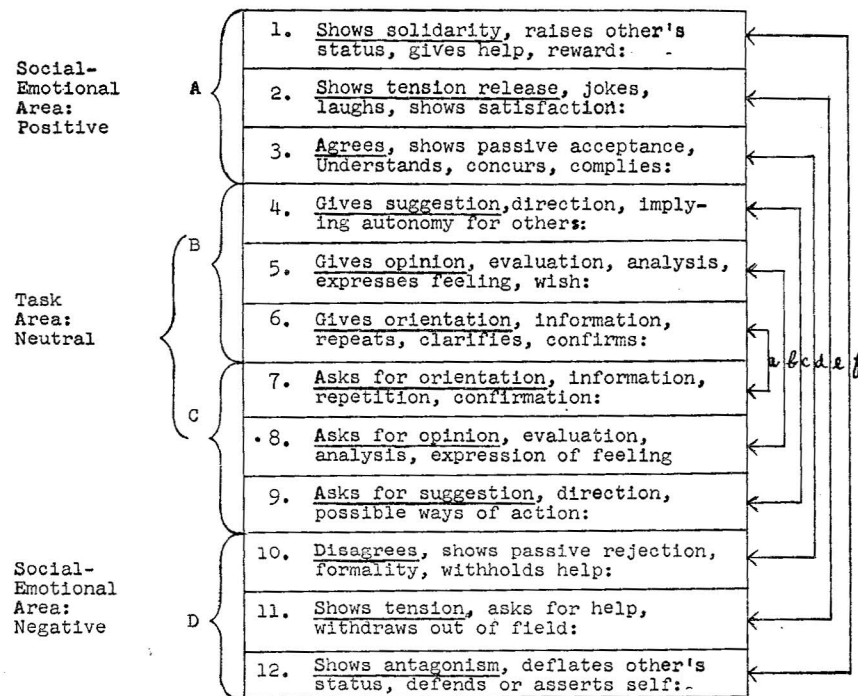


FIGURE 1
THE SYSTEM OF CATEGORIES USED IN OBSERVATION AND THEIR MAJOR RELATIONS
Key:

a—Problems of Communication (6, 7)
b—Problems of Evaluation (5, 8)
c—Problems of Control (4, 9)
d—Problems of Decision (3, 10)
e—Problems of Tension Reduction (2, 11)
f—Problems of Reintegration (1, 12)

A—Positive Reactions
B—Attempted Answers
C—Questions
D—Negative Reactions

C. RESULTS AND DISCUSSION

1. Hypothesis No. 1

The duration of proaction will be less under LSD-25 than under "normal" conditions; that is, the quantity of continuous speech for the group and/or the individual will be less under LSD-25 than under placebo or non-drug conditions.

Quantity of speech, one of the most basic variables of group communication, is easily quantified and throws light upon a basic group process. The above hypothesis represents our feeling that the impairment of intellectual

functioning, brought about by LSD-25 (10, 13), would be reflected in a shortening of individual verbal participation.

The measure of quantity of speech used was the number of typed lines. Although the number of words or number of propositions (syntactical idea units) could also have been used, the former is more easily obtained. Unpublished studies by one of the authors (H. L.) have established the correlation of lines and propositions to be approximately .9, the correlation of words and lines is probably higher still.

TABLE 1
AVERAGE DURATION OF PROACTION* FOR INDIVIDUALS AND GROUPS
UNDER THREE CONDITIONS

Condition	A	Individual B C D			Average of group
1. Average proaction during LSD-25 in study group	.8	.9	.9	.8	.85
2. Average proaction during normal in study group	1.3	.9	2.0	1.2	1.4
3. Average proaction during normal while individuals participated in different groups where others had LSD-25	2.3	1.4	3.1	1.6	2.1**

*Proaction is defined as the ratio $\frac{\text{number of lines}}{\text{number of initiations}}$

**This is not really a group average. It represents the average proaction of the four individuals, derived from their individual participations in four different groups.

Table 1 gives the average duration of proaction under three conditions. Several observations can be made from the data:

1. Our hypothesis is borne out. Seven of the eight differences in proaction are in the expected direction; some of these differences are considerable.
2. The increase in proactive duration has to be explained in terms of at least two factors: the effect of LSD-25, and the effect of the group in which the individual plays a part.
3. No relation between LSD-25 dosage and decrease of proactive duration emerges from this data. Subject *A* and Subject *D* had 100 micrograms each under Condition 1 while Subject *B* and Subject *C* had 50 micrograms each. Subject *B*'s proactive value does not decrease from Condition 2 while Subject *C*'s proactive value does. One explanation which comes to mind would ascribe the relative relationships to something one might term "individual tolerance or sensitivity" rather than to absolute dosage. Previous studies in this laboratory have demonstrated considerable individual variation in the number of symptoms elicited by the same dose of LSD-25 (2).

4. We observe further that the nature or composition of the group of which the individual is a member makes a difference in his proactive rate. In each case the highest value appears when the individual interacts in groups where he is under condition "normal" while some or most of the others are under varying dosage of LSD-25.

This appears to be a very interesting finding. For interpretation, we must refer to the concept of equilibrium commonly used in the study of interaction. The communication system of a group is postulated to represent an equilibrium so that if one unit of the system fails to do its part, other units of the system make up for it. The presence of individuals whose proactions are decreased operates to increase the proactions of those who are not affected. This would be in line with the observation that in communicating with a rather taciturn individual it is necessary to speak for longer periods if one wishes to have the conversation continue.

5. We might also note that there is far less inter-individual variation under Condition 1 than there is under Conditions 2 or 3.

2. Hypothesis No. 2

The density of speech is expected to be less under LSD-25 than under "normal."

This again is a hypothesis which represents an extrapolation of the intellectual impairment findings (10, 13). One way in which communication processes may be affected, we reasoned, was in their conciseness. Density is defined as the number of propositions per line. If complete idea units are communicated in few lines we call speech "dense"; if it takes a great number of lines to communicate the same number of ideas, the speech is lacking in density.

Table 2 does not bear out our contention. Rather, there is a slight tendency in the reverse direction, that is, speech is somewhat more dense under LSD-25 than under "normal" conditions. One should note that the temporal element

TABLE 2
DENSITY OF SPEECH UNDER LSD-25 AND UNDER "NORMAL"

Condition	Number of Propositions	Ratio
	Number of Lines	
Normal	699	1.6
	440	
LSD-25	708	1.9
	374	

enters into considerations of density. It may be that individuals talk considerably slower (Hypothesis 2) under LSD-25 than under "normal," and that it takes considerably longer to communicate an idea or proposition under LSD-25 even though it is done within the same or fewer number of lines as under "normal."

3. Hypothesis No. 3

The number of unfinished statements will be greater under LSD-25 than under condition "normal."

Table 3 indicates that this hypothesis seems confirmed. There is a tendency for communication to "trail off" under LSD-25 and not be concluded mean-

TABLE 3
STATEMENTS UNFINISHED BY GROUP MEMBERS UNDER LSD-25 AND UNDER "NORMAL"

Condition	A	Individual			Group total
		B	C	D	
Normal	1	1	3	2	7
LSD-25	16	24	8	36	84

Note: Definition of unfinished statement: any statement in which either subject or predicate was missing, and not implied.

ingfully. This was noted in varying degrees in all of the subjects. We are thus dealing here with a definite interference with the form of the communicative act.

4. Hypothesis No. 4

The number of interruptions will be greater under LSD-25 than under "normal."

The results given in Table 4 show that the converse of the hypothesis is true. The relationship between interruptions and unfinished statements is complementary, but in an inverse fashion. It seems that the same factor operating to make communications concise and complete, operates to maximize interruptions. One may hypothesize that individuals will be most likely to interrupt someone else when they are clearly conscious of, and have succinctly formulated the ideas which they wish to communicate. We believe that the

TABLE 4
INTERRUPTIONS UNDER LSD-25 AND UNDER "NORMAL"

Condition	A	Individual (Interrupted)			Group total
		B	C	D	
Normal	19	9	22	22	72
LSD-25	2	2	0	9	13

findings on decreased proaction, increased unfinished statements, and decreased interruptions should be viewed jointly. They present an integrated picture of changes in formal communication behavior which occur under the influence of LSD-25.

5. Hypothesis No. 5

The ratio of expressive acts to instrumental acts will be greater under LSD-25 than "normal," that is, the ratio of Bales' Categories 1 to 3, plus 10 to 12, to Categories 4 to 9 will be greater under LSD-25 than "normal."

This is the first in a series of hypotheses which utilizes the system of categories devised by Bales, and in terms of which our data has been scored.

As previously mentioned, Bales holds that the small group constitutes "a functioning social system." There are four types of problems which are being met by the system: (a) adaptation to conditions of the external situation, (b) instrumental control over parts of the situation in the performance of goal orientated tasks, (c) management and expression of sentiments and tensions of the members and, (d) preserving the social integration of members with each other as a social collectivity. Responses (acts) can then be classified in terms of the type of problem with which they are concerned. Responses concerned with Problem 3 plus 4 are called *expressive-integrative*. The following categories seen in Figure 1 are subsumed under this dimension: 1, 2, 3, 10, 11, and 12.

Acts dealing with Problems 1 and 2 are combined under the heading of *instrumental-adaptive*. The following categories comprise this area: 4, 5, 6, 7, 8, and 9.

The hypothesis was formulated on the assumption that the drug action on individual participants would function to disturb the relationship between the expressive and instrumental acts in group communication. In particular, we believed that there would be more acts devoted to the expression and management of tensions and sentiments. Thinking simply in terms of a dichotomy between emotional-personal concerns and task-centered content activity, it seemed that the scales would be tipped heavily in favor of the former, under Condition 1. This hypothesis was not confirmed as seen in Table 5. Yet, this very non-confirmation raises some very interesting problems. Can it be that the lack of change in the relationship between expressive and instrumental activity implies that the social functioning of the individual under LSD-25 is far less impaired than one may suspect from the evidence accumulated through individual testing?

For this group about the same quantity of behavior is devoted to tension

management as to problem exploration under both conditions. The distribution of specific categories undergoes marked changes but it is interesting to observe that ratios along the major analytical dimensions remain the same.

TABLE 5
THE RATIO OF EXPRESSIVE OVER INSTRUMENTAL ACTIVITY UNDER
"NORMAL" AND UNDER LSD-25

Condition	Number of Expressive Acts	Ratio
	Number of Instrumental Acts	
Normal	200	.40
	498	
LSD-25	208	.42
	500	

It is impossible here to explore fully the implication of a finding such as this. One would wish to gather further data to obtain additional confirmation of this finding, and to evaluate the relationship between emotional and task behavior within an analytical scheme other than Bales'. Nevertheless, here is an unexpected finding which deserves the attention of those presently doing pharmacological research and may well raise significant issues in the whole area of relating individual-psychological to social group processes.

6. Hypothesis No. 6

The ratio of Bales' Categories 1 to 12 will be less under LSD-25 than under "normal," i.e., the ratio of solidarity acts to antagonistic acts will be lower under LSD-25 than under "normal."

In devising this hypothesis we were operating on the assumption that the drug in its effect upon the individual would free repressed ideas, and would enable him to express antagonistic and hostile feelings more freely. Our premise was based upon previous observations of subjects under LSD-25 as well as upon reports in the literature (6). The actual relationship emerging is of a strikingly different order than envisaged. Table 6 shows that the ratio of solidarity acts to antagonistic acts is considerably higher under LSD-25 than "normal."

The table also shows the limitations in formulating hypotheses about a group process if one proceeds from the point of view of individual dynamics. Thus, based upon how an individual would be affected by LSD-25, we extrapolated to group behavior. We did not consider the type of group and the situational problems faced by the group. It is, however, in terms of these latter considerations that the finding becomes meaningful.

Let us consider the "group problem" of the four subjects involved. Four individuals, volunteering as subjects for experiments to test the effects of the new drug, meet in a strange room. They face the common threat of an

TABLE 6
RATIO OF SOLIDARITY TO ANTAGONISTIC ACTS UNDER LSD-25 AND "NORMAL"

Study group condition	Solidarity Acts	Ratio
	Antagonistic Acts	
Normal	$\frac{11}{39}$	.3
LSD-25	$\frac{21}{9}$	2.3

unknown situation and the problem of trying to communicate and interact under conditions they expect to be difficult. Their actions are, therefore, ones of mutual encouragement and of helping each other. There is an absence of acts which would destroy this mutual support situation.

In looking at the data in Table 7, we note that the value of every negative emotional category is lower under LSD-25 than under "normal." Thus,

TABLE 7
DISTRIBUTION OF BALES' CATEGORIES FOR STUDY GROUP UNDER LSD-25 AND "NORMAL"
(Group discussion: *The Place of Women in Society*)

Category	Normal	LSD-25
	Percentage of total	Percentage of total
1. Shows Solidarity	1.7	3.0
2. Shows Tension Release	3.3	13.8
3. Agrees	8.2	7.9
4. Gives Suggestion	1.3	3.5
5. Gives Opinion	48.6	32.5
6. Gives Orientation	12.9	21.0
7. Asks for Orientation	2.9	4.7
8. Asks for Opinion	4.3	7.9
9. Asks for Suggestion	1.3	1.0
10. Disagrees	8.7	2.4
11. Shows Tension	1.3	1.0
12. Shows Antagonism	5.7	1.3

though the number of acts within individual categories are rather small, a total picture emerges which possesses some stability. Other collateral documentation of this hypothesis is available in the finding with regard to Hypothesis No. 7.

A word of caution should be introduced here. There is some evidence from Bales' work that negative emotional reactions increase when the same groups come together repeatedly. In our study, the LSD-25 experiment took place

prior to the placebo experiment, thus this factor may be operative here. This increase in negative reactions is explained by Bales partially as a function of the tensions generated by group decision, control, and status differentiation. One could account for it also by the common sense consideration that as people get to know each other better they feel less inhibited in expressing negative and antagonistic feelings.

7. Hypothesis No. 7

There will be more evaluation than orientation under LSD-25 than under "normal," i.e., the ratio of Categories 5 plus 8 to 6 plus 7 will be higher under LSD-25 than under "normal."

Categories 5 and 8 embrace those acts having to do with the giving of and asking for opinion, the giving of and asking for evaluation, and the giving of or asking for an expression of feeling or wish. All acts of this type, according to Bales, deal with the problem of evaluation. Categories 6 and 7, on the other hand, deal with the giving of and asking for orientation and information.

Here again, the originally stated hypothesis was derived from results obtained from the individual under the influence of the drug. We originally felt that the reactions of a subject would take on an increasingly personal coloration, be less objective, and revolve less around systematic communication.

After analysis of Hypothesis No. 6, however, we reconsidered the above formulation. Our involvement with extrapolation from individual processes had deceived us, and we felt that a reframing of this hypothesis in terms of a group orientation might be profitable. If the explanation with reference to Hypothesis No. 6 is valid then the primary problem faced by the individuals in the LSD-25 group was the shared uncertainty of having to function under the influence of LSD-25. Therefore, we would expect that acts concerned with the giving of and asking for orientation and information would increase. Just as the group had maximized behavior for emotional reassurance, we felt they would tend to maximize behavior designed to obtain cognitive reassurance.

It is the latter hypothesis developed around the group's problem which seems confirmed by the data, as shown in Table 8. The ratio for the LSD-25 group is less than half of that of the normal group. Looking at the absolute numbers involved, we observe that in the LSD-25 group, evaluative acts decrease and orienting acts increase.

The findings with reference to the last two hypotheses then may be considered complementary. They represent different aspects of the way in which the experimental group reacts to the administration of the drug, and to

the problem presented to it, i.e., (a) communication and interaction with one another under the drug, and (b) communication, particularly with reference to an assigned topic, *The Woman's Place in Society*. Here, as in the examina-

TABLE 8
THE RATIO OF EVALUATIVE OVER ORIENTING BEHAVIOR FOR THE
STUDY GROUP UNDER TWO CONDITIONS

Condition	<u>Evaluation</u> <u>Orientation</u>	Ratio
Normal	$\frac{370}{110}$	3.4
LSD-25	$\frac{286}{182}$	1.5

tion of previous hypotheses, we have come up against unexpected results, which, if they are confirmed in further work, strongly suggest the need for an intensive study of group process under LSD-25 to supplement the study of individual effects of the drug.

8. Hypothesis No. 8

The ratio of questions (Categories 7 to 9) to answers (Categories 4 to 6) will be higher under LSD-25 than under "normal."

The system of categories devised by Bales further permits characterization of acts, falling within the instrumental-adaptive dimension, as questions and answers. In task-centered communication the balance between questions asked and answers received is an important one. Every question initiates a chain of answers until the rise of additional questions.

We reasoned that a disturbance in the communication processes between individuals attributed to LSD-25 might result in unbalancing the equilibrium between questions and answers. Thus, there would be relatively more questions needed for a given number of answers under LSD-25 than under "normal."

This hypothesis seems confirmed, as shown in Table 9. In the communica-

TABLE 9
RATIO OF QUESTIONS TO ANSWERS UNDER LSD-25 AND "NORMAL"

Condition	<u>Questions</u> <u>Answers</u>	Ratio
Normal	$\frac{59}{439}$	.13
LSD-25	$\frac{96}{409}$	.23

tion process under LSD-25 there is more input in the form of questions needed for a given quantity of output (answers).

Let us briefly relate the finding presented here to those previously discussed in relation to Hypotheses 5 and 6. We noted in our discussion of Hypothesis No. 5 that the basic relationship between emotional and task-oriented behavior did not seem to be impaired under LSD-25. However, we observed in the findings with respect to Hypothesis No. 6 that the quality of the expressive-integrative behavior (or social-emotional area) did undergo an unexpected change. We now see a similar internal change within the instrumental-adaptive area with respect to questions and answers.

D. SUMMARY AND CONCLUSIONS

We wish to stress once more that the study reported was an exploratory one. Research along the lines described is continuing. The findings enumerated should, therefore, be considered more in the nature of working hypotheses for further exploration.

Some of the patterns of group communication under LSD-25 identified in our exploratory study were as follows:

1. Verbal output on the part of group members under the influence of the drug was restricted or shortened.
2. In groups where some members had been administered LSD-25 and others had not, there was a tendency for those who had not received the drug to increase their communication output. We interpreted this to mean that the individuals not under the influence of the drug made up for the deficiency in verbal communication of those who were.
3. When all group members were given LSD-25 there was a marked reduction in negative interpersonal responses. We suggest that disruptive social behavior is reduced spontaneously when group members operate under a common threat which, in our case, was the awareness of having to function socially while under the effect of LSD-25.
4. Despite the relatively high dosage of LSD-25 administered, the ratio between amounts of task activity and socio-emotional activity does not differ for the group when under condition "LSD-25," and when under condition "normal." The stability of this relationship under varying dosages and conditions deserves further examination. We suggest that the pattern of group communication seems less impaired by the drug, than changes observed in individual functioning had led us to expect.
5. The ratio of questions to answers, as well as to the ratio of orientation to evaluative responses, is higher in the group under condition "LSD-25"

than under condition "normal." We interpreted this as an attempt on the part of the group to restore cognitive clarity despite the felt impairment.

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133 East 58th Street
New York City 22